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China Passenger Car Electronic Control Suspension Industry Research Report, 2024

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The assembly volume of Air Suspension increased by 113% year-on-year in 2023, and the magic carpet suspension of independent brands achieved a breakthrough

ResearchInChina published "China Passenger Car Electronic Control Suspension Industry Research Report, 2024", which combs Electronic Control Suspension industry chain and its applications, reflects the current market development situation and forecast future development trend.

Electronic Control Suspension can be divided into full active suspension and semi-active suspension according to whether it contains power source. Full active suspension contains power source, usually refers to as "active suspension"; Semi-active suspension or passive active suspension does not contain power source. Active suspension can adjust two parameters of suspension damping and stiffness, while semi-active suspension can adjust one of the two parameters.

Comparison of Common Active Suspension and Semi-active Suspension

Suspension type	Magic carpet suspension	Air Suspension	MRC electromagnetic suspension	CDC hydraulic suspension
Type	Active suspension	Active suspension	Semi-active suspension	Semi-active suspension
Composition	Inductor (front view binocular camera, etc.), calculation actuator, Air Suspension and other components.	Air spring, electric shock absorber, air supply unit, ECU, sensor, air storage tank and other accessories, etc.	Magnetic fluid variable damping control shock absorber, acceleration sensor, controller and other accessories, etc.	CDC shock absorber, electromagnetic control proportional valve, body acceleration sensor, wheel acceleration sensor and other accessories.
Differentiation	Compared with Air Suspension, magic carpet suspension features "advancement". It monitors the road conditions ahead through the front-view camera and adjusts the current body status actively in advance.	The sensor collects the current car body state signal and transmits it to ECU which issues instructions according to a certain algorithm to drive air supply unit to work and adjust the suspension height and stiffness.	The shock absorber uses magnetorheological fluid as the damping adjustment medium to detect 1,000 times per second with the response time of 1 ms.	The shock absorber uses hydraulic oil as the damping adjustment medium to detect 100 times per second with the response time of 1 ms.
Application cases	Mercedes-Benz, Audi, BMW, Voyah, etc.	NIO, XPeng, Li Auto, BYD, etc.	Cadillac, etc.	BYD, Chery, Buick, etc.

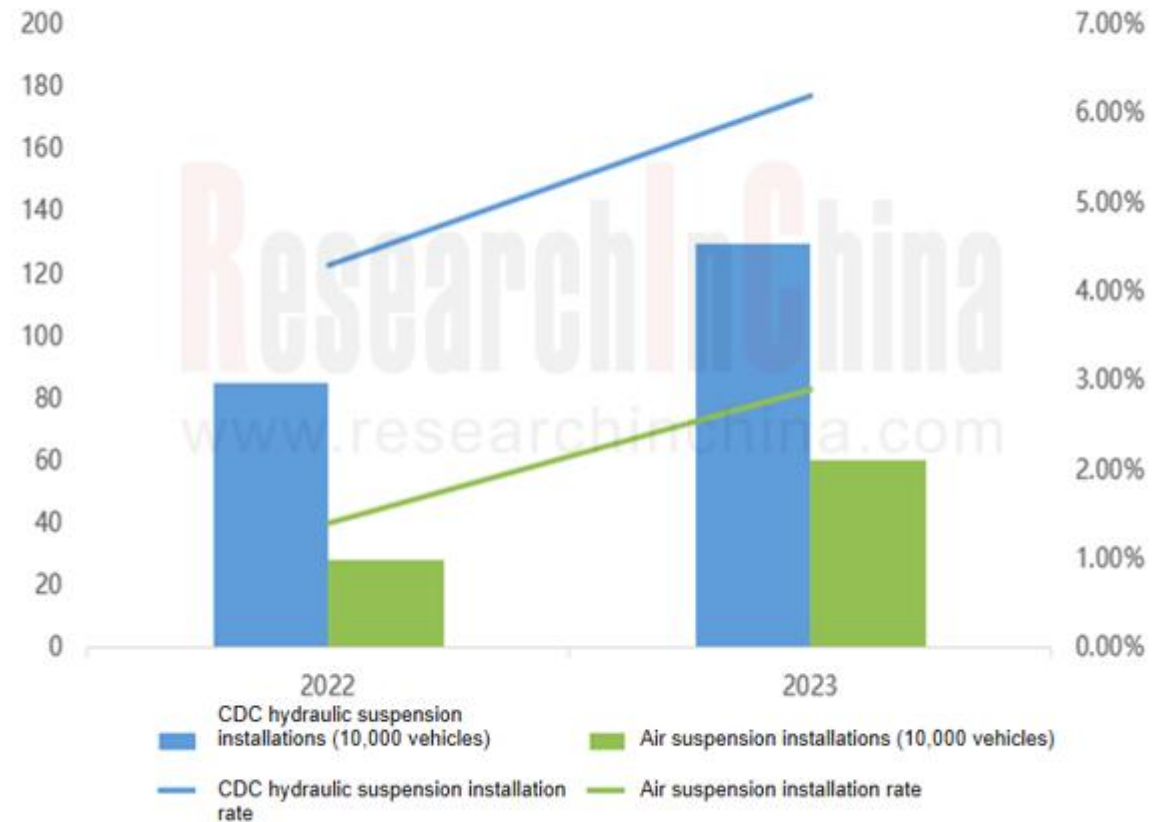
Source: ResearchInChina

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1. In 2023, the assembly volume of Air Suspension exceeded 600,000 units, up 113.1% year on year

In 2023, the assembly volume of CDC hydraulic suspension is close to 1.3 million vehicles, with a year-on-year growth of 52.7%, and the assembly rate increases by 1.9 percentage points year-on-year. Driven by emerging auto brands, the assembly volume of Air Suspension in 2023 exceeded 600,000 units, a surge of 113.1%.

Assembly Volume & Assembly Rate of CDC Hydraulic Suspension and Air Suspension, 2022-2023



Source: ResearchInChina

Air Suspension Installation of Some Brands

According to statistics, the starting price of Air Suspension carrying models in 2023 has dipped to the range of 190,000 yuan, NIO, Li Auto, Xpeng, Voyah, Zeekr and other brands have equipped with air spring as standard configuration, it is expected that in 2024, the air spring assembly will continue to double.

Air Suspension Installation of Some Brands

Brand	Model	Year	Air Suspension configuration	Manufacturer's quotation (RMB)	Price of model with Air Suspension (RMB)
NIO	ES8	2023	Standard configuration	498,000-598,000	498,000
	ET7	2023	Standard configuration	428,000-506,000	428,000
	ES7	2022	Standard configuration	438,000-518,000	438,000
	EC7	2023	Standard configuration	458,000-548,000	458,000
Xpeng	G9	2024	Top configuration	263,900-359,900	359,900
	X9	2024	Standard configuration	359,800-419,800	359,800
Li Auto	L7	2023	Mid-to-high configuration	319,800-379,800	339,800
	L8	2023	Mid-to-high configuration	339,800-399,800	359,800
	L9	2023	Standard configuration	429,800-459,800	429,800
Voyah	FREE	2024	Standard configuration	266,900	266,900
	Voyah Zhuiquang	2024	Top configuration	252,800-277,800	277,800
	Dreamer PHEV	2024	Top configuration	339,900-419,900	419,900
	Dreamer EV	2024	Top configuration	369,900-469,900	469,900
ZEEKR	1	2023	Available in YOU version	269,000-769,000	349,000
	9	2023	Standard configuration	499,000-588,000	499,000
HiPhi	HiPhi X	2022	Standard configuration	570,000-620,000	570,000
	HiPhi Z	2023	Standard configuration	510,000-630,000	510,000
AITO	M9	2024	Standard configuration	469,800-569,800	469,800
EXEED	STERRA ES	2024	Standard (except the minimum configuration version)	198,800-319,800	205,800

Source: ResearchInChina

Domestic OEMS have achieved a breakthrough in magic carpet suspension

2. Domestic OEMS have achieved a breakthrough in magic carpet suspension

Magic carpet suspension was first carried on Mercedes-Benz models, which called it "MAGIC BODY CONTROL system". The system realizes the road scanning function through stereo camera on the upper part of front windshield. After calculating the data, the adjustment of active suspension system can achieve the purpose of making body always maintain horizontal posture.

Later, BMW also launched the magic carpet intelligent Air Suspension system, which is composed of dynamic vibration reduction control, overall active steering, intelligent four-wheel drive, four-wheel speed sensors, front and rear axle electric active stabilizer bar, binocular camera, Air Suspension and other components. The system can scan the road information for up to 14 meters in front of the vehicle, and it can raise the car body by 20mm on a bumpy road surface.

In addition to luxury brands such as Mercedes-Benz, BMW and Audi, domestic OEMs have also made a breakthrough in the field of magic carpet suspension in recent years.

The "magic carpet chassis", carried by Voyah Zhuiguang which is available on market in December 2023, has key components including four CDC shock absorbers, air springs, and a shared ADAS front-view camera, etc. The front-facing camera scans the road data of 5-15 meters in front of the vehicle in real time, and transmits it to active suspension controller to adjust suspension status.

Voyah Zhuiguang PHEV magic carpet chassis can adjust mileage to 65mm, adjustment accuracy to 2mm. The system can judge the road surface condition and the vehicle state for 500 times per second, and the shock absorber can realize 100 times of real-time control per second.

In addition to Voyah, BYD's self-developed Yunnian-X also belongs to magic carpet suspension. The main components of Yunnian-X system include forward binocular camera, active anti-tilt rod, double valve shock absorber, air spring, height sensor, Yunnian intelligent computing center, etc. The system is based on damping control technology, height control technology, intelligent perception technology, stiffness control technology, four-wheel linkage technology and full active control technology. In addition to the traditional magic carpet function, Yunnian-X can still ensure that the vehicle continues to have driving ability when the single front wheel of the vehicle falls off. In addition, it also has the functions of camping leveling, four-wheel grounding, suspension 500mm/s height maximum adjustment speed.

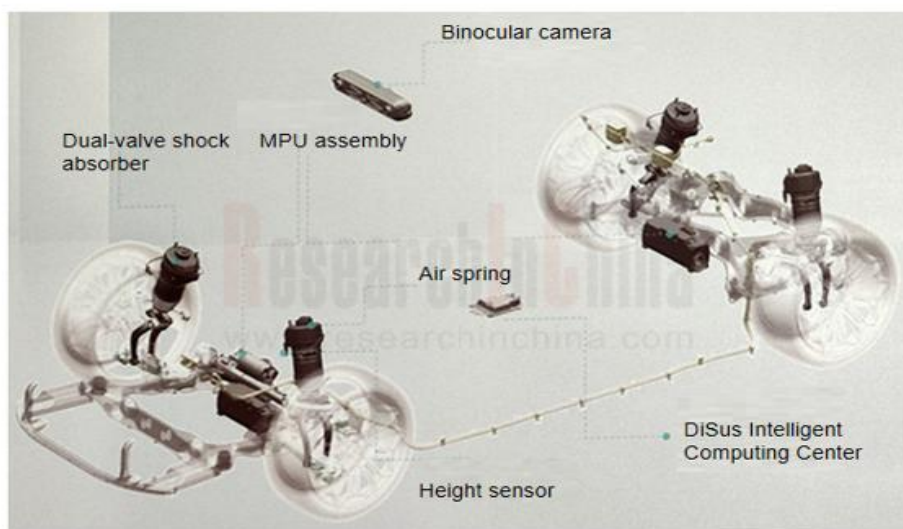
The production capacity of local suppliers is released, and the scale effect drives to further lower the price of electronic control suspension

3. The production capacity of local suppliers is released, and the scale effect drives to further lower the price of electronic control suspension

Baolong Technology expanded its production capacity twice in 2021 and 2023. It is expected that after the complete release of capacity under construction in 2028, 4.84 million air spring shock absorber assembly and independent air spring, 1 million air supply units (ASU), 1.04 million suspension controllers and 2.74 million gas storage tanks will be realized.

As of the orders disclosed in September 2023, the order value of Baolong Technology is more than 5 billion yuan, and it is expected to ship 3.16 million air spring shock absorber assembly and independent air spring, and 2.21 million gas storage tank and other products in 2026.

Composition of Yunnian-X system



Source: BYD

Electronic Control Suspension Capacity Expansion Project of Baolong Technology

	1.5 million/a intelligent electronic shock absorber project	Air Suspension system intelligent manufacturing capacity expansion project
Funding source	Non-public issuance of A shares in 2021	Issuance of convertible corporate bonds in August 2023.
Estimated completion time	February 2025	End of 2025
Investment	RMB180 million	RMB1,522 million
Factory location	Hefei	Air Suspension system components: Hefei Air spring: Xuancheng Ningguo Economic and Technological Development Zone Vibration reduction system accessories: Xuancheng Ningguo Economic and Technological Development Zone
Products	Air spring shock absorber assemblies and independent air springs	Air spring shock absorber assemblies, independent air springs, air supply units, suspension controllers, commercial vehicle air springs, passenger car air springs, aluminum parts and air storage tanks.
Annual capacity	1.5 million air spring shock absorber assemblies and independent air springs	1.41 million air spring shock absorber assemblies 1.37 million independent air springs 1 million air supply units 1.04 million suspension controllers 4.28 million air springs for use vehicles (3.12 million air springs for commercial vehicles) 7.92 million aluminum parts 2.7 million gas storage tanks

Source: ResearchInChina

Price Forecast of Air Suspension of Related Components

According to the forecast of Baolong Technology, the unit price of air spring shock absorber assembly in 2027 is 1120 yuan, compared with 2024, a decrease of nearly 9 percentage points, and the unit price of air supply unit in 2027 is 329 yuan, a decrease of nearly 8 percentage points.

In addition to Baolong Technology, KH Automotive Technologies has also obtained designated letters from more than 30 models of 14 mainstream OEMs, including Li Auto, Voyah, Zeekr, Lynk, Chery, BYD, Geely Englon, Avatr, Changan and others. It is expected that the total supply of models will reach 32 in 2024, and Air Suspension delivery volume of 0.8-1 million sets will be achieved within the year.

In September 2023, KH Automotive Technologies completed C round of financing of 300 million yuan, which will be mainly used for a series of capital expenditure such as plant and equipment involved in the new production capacity and supporting working capital support. At present, the annual capacity of KH Automotive Technologies is about 700,000 sets. In the future, new production lines will be opened in Suzhou, Chongqing and other places.

Price Forecast of Air Suspension Related Components, 2024-2034E

Parts/Unit price (yuan)	2024E	2025E	2026E	2027E	2028-2034E
Air spring shock absorber assembly	1,228	1,191	1,155	1,120	1,087
Independent air spring	513	509	489	465	451
Air supply unit	350	343	336	329	323
Suspension controller	447	438	429	420	412
Gas storage tank	156	141	127	114	103

Source: Baolong Technology

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