



- 智能线控 科技保障安全 -

X-BY-WIRE, FOR FUTURE SAFETY

Trinova Product Collection

北京英创汇智汽车技术有限公司
Beijing Trinova Auto Tech Co.,Ltd

Company Layout

Trinova, The company was founded in 2016, with a core team from Tsinghua University. Its main products include automotive chassis electronic control products (ABS ESC、EPBi、TBS、T-IBC、C-EPS、EPB、). We have a full chain product development and production system covering product research and development, testing, manufacturing, calibration and matching, including calipers, automotive sensors, EMS, automotive seats, automotive exterior parts, lathe parts, valve block parts, injection molded parts, etc. At present, Yingchuang Huizhi has established a fully automated production and assembly workshop with an annual output of 3 million sets, using Beijing Yizhuang R&D Center, Tianjin Production and Manufacturing Base, Hubei Yingshan Manufacturing Center, and actual vehicle testing field as three strategic support points, and has carried out large-scale supporting with many well-known domestic and foreign automobile enterprises.

2 million sets
Annual shipment
volume

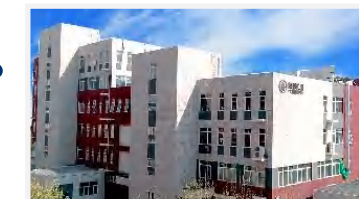
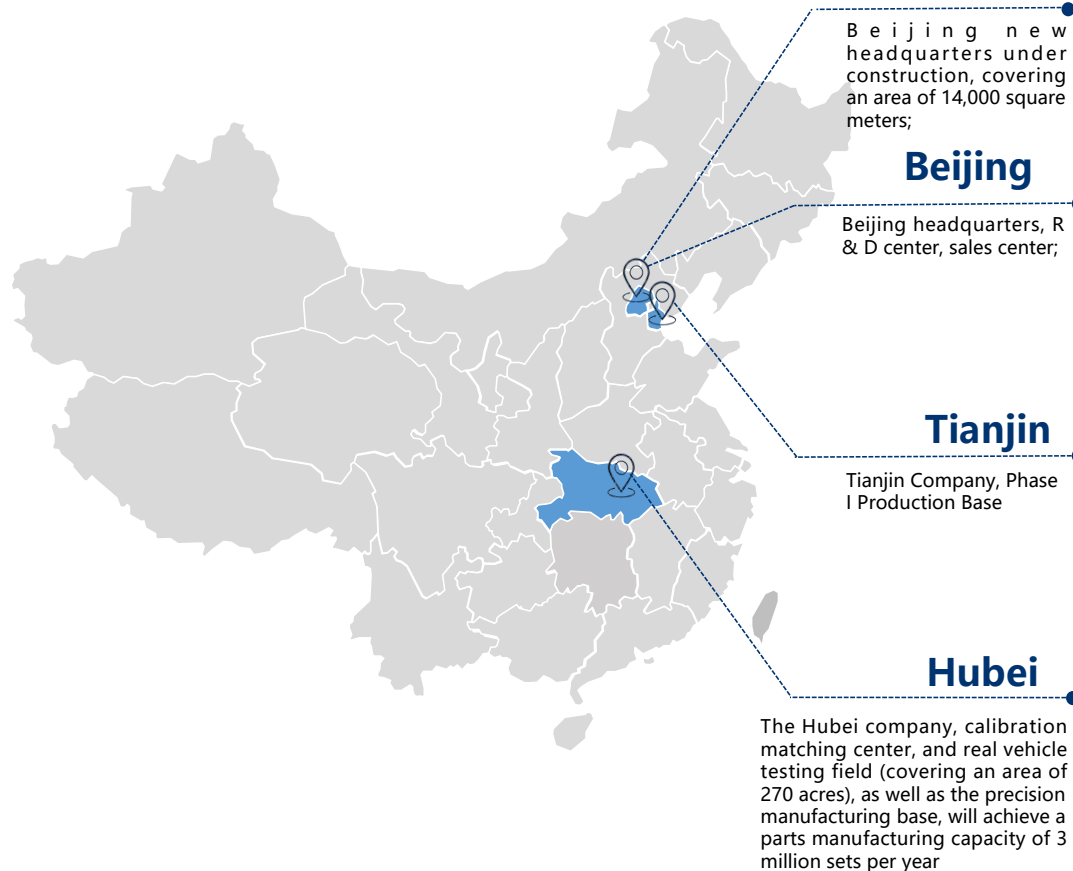
More than 20 years
Chassis development
experience

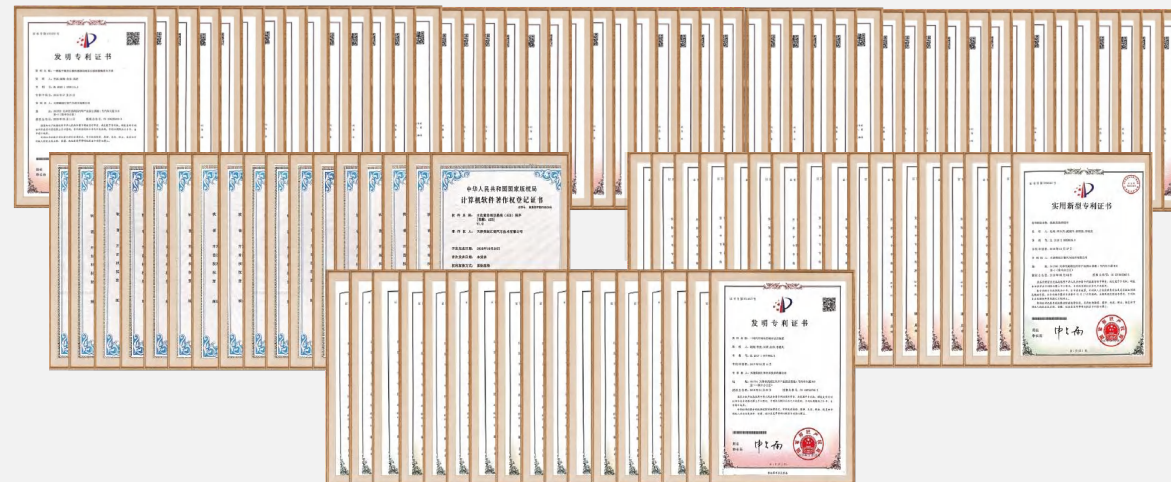
Over 400 people
Global R&D team

More than 300 items
Core invention patent

COMPANY LAYOUT

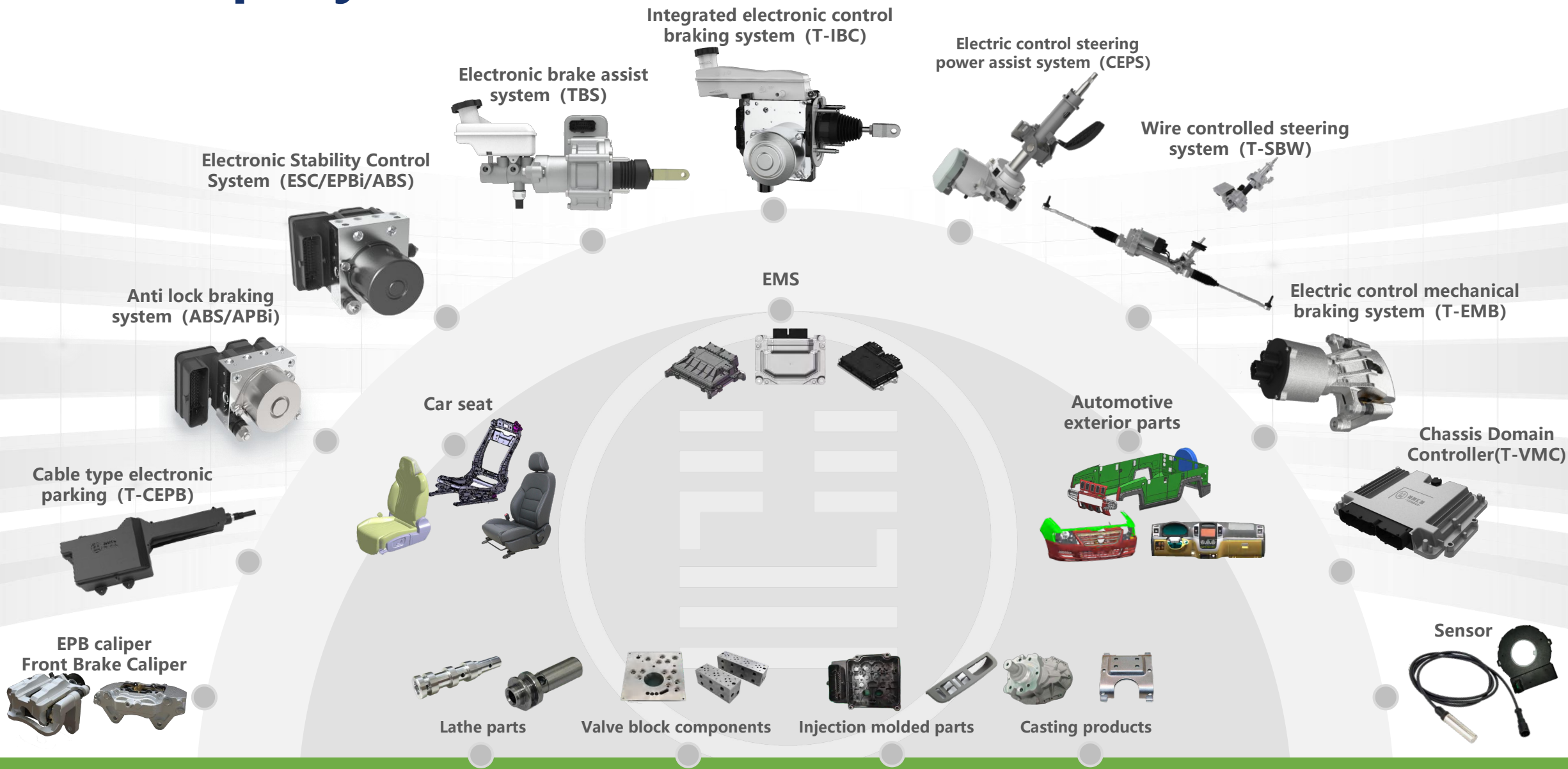
**Research and development,
testing, manufacturing trinity**





 It has more than 300 core invention patents of wire chassis series, including more than 150 invention patents independently declared and more than 80 patents granted.

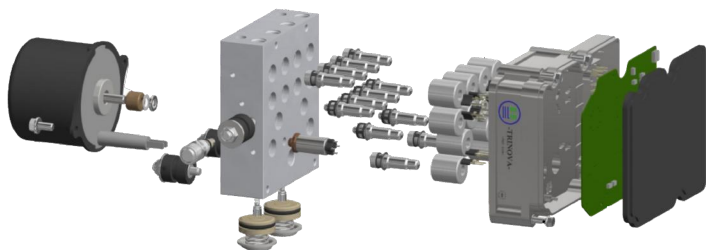
Company Products



Core Product

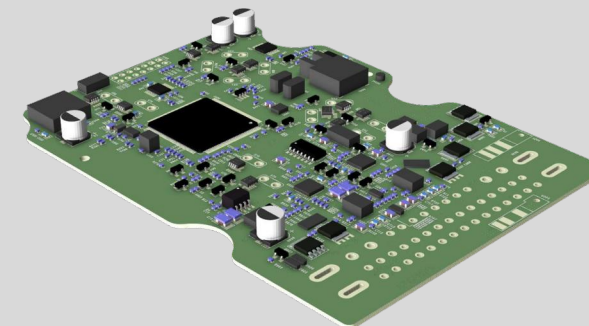
ABS/APBi/ESC/ESC pro/EPBi/Dual control EPBi

- **Serialization:** ABS/APBi/ESC/ESC pro/EPBi/dual control EPBi products for various vehicle models;
- **Multi platform:** ECU platform with 4 chip solutions for supply chain security;
- **Autonomous and controllable:** Over a period of 20 years, completely positive independent research and development;
- **High performance:** benchmarking against international advanced products, with comprehensive and excellent functions.



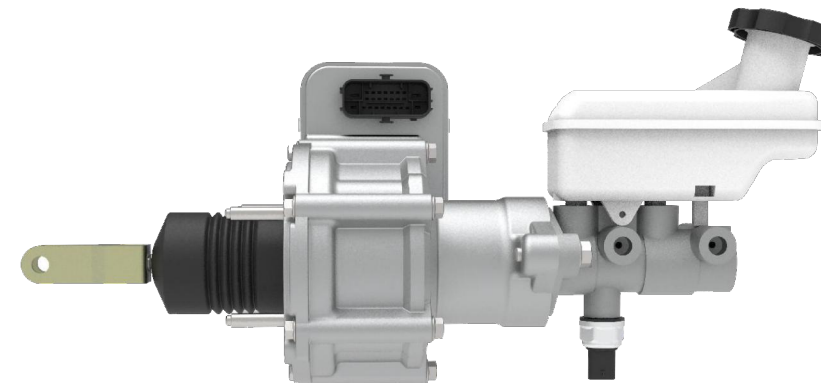
Function		Describe
Core functions	ABS	Antilock Braking System
	EBD	Electric brake force Distribution
	TCS	Traction Control System
	AYC	Active yaw control system
Value added features	HHC	Uphill assist
	AVH	Automatic brake parking
	HBA	Emergency brake assist
	EPB	Electronic parking brake
	HDC	Downhill auxiliary
	HBB	Hydraulic brake booster
	HBC	Hydraulic power failure compensation
	ARC	Active anti-rollover control
	iTPMS	Indirect tire pressure monitoring
	CDD-S	Driver assisted deceleration control
Extended functionality	VLC	Longitudinal dynamic control of vehicle
	TCH	Trajectory Road Planning
	APA	Automatic parking assist
	ACC	Adaptive cruise control
	AEB	Active emergency braking

After 3 years of effort, iterating through 3 series and more than 100 ECU models, we have successfully launched the national production of the new generation ABS/ESC/EPBi products and achieved large-scale mass production applications



TBS (Trinova eBooster System)

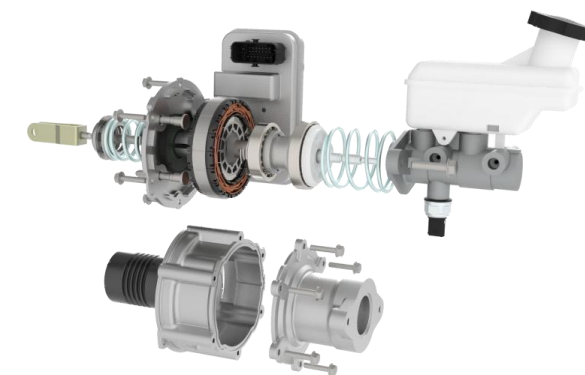
- Adjustable foot feel: comfortable, sporty
- Supports active braking: ACC AEB, APA and other line control actions
- Coordinated energy recovery: maximum deceleration of about 0.3g pure electric braking
- Value added features: automatic parking, hill start assist, comfortable parking, etc
- Redundant braking: in conjunction with ESC EPB can form multi-level failure redundancy



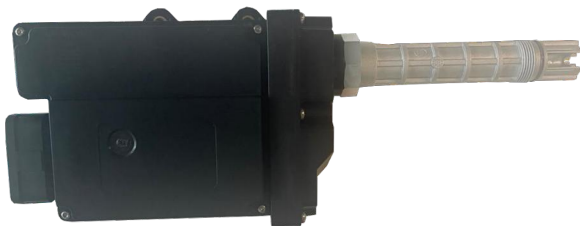
***Fully independently designed, applied for/authorized more than 30 core invention patents, and obtained more than 10 software copyrights.**

Function		Description
Core function	BFB	Driver brake assist
	PRL	Brake pressure control
	EBR	Active braking/deceleration control
	CRBS	braking energy recovery
Value-added function	HLD	Hydraulic leak detection
	HHC	Uphill assist
	AVH	Automatic brake parking
	CST	Comfort parking

Model	TBS260	TBS450	TBS600
The biggest	≥8.5kN	≥12kN	≥12kN
Supporting master cylinder bore (mm)	550W	840W	840W
10MPa building pressure	20.64、22.22、23.81、25.4	26.99、28.57、30.16、31.75	
Maximum building pressure	≤200ms	≤250ms	
Energy recovery	≥15MPa	≥15MPa	
Applicable models	Support maximum regenerative braking deceleration >0.3g		
Applicable models	Passenger cars (12V)	Light truck (12V)	Light passenger and light truck (24V)



EPB (Electronic parking brake system)



T-CEPB

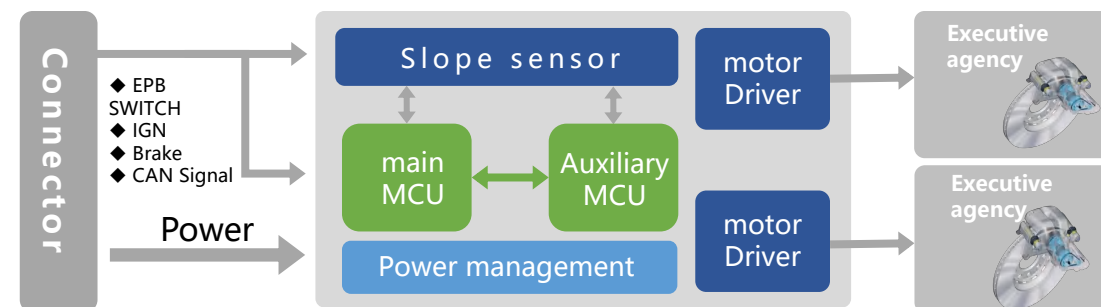
T-CEPB Product parameter

Assembly mass	1.5KG
Working life	100,000 times
Work output	1600N
Work trip	120mm
Temperature range	-40~70℃
Operating voltage	12V
Waterproof class	IP67(*)
Applicable vehicle type	Sedan, SUV, MPV, Light truck



T-DEPB

- The controller integrates two MCUS (main MCU and auxiliary MCU) to detect and monitor the signal at the same time.
- The main MCU and auxiliary MCU verify data through serial data to improve the reliability of the controller.
- The main MCU and auxiliary MCU cooperate to control the work of the actuator to improve the security of the system.
- When a fault is detected, the controller will enter the failure mode in response.

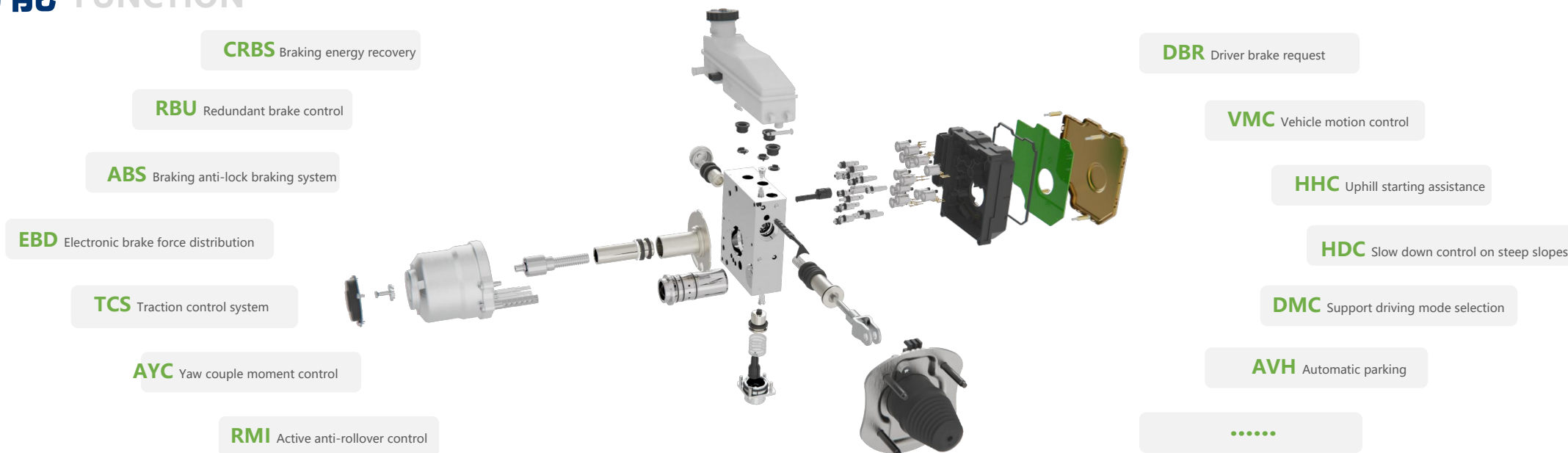


T-IBC (Onebox)

- Safety redundancy: Dual MCU redundancy design, functional safety ASIL-D level, RBU redundancy backup and mechanical brake backup to ensure service brake safety, dual control EPB to ensure parking brake safety;
- High efficiency and light weight: lightweight design, hollow shaft motor direct drive ball screw, small volume, light weight;
- Comprehensive function: It has 20 functions including full ESC function, 10MPa pressure building time is about 150ms, and supports automatic driving above L3 level.



功能 FUNCTION



T-EPS (Intelligent electronic control steering system)

Trinova has the leading independent research and development and production capabilities of electric power steering systems, the whole system supports L2+ADAS functions, and the highest support for automatic driving above L3 level.



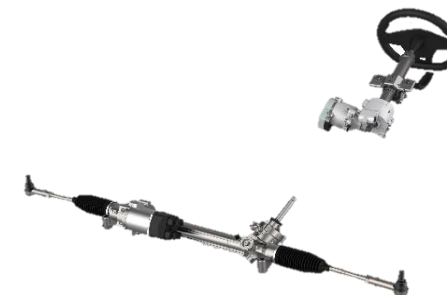
C-EPS



P-EPS



P-SBW



SBW

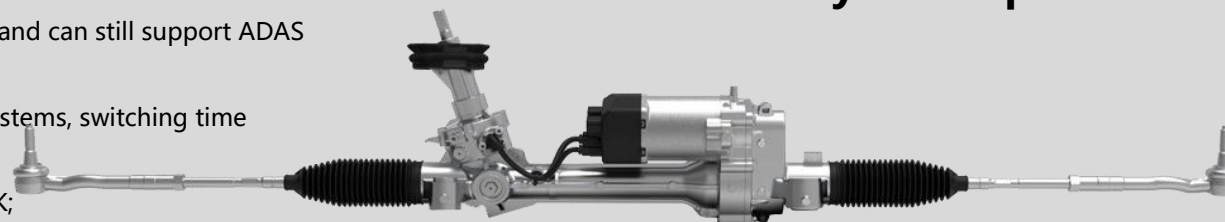
Redundancy RP-EPS

Rack power assisted electric power steering system

- Safety redundancy: full redundancy EPS, dual MCU, six-phase motor, dual drive circuit, dual power management system, etc.
- Functional safety: Both systems support ASIL-D functional safety level requirements, and can still support ADAS function after a single point of failure;
- Intelligent switching: Support intelligent switching between the main and auxiliary systems, switching time <100ms, more safe and reliable;
- High integration: dual system integration, small size, light weight, high power, IP6K9K;
- High-end: Support level 3 and above the automatic driving system.



Redundancy Powerpack

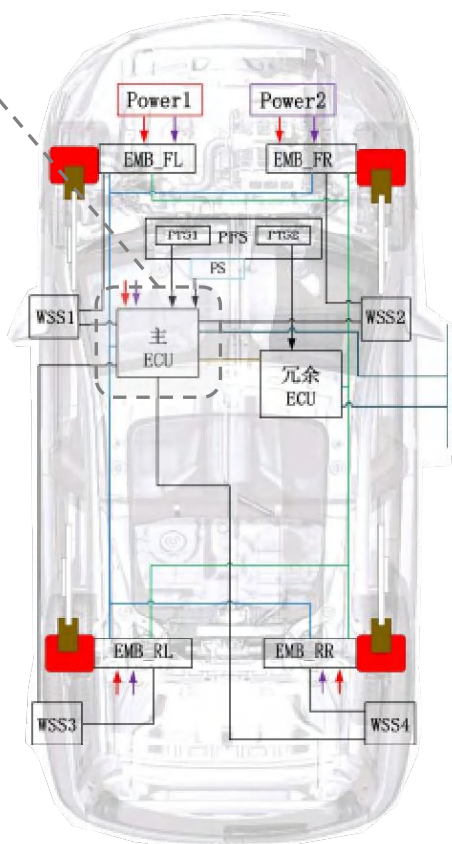


T-EMB (Electronic mechanical braking system)

FUNCTION

EMB master controller that supports implementation of the domain controller architecture

PFS: Pedal simulator
 PTS: Travel sensor
 Main control ECU: Domain control ECU
 Redundant ECUs: backup ECUs
 EMB_FL: left front-end EMB controller
 EMB_FR: right front EMB controller
 EMB_RL: left back-end EMB controller
 EMB_RR: indicates the right back-end EMB controller
 WSS1: left front wheel speed
 WSS2: right front wheel speed
 WSS3: left rear wheel speed
 WSS4: right rear wheel speed
 — CAN0
 — CAN1(FD)
 — CAN2(FD)
 — 公共CAN(FD)
 — Power1
 — Power2
 — Hardwire



BBF(EBD) basic braking function

ADAS Supports the ADAS function

CRBS Coordinated braking energy recovery

HDC Slow down control on steep slopes

ABS Braking anti-lock braking system

HHC Uphill starting assistance

TCS Traction control system

EPBi Integrated parking brake

AYC Yaw couple moment control

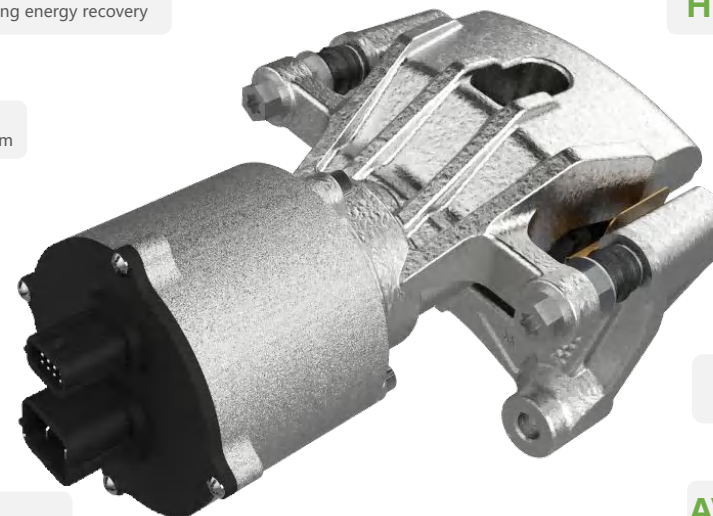
iTPMS Integrated indirect tire pressure monitoring

VMC Vehicle motion control

AVH Automatic parking

DMC Driving mode selection

RSC Anti-roll control



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T-VMC (Trinova Vehicle Motion Control)

Trinova Vehicle Motion Control T-VMC is a new generation of transformative chassis control platform. Based on the in-depth understanding and experience accumulation of vehicle dynamics control, T-VMC breaks the coupling mechanism between traditional chassis systems, establishes a complete vehicle dynamics digital model, integrates the control instructions of the driver and the driver assistance system into a unified arbitration, and realizes the integrated and coordinated control of longitudinal, lateral and vertical motion of the vehicle. Effectively improve the control efficiency and control safety of the line control, steering, drive and suspension systems, and bring a new driving experience to the driver.

ADVANTAGE

Cooperative chassis domain
control architecture

Supports multiple types of
wire chassis systems

Dual control MCU, ASIL-D
functional safety level

Autosar underlying software
architecture

Air spring, CDD shock absorber
control

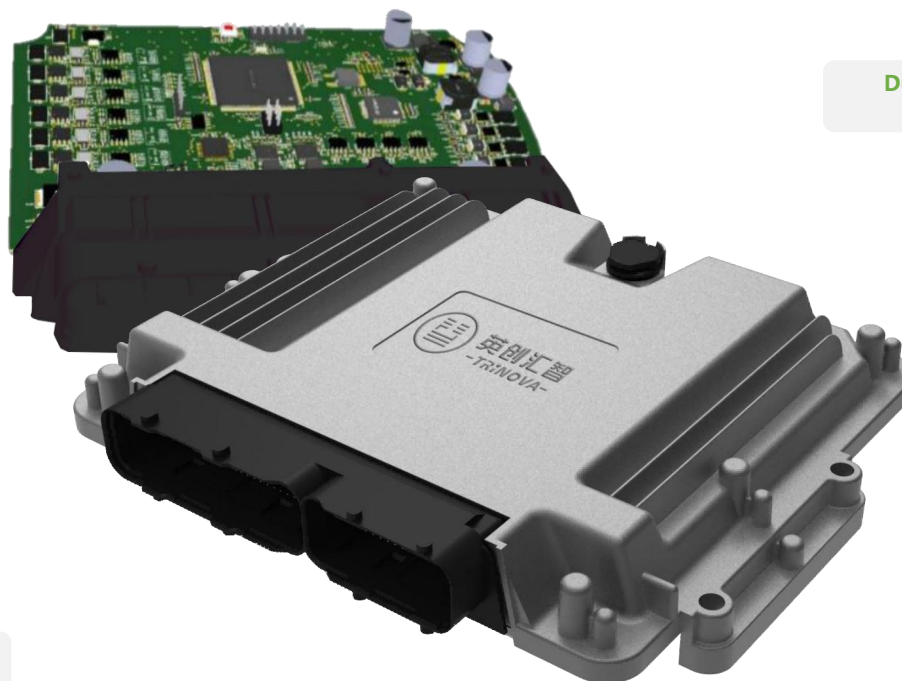
Dual control EPB electronic
parking

Vehicle dynamics management
system, horizontal vertical vertical
three-dimensional integrated control

Unified fusion of sensor
information and unified solution
of vehicle model

High speed, stable multi-type
communication interface

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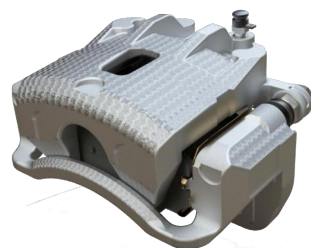


Calipers



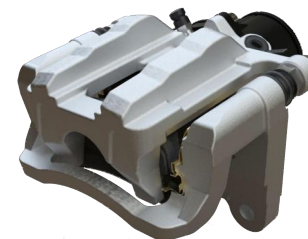
Fixed calipers

- Type: Two piece cast pliers body
- Dual cylinder four piston, providing sufficient braking force
- Low drag: Optimized rectangular groove design ensures quick piston return
- Built in oil circuit optimization design, balanced pressure application on both sides, ensuring stable working conditions
- Two piece high stiffness, small deformation, ensuring sufficient braking force



Floating calipers

- High stiffness: optimized design of clamp bracket to enhance structural strength
- Low noise: Special formula for friction plates and optimization of product modal analysis
- Small space: Lightweight design, single side single piston, small space occupation, convenient layout
- Special coating treatment for key components to reduce resistance and energy consumption



EPB electronic parking caliper

- MGU motors can provide multiple options of $14\text{N} \cdot \text{m}$, $16\text{N} \cdot \text{m}$, and $22\text{N} \cdot \text{m}$ to match the clamping force requirements of different vehicle models;
- Both 12V and 24V systems can be matched
- The protection level meets IP69K to adapt to harsh working conditions
- The designed service life of the parking mechanism is greater than 100000 times



Brake assembly

- Assembly drag torque: Front end $\leq 3.5\text{N} \cdot \text{m}$; Afterburner $< 2\text{N} \cdot \text{m}$
- Brake disc end face runout $\leq 0.05\text{mm}$
- Capable of developing aluminum alloy steering knuckles to meet customers' lightweight requirements

Wheel speed sensor



Wheel speed sensor1

Product features

- Independent structural design and research and development
- Dual line current interface
- Has high resistance to piezoelectric effects
- Mature and reliable processing technology
- The material has strong temperature resistance and a wide working temperature range



Wheel speed sensor2

Product features

- Independent structural design and research and development
- Dual line current interface
- Has high resistance to piezoelectric effects
- Mature and reliable processing technology
- The material has strong temperature resistance and a wide working temperature range.
- The cost is higher than that of linear products, and installation and replacement are convenient and fast.



Wheel speed sensor3

Product features

- Independent structural design and research and development
- Dual line current interface
- Stable output signal, built-in filtering circuit, strong anti-interference ability
- Mature and reliable processing technology
- The material has strong resistance to temperature and corrosion, and has a wide range of working temperatures

Steering angle sensor (SAS)



Usage: Combination switch installation
Internal structure: non-contact
Induction principle: magnetic field detection type
Signal output: CAN bus
Redundancy level: non redundant



Usage: Combination switch installation
Internal structure: non-contact
Induction principle: magnetic field detection type
Signal output: CAN bus
Redundancy level: non redundant



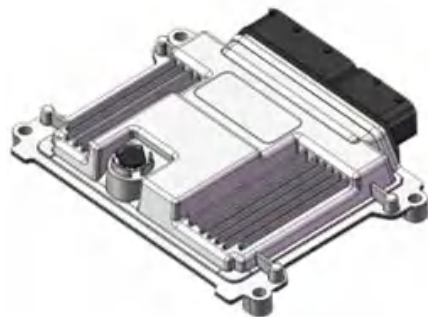
Usage: Combination switch installation
Internal structure: non-contact
Induction principle: magnetic field detection type
Signal output: CAN bus
Redundancy level: dual redundancy



Usage: Tubular installation
Internal structure: non-contact
Induction principle: magnetic field detection type
Signal output: CAN bus
Redundancy level: non redundant



EMS



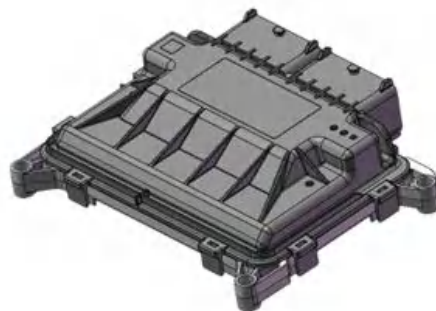
Hybrid powertrain domain controller FC56 series (HECU)

Product performance

Equipped with vehicle status management, high-voltage power on/off management, driving mode management, vehicle energy management, vehicle thermal management CAN network management, fault diagnosis management, onboard interaction management, extended range management, accessory management, drive control, driving control, cruise control, crawling, energy recovery and other functions;

Product application

Suitable for hybrid assembly control with PFI gasoline engines, supporting various hybrid architectures such as range extender, series, and hybrid.



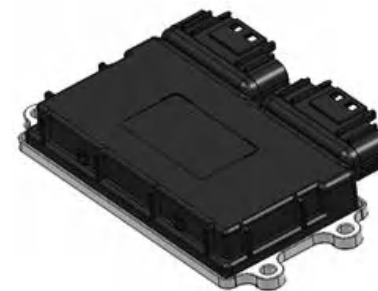
New Energy Vehicle Controller (VCU) VC20 Series

Product performance

Equipped with vehicle status management, high-voltage power on/off management, driving mode management, vehicle energy management, vehicle thermal management CAN network management, fault diagnosis management, accessory management, drive control, driving control, cruise control, crawling, energy recovery and other functions.

Product application

Suitable for various pure electric and hybrid models, high-performance VCU.



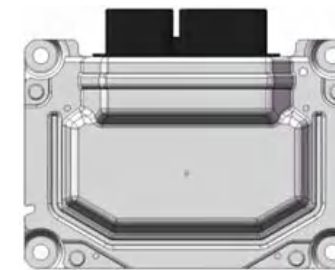
New Energy Vehicle Controller (VCU) VC20 Series

Product performance

Equipped with vehicle status management, high-voltage power on/off management, driving mode management, vehicle energy management, vehicle thermal management CAN network management, fault diagnosis management, accessory management, drive control, driving control, cruise control, crawling, energy recovery and other functions.

Product application

Suitable for various pure electric and hybrid vehicle models, economy VCU, especially suitable for entry-level new energy vehicle models with strict cost requirements.



Pure electric/hybrid vehicle controller (VCU) VC16 series

Product performance

Flexible and configurable hardware output can meet various customer needs, offering high cost performance products; HMI signal acquisition for accelerator pedal, brake pedal, shifter, handbrake, etc; Implementation of hill start assistance, hill descent control, intelligent single pedal control, and cruise control;

Product application

Suitable for pure electric A-class passenger cars, microvans, microcars, or hybrid vehicles, with abundant platform control port resources that can be flexibly configured according to customer needs, suitable for pure electric vehicles (EV) and hybrid vehicles (HEV).

Car seats

AC35 front frame platform (ECO&Standard&Plus)

- AC35 PLUS (Export) - Meets Volvo and US standards
- AC35 Standard (domestic) - Meets domestic and European standards
- AC35 ECO (National Standard) - Meets National Standard
- Shared parts and consistent interfaces



ADVANTAGE

- Active lumbar support



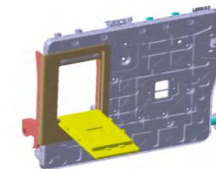
- Low hysteresis foaming (latex)



- Zero gravity seat frame



- Luggage compartment passage



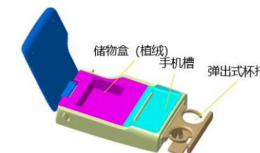
- Electric music headrest



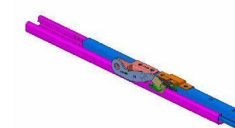
- Hand/electric thigh rest



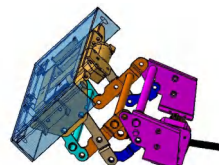
- Multi functional large armrest



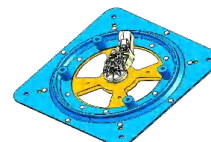
- AC1/3/5 slide rail



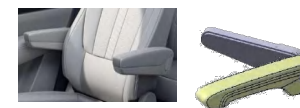
- Four/two electric leg rests



- Rotating table



- Stepwise adjustable armrest

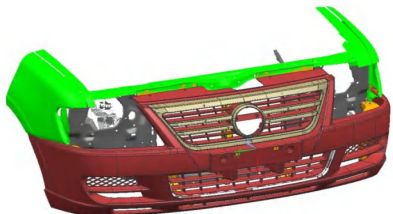


- Folding seats



Core Product

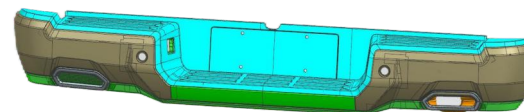
Automotive exterior parts



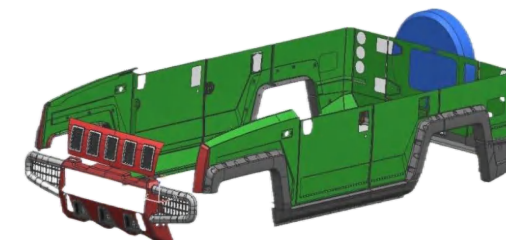
SAP T Growth Enterprise Board
Upgrades Bumper



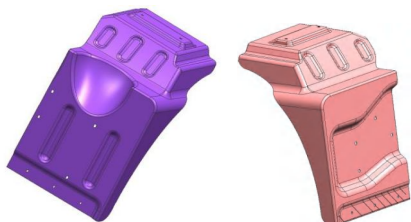
Beiqi Foton front bumper and front
grille design



Rear bumper design of BAIC Foton
General



Beiqi Warrior civilian version with wheel arches,
rear bumper, and front grille design



Oman heavy-duty truck left and
right fenders



Landscape light passenger left and right
door guard assembly



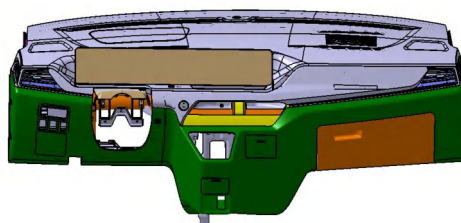
Air chamber cover assembly



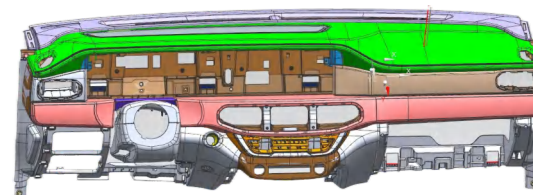
Front and rear mudguards, rear
wheel arches, front/rear
decorative panels



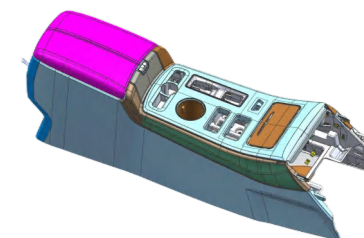
Landscape light passenger dashboard
assembly



Beiqi Foton Tuyano VB2 main
instrument panel



Beiqi Foton F9 Main and Auxiliary Instrument
Panel Design



Beiqi Foton F9 Main and Auxiliary
Instrument Panel Design

Valve block components

Valve body products are used for hydraulic valve blocks in automobiles and construction machinery. The valve body requires multiple solenoid valves to be matched with precision press fit, with a minimum precision of 0.018mm to ensure hydraulic sealing and stability!

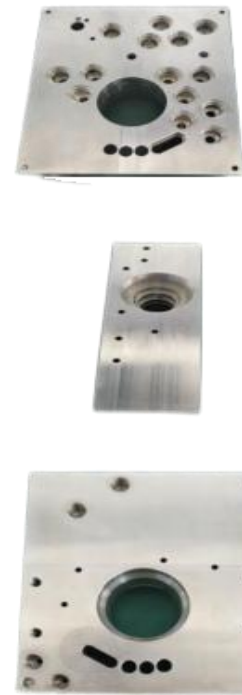
**ABS valve
block**



**ESC valve
block**



**IBC valve
block**



**Engineering
hydraulic
valve block**



Injection molded parts

Injection molding mainly produces engineering plastic seals such as PEEK and PPS, with precision controlled below 0.05mm; In addition, the main focus is on pin connectors, with one product containing up to 50 metal inserts. According to customer needs, surface treatment processes such as painting and electroplating can be implemented on the parts in the later stage.



Ball head sealed push rod



Upper skirt sealing piston



accumulator piston



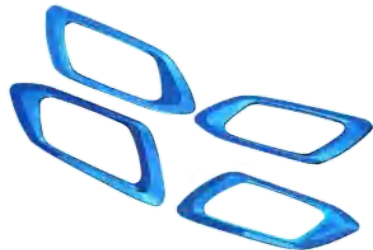
TBS connector



ESC housing



The switch door armrest is now silver gray



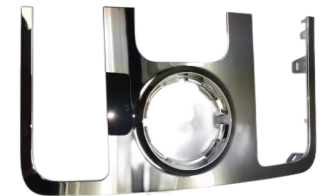
Inner handle decorative strip in gemstone blue



Door handle pearl nickel electroplating



Door panel decorative strip dual color electroplating



Trivalent chromium electroplating on cup holder decorative panel

Stamping products

Bracket, door lock products



Foundry Products



TBS electronic control brake assist system housing



New energy motor front and rear end caps



New energy three in one motor control housing



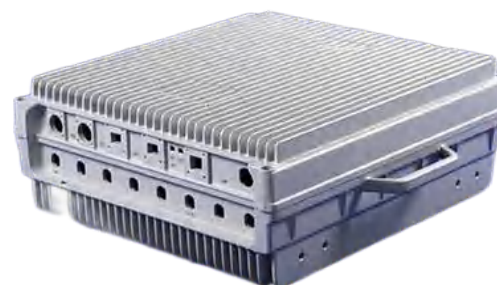
New Energy Vehicle Drive Motor Control
◎ Three in One Controller Shell



TBS electronic control brake assist system housing



铝合金压铸复杂壳体-EUE信号



Aluminum alloy die-casting complex shell - UEE signal



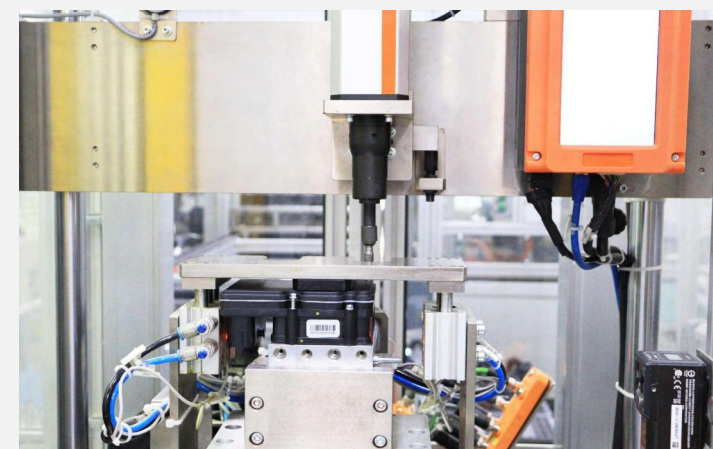
Motor Water Cooling Controller - New Energy Electric Vehicle Die Casting Parts

Intelligent assembly inspection



ESC intelligent assembly testing line

The Beijing base's ESC fully automatic assembly and testing line has an ESC production capacity of 1.5 million sets per year; The ESC flexible assembly testing line at Tianjin base has an ABS/ESC production capacity of 1.5 million sets per year;



Intelligent assembly inspection



TBS automatic intelligent assembly inspection line

Yingshan Base TBS automatic assembly inspection line, composed of a final assembly line, a sub-assembly line, an ECU motor assembly production line, the production capacity of 400,000 sets/year;



T-IBC semi-automatic assembly inspection line

The Beijing base T-IBC semi-automatic assembly and testing line is fully self-developed, covering over 100 testing items for 7 major functional modules of the assembly, with an annual production capacity of 200000 sets;

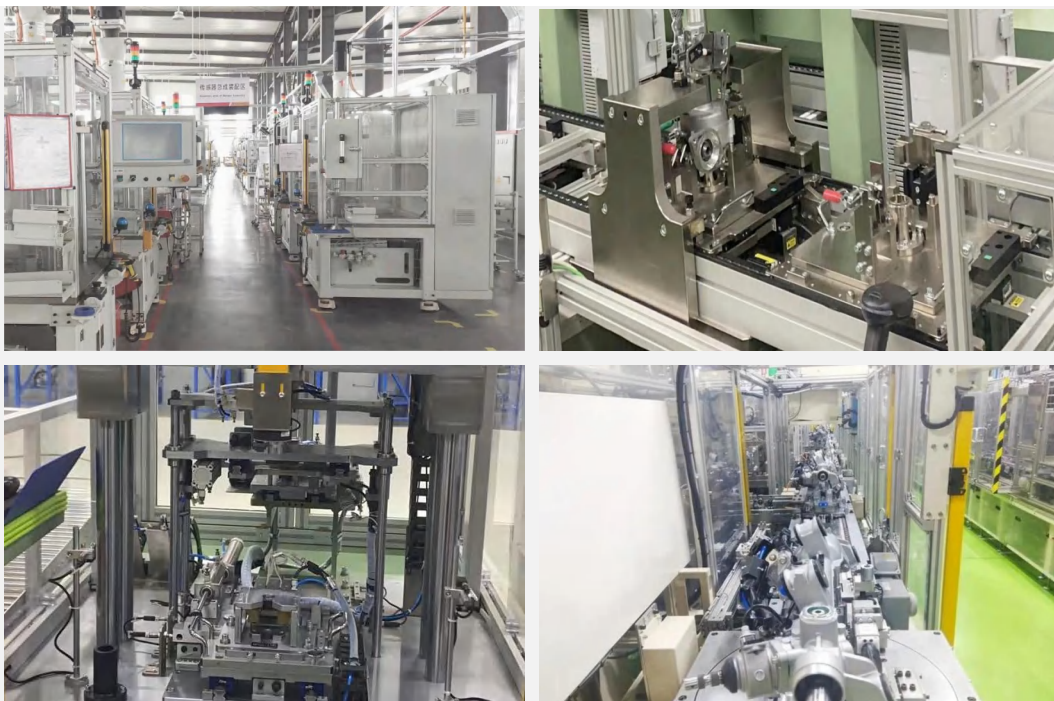


Intelligent assembly inspection



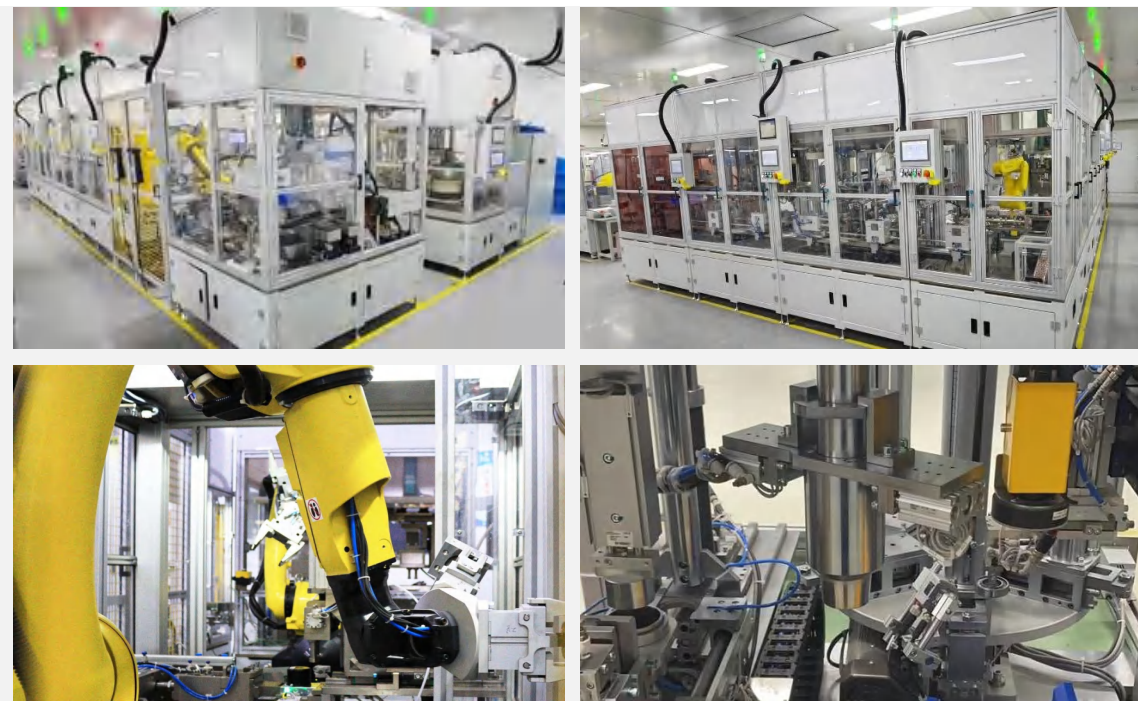
EPS final assembly and test line

EPS assembly and test line, which can realize the traceability of product information; Fixture design to meet the interchangeability and versatility, fixture replacement time ≤ 15 minutes, the key assembly process automatic completion;



Electric control unit assembly line (Powerpack)

EPS electronic control unit assembly product automatic assembly testing line, production capacity of 200,000 sets/year.



Intelligent assembly inspection



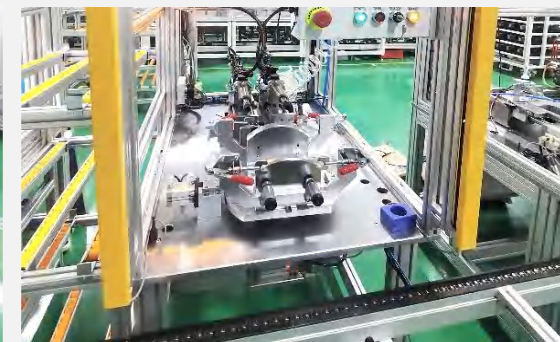
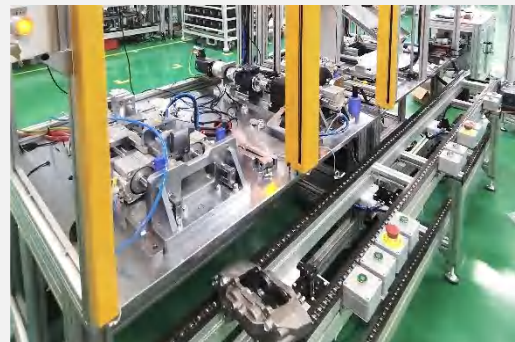
Draw-type EPB production line

Yingshan base pull wire EPB assembly line, self-designed, beat 60 seconds, production capacity of 400,000 sets/year;



Fixed pliers/floating pliers/EPB flexible assembly line

The caliper assembly line at Yingshan Base has semi-automatic assembly and testing functions, which can be used for the assembly and production of different types of caliper products; Fixed clamp with a rhythm of $\leq 70s/piece$, floating clamp/EPB $\leq 40s/piece$, with a production capacity of 200000 sets/year;

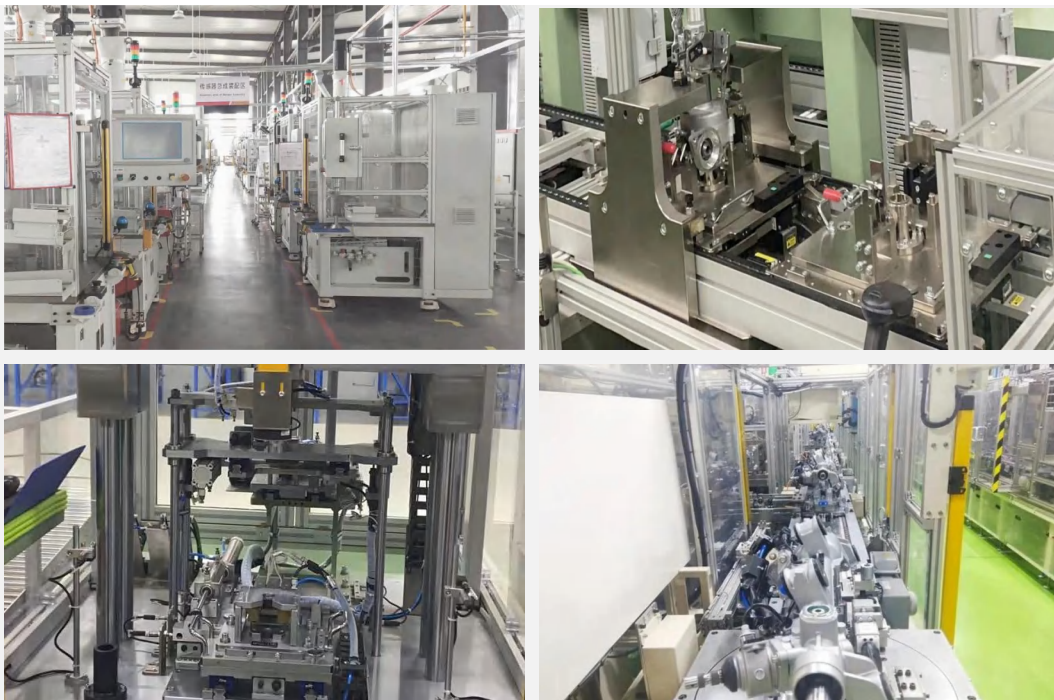


Intelligent assembly inspection



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Intelligent assembly inspection



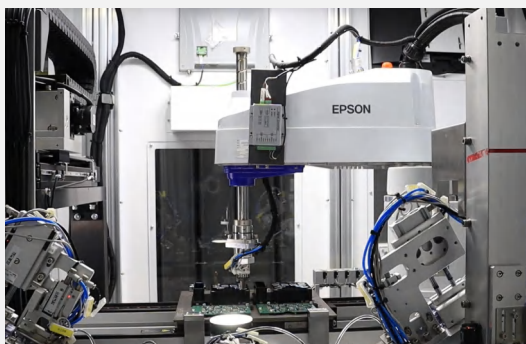
ECU intelligent assembly detection line

Tianjin base ECU automatic production line, using vehicle board circulation transmission, a total of 13 stations, production capacity of 1.5 million sets/year; ECU semi-automatic production line, production capacity of 1 million sets/year;



Solenoid valve automatic assembly test line

Beijing base normally open valve, normally closed valve production inspection line a total of 12, using rotary disc assembly, the whole line assembly time increased to 7s, a total of 145 testing measures, production capacity of 3 million sets/year;



Walking machine workshop

At present, there are more than 60 fully automatic five axis walking machines in the walking machine workshop, mainly in Tsushima and Nishitetsu, Japan. They can process slender shaft parts, valve parts, sleeve parts, lock parts, electrical parts, valve cores, pump bodies, pistons and other metal precision machining products with critical dimensions. The machining accuracy can be controlled at 0.002mm, and the smoothness can be controlled at Ra0.2.



Machining workshop

The machining center workshop has more than 30 imported horizontal dual station automatic CNC machines, mainly imported from Japan HCN-5000L Mazak, mainly producing products with high dimensional precision requirements, and the machining accuracy can be controlled within 0.005mm.



Injection workshop

The injection molding workshop is equipped with more than 10 horizontal and vertical injection molding machines, which can ensure the dimensional stability of precision parts within 0.05mm. Mainly engaged in the manufacturing of embedded injection molding and engineering plastic seals.



Cleaning workshop

The cleaning workshop has two fully automatic cleaning lines, with one hydrocarbon automatic cleaning equipment mainly used to clean oil stains on metal machined parts. It can clean 200000 pieces per day; 1 automatic high-pressure cleaning and ultrasonic vacuum drying cleaning line, mainly used to clean valve bodies with complex oil channels, with cleanliness controlled within 400um.

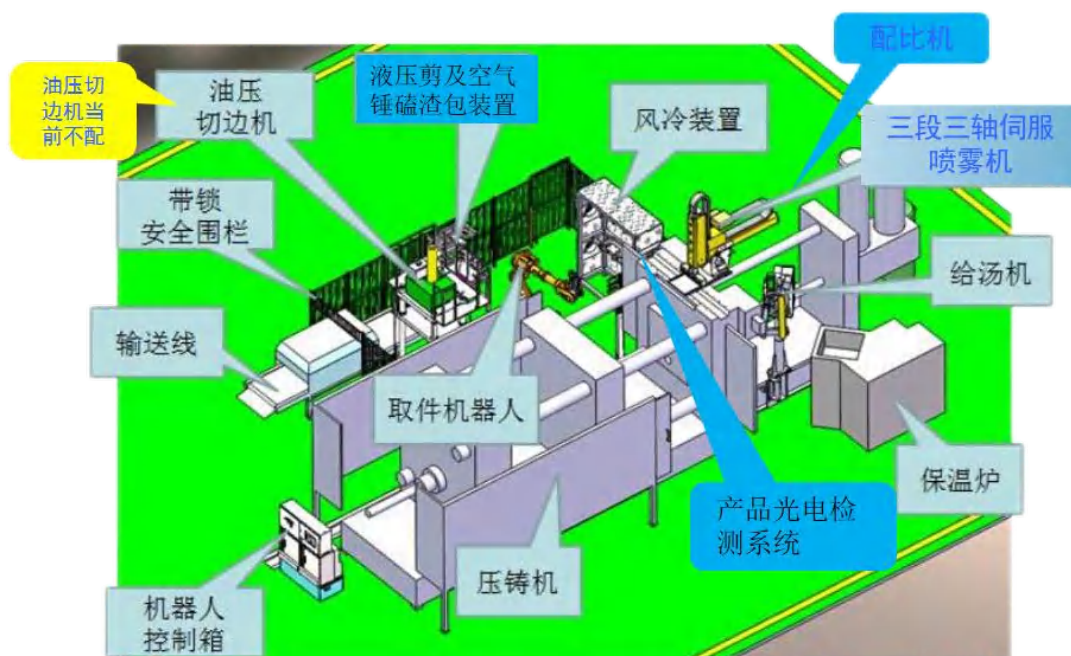


Mold processing workshop

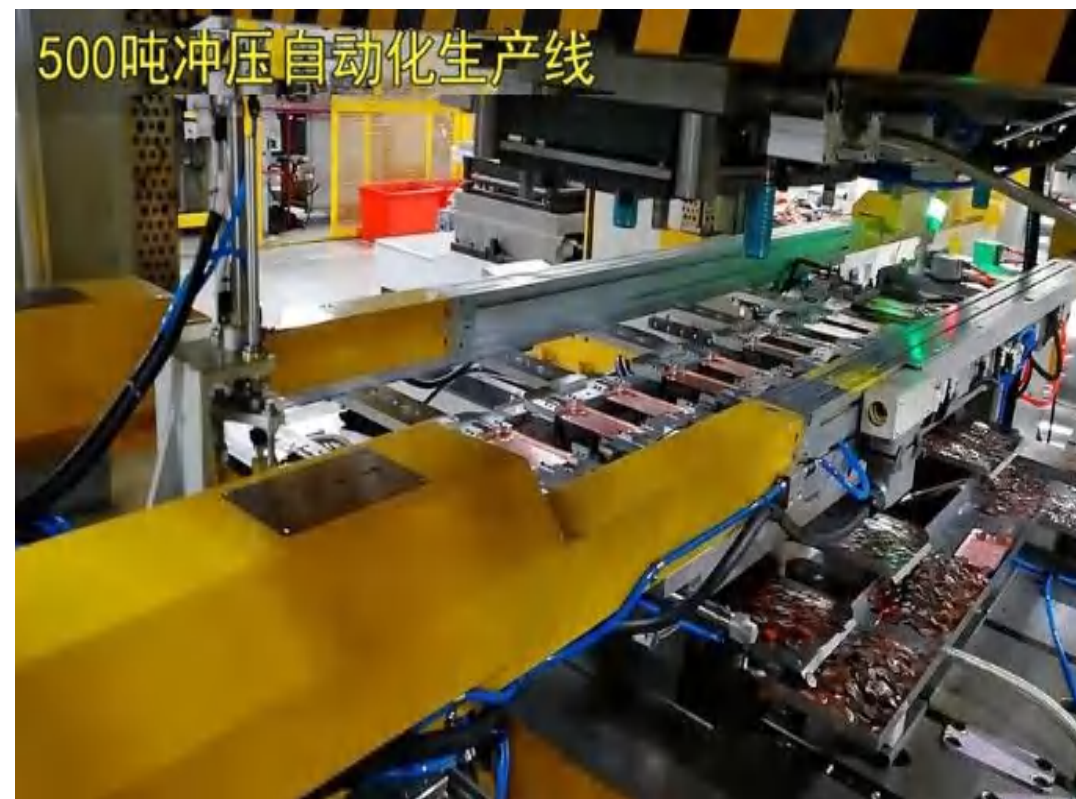
The mold processing workshop is equipped with 4 vertical CNC machines, 3 lathes, 1 milling compound machine, 1 laser welding machine, 1 grinder, as well as spark machines and wire cutting equipment; The machining center is equipped with heavy cutting, rough cutting, precision machining, high-speed electrode machining, turning milling composite, and five axis turntable, which can fully meet the high-precision requirements of various complex components in mold processing.



The casting workshop is equipped with Haitian HDC1650T, 2000T and other cold chamber die-casting machines, all of which are equipped with the core technology of Haitian, the dual closed-loop full-time control injection system. Through the intelligent die-casting island, fully automated processes such as robot rapid picking, spraying, automatic detection, product cutting and shaping, deburring and polishing, palletizing and packing are achieved, adapting to the production needs of complex mold die-casting parts and ensuring stable and efficient production of product quality.



The stamping workshop is equipped with 10 50T-350T stamping machines and 1 automatic production line, with the ability to undertake precision part stamping.





Thank you



北京英创汇智汽车技术有限公司
Beijing Trinova Auto Tech Co.,Ltd