# EBS控制系统
# EBS

2023年4月
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# EBS系统
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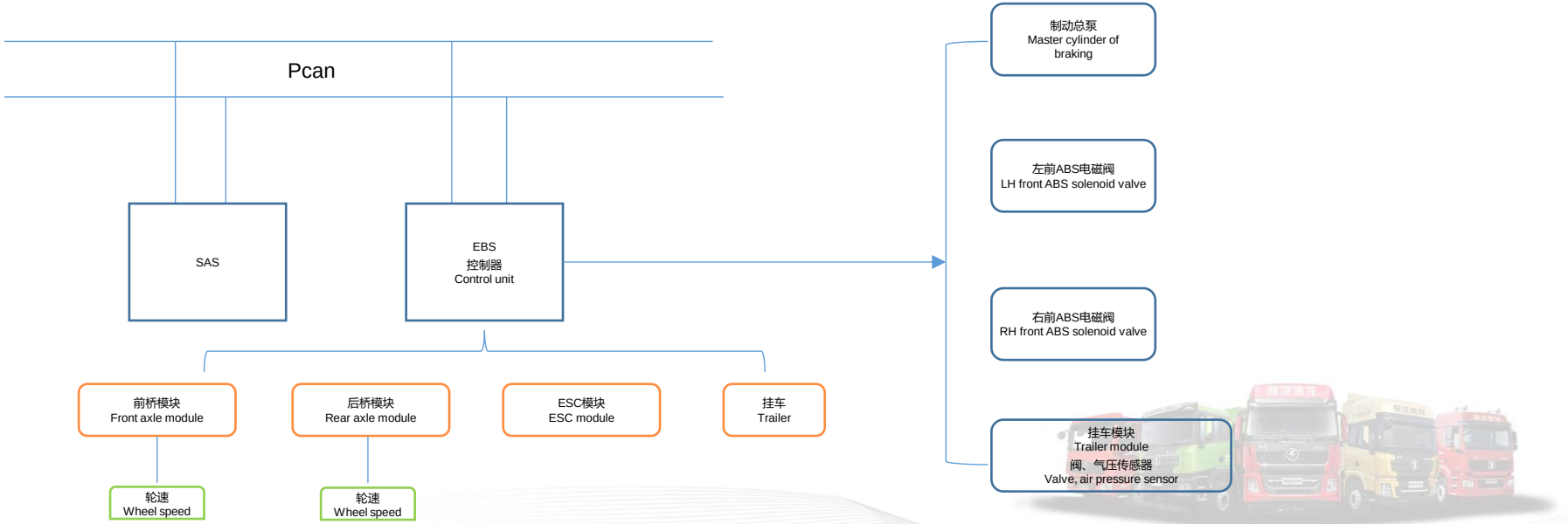
## 一、架构原理
## I. Architecture principle

EBS系统包括 制动踏板、控制器、SAS、ESC、前桥模块、后桥模块、前桥左右ABS电磁阀、轮速、磨损报警、磨损传感器，其中控制器与整车通讯，SAS转角传感器在整车Can，ESC、前桥模块、后桥模块、挂车模块是控制器的子Can，挂车预留can线到EBS的子网。前轴ABS阀是控制器直接控制，各模块集成阀与通信功能。
The EBS system includes brake pedal, control unit, SAS, ESC, front axle module, rear axle module, LH / RH ABS solenoid valve of the front axle, wheel speed, wear alarm, and wear sensor, among which the control unit communicates with the vehicle, and the SAS angle sensor is in the vehicle Can. ESC, front axle module, rear axle module, and trailer module are sub-Cans of the control unit, and the trailer reserves CAN bus to the EBS subnet. The front axle ABS valve is directly controlled by the control unit, with each module integrating valves and communication functions.



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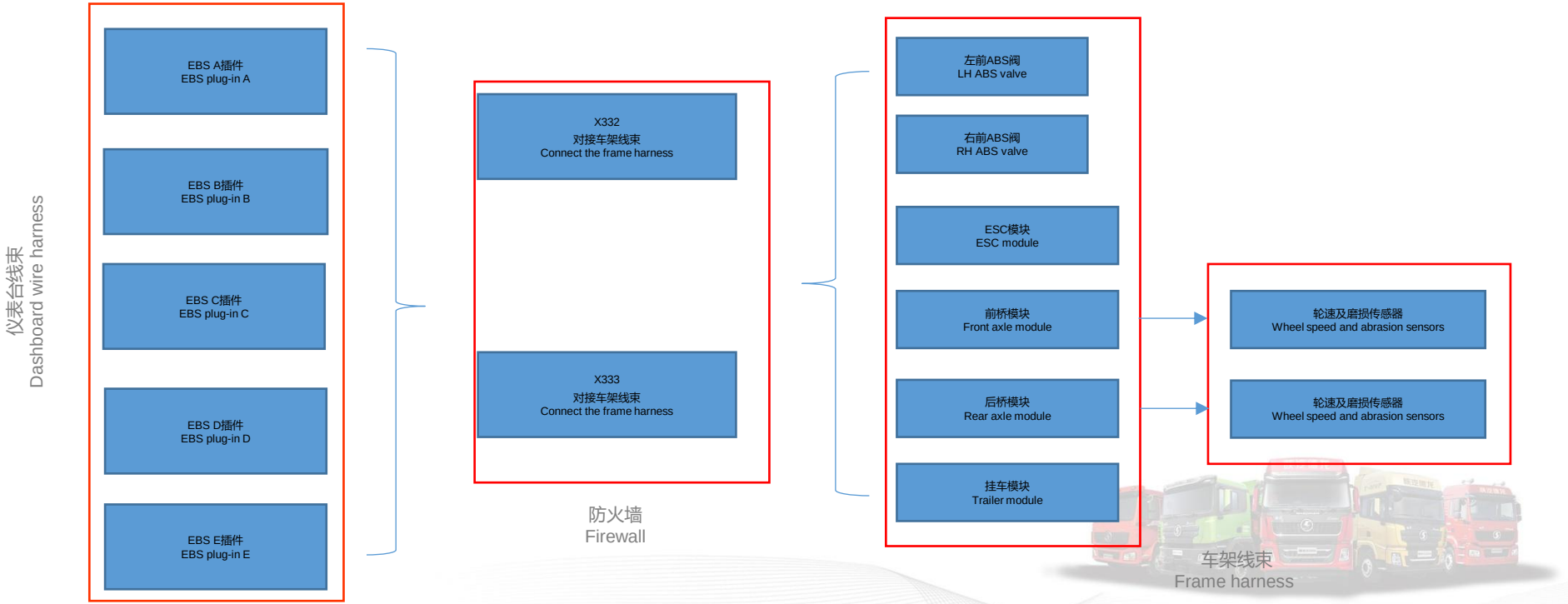
线束结构：线束拓扑、接插器对接、各线束重点或特殊功能，例如继电器、保险、卡接等。
Wire harness structure: wire harness topology, connector docking, key points or special functions of each wire harness, such as relay, fuse, clip, etc.

*说明：磨损报警时直接到仪表，低有效：地-右后-左后-右前-左前-X316 Pin10-IC G10。
*Note: it is directly connected to the IC when the wear alarm occurs, with active-low: ground - RH rear - LH rear - RH front - RH front - X316 Pin10 - IC G10.



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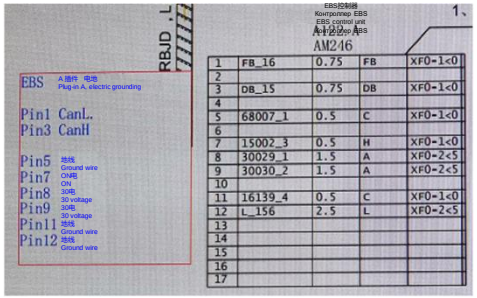
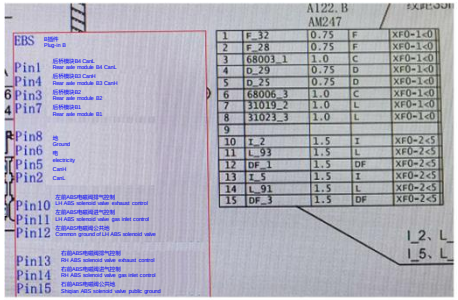
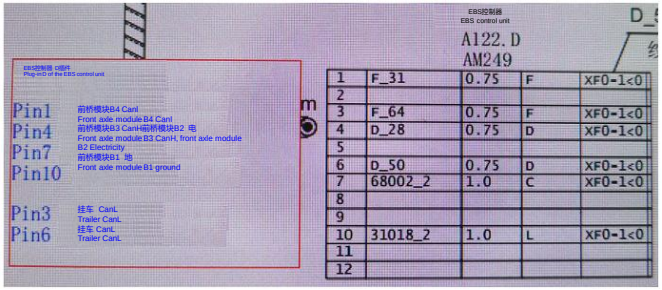
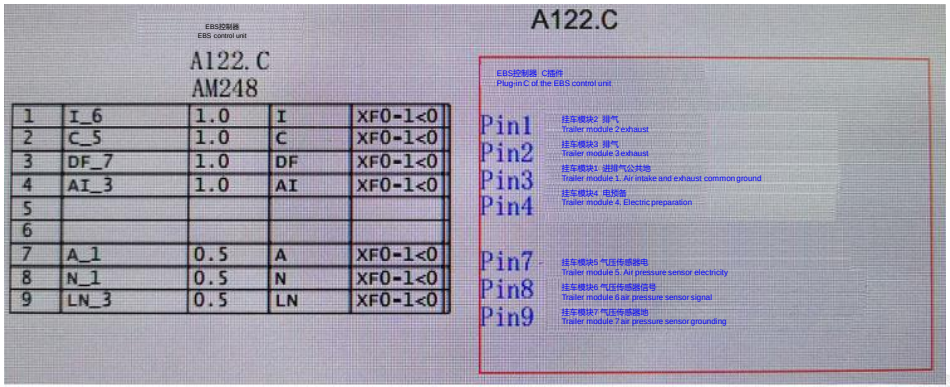
控制器管脚定义：重点子健系统介绍、管脚定义。
Definition of control pin: introduction of key subsystems, pin definition.

控制器管脚定义
Definition of control pin

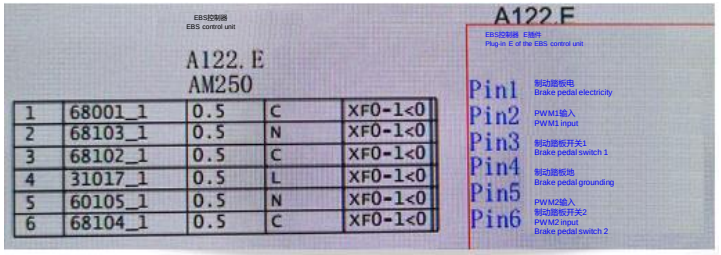



注：配合电气管路图查阅更清晰
Note: it is clearer to consult with the electrical pipeline diagram



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**EBS**

## 二、功能逻辑
## II. Functional logic

### 1、ABS功能
### 1. ABS function

- 控制器只采集轮速判断抱死，进行ABS电磁阀（常开）控制，使其关闭，使得保压暂时保持制动，减少制动力，或者排气取消制动。通过频繁开启增压、保压、排压实现刹车、维持刹车状态、不刹车，实现ABS功能，本质是在紧急制动过程中暂时停止制动。
  The control unit only judges lockup by collecting wheel speeds, controls and closes the ABS solenoid valve (normally open), so that the pressure is maintained to temporarily keep braking and reduce the braking force, or the brake is cancelled with the exhaust. The ABS function is enabled by frequently starting boost, maintaining pressure, releasing pressure to achieve brake, keeping the brake status, or not brake, the essence of which is to temporarily stop braking during an emergency brake.

- 没有制动力分配等功能，因为气压先过脚阀，被脚阀控制，不踩脚阀时，气压不能过来。
  There is no such function as braking force distribution, because the air pressure first passes through the foot valve, by which it is controlled. When the foot valve is not stepped on, the air pressure will not come through.

- 脚阀常断，ABS阀常通。一般在40km/h以上功能更明显，无制动拖痕。
  The foot valve is often disconnected and the ABS valve connected. Generally, the function is more apparent with the speed higher than 40 km/h, without drag marks of brake.

- 在原始机械制动基础上（气瓶、脚阀、气室）只需要增加必备的控制器、ABS电磁阀、轮速传感器。
  On the basis of the original mechanical brake (gas cylinder, foot valve, air chamber), only the necessary control unit, ABS solenoid valve, and wheel speed sensor shall be increased.

**EBS系统**
**EBS**

## 二、功能逻辑
## II. Functional logic

### 2、HAS坡道起步功能
### 2. HAS function

- 在ABS基础上增加ASR差动阀和两位单通阀，和ASR功能 一致。
  Based on ABS, increase the ASR differential valve and the two-position single-way valve, with the same function as ASR.

- 坡道起步辅助功能，根据AMT的坡道传感器及载荷计算，判断是否需要坡道起步辅助起作用，EBS会在起步前期，先给车辆叠加制动力（当3s后变速箱未准备好也会释放），直到TCU判断可以释放制动时，然后再释放制动气压，保证在刚开始正扭矩不足以带动车辆前进时，车辆不至于倒退溜车。
  HAS assistive function will judge if it is necessary to act according to the calculation of AMT hill sensor and load. EBS will superimpose the braking force on the vehicle in the early stage of the start (it will also release when the transmission is not ready after 3 s), and release the brake air pressure until the TCU determines to release the brake, so as to ensure the vehicle will not roll backwards when the positive torque is insufficient to drive the vehicle forward at the beginning.

- 开关信号：3道开关，首先EBS需要软件打开该功能，其次需要驾驶员打开软开关（EBC1_x（或MSF，如SPN 521160））或硬线开关，最后需要AMT判断当前载荷与驱动力需要制动辅助避免溜车，来自ETC7报文 TrasmtReadyforBrakeRelease 表示变速箱是否允许释放制动力，0表示不许释放，此时需要坡道辅助起作用。
  Switch signal: there are 3 switches. First, EBS function shall be turned on with software. Second, the driver is required to turn on the soft switch (EBC1_x (or MSF, such as SPN 521160)) or hardwire switch. And finally, AMT is required to judge if brake assistance is needed for the current load and driving force in case of rolling. The message TrasmtReadyforBrakeRelease coming from ETC7 indicates if the transmission permits to release the braking force. When 0 means release is not permitted, HAS assistance is required at this time.

**EBS系统**
**EBS**

## 二、功能逻辑
## II. Functional logic

### 3、ASR防打滑功能
### 3. ASR function

- 在ABS基础上增加ASR差动阀和两位单通阀，是三位两通常断电磁阀，常断，控制时导通，再通过ABS电磁阀（常开）进入气室制动。本质是在加速起步过程中暂时制动车轮。
  On the basis of ABS, an ASR differential valve and a two-position one-way valve are increased, which are a three-position two-way solenoid valve of constant disconnection. It is constantly off and obtains continuity in control, and then enters air chamber braking through the ABS solenoid valve (constantly open), the essence of which is to temporarily brake the wheels during acceleration of start.

- 原理是当车速较低时35km/h以下，驱动轮打滑时，通过对其制动减少打滑，如果两侧都打滑，则还要限制发动机扭矩减少打滑。
  The principle is to reduce slipping for the brake when the vehicle speed is lower than 35 km/h and the drive wheel slips. If both sides slip, the engine torque is also limited to reduce slipping.

- 两位单向阀的作用是将ASR的控制气源与脚阀的气源并列，实现自定控制制动使用ASR阀，驾驶员制动通过脚制动阀。
  The function of the two-position one-way valve is to parallel the control gas source of ASR with that of the foot valve, so as to achieve customized control brake by using the ASR valve, and the driver brakes with the foot brake valve.

- ASR关断开关，有ESC时是复用的软开关，没有ESC时是单独的ASR硬线开关，但X6000没有单独的ASR无单独开关，X5000单独的ASR比较少无开关关断，X3000有单独的ASR也设计了单独的硬线开关。
  The ASR off switch is a soft switch for multiplexed uses when ESC exits, and a separate ASR hardwire switch without ESC. However, X6000 is not provided with a separate ASR and a separate switch, X5000 has fewer separate ASRs without a switch to turn off, and X3000 has a separate ASR with also a designed and separate hardwire switch.

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## 二、功能逻辑
## II. Functional logic

### 4、ESC防侧倾功能
### 4. ESC function

- 车身电子稳定系统（ESC），是一种可以控制驱动轮，也可以控制从动轮的，包含ABS（防抱死刹车系统）及ASR（防侧滑系统）的汽车防滑装置。
  The electronic stability system (ESC) of the body is an anti-skid vehicle device that can control the drive wheels and the driven wheels, including ABS (anti-lock brake system) and ASR (anti-skid system).

- ESC系统实际是一种牵引力控制系统，与其他牵引力控制系统比较，ESC不但控制驱动轮，而且可控制从动轮。如后轮驱动汽车常出现的转向过多情况，此时后轮失控而甩尾，ESC便会刹慢外侧的前轮来稳定车子；在转向过少时，为了校正循迹方向，ESC则会刹慢内后轮，从而校正行驶方向。
  The ESC system is actually a traction control system. Compared with other traction control systems, ESC not only controls the drive wheels, but also the driven wheels. For example, too much steering often occurs in rear-wheel drive vehicles, when the rear wheels lose control and flick, so that ESC will slowly brake the outside front wheel to stabilize the vehicle; when the steering is too little, ESC will slowly brake the inner rear wheel for the sake of correcting the tracking direction, and thereby correcting the driving direction.

- ESC系统包含ABS（防抱死刹车系统）及ASR（防侧滑系统），是这两种系统功能上的延伸。因此，ESC称得上是当前汽车防滑装置的最高级形式。
  The ESC system includes ABS (anti-lock brake system) and ASR (anti-skid system), which is an extension for the functions of these two systems. Therefore, ESC can be regarded as the most advanced form of current automobile anti-skid device.

- 实现 需要在ASR基础上增加ESC模块和方向盘转角传感器。
  ESC module and SAS shall be added on the basis of ASR.

**EBS系统**
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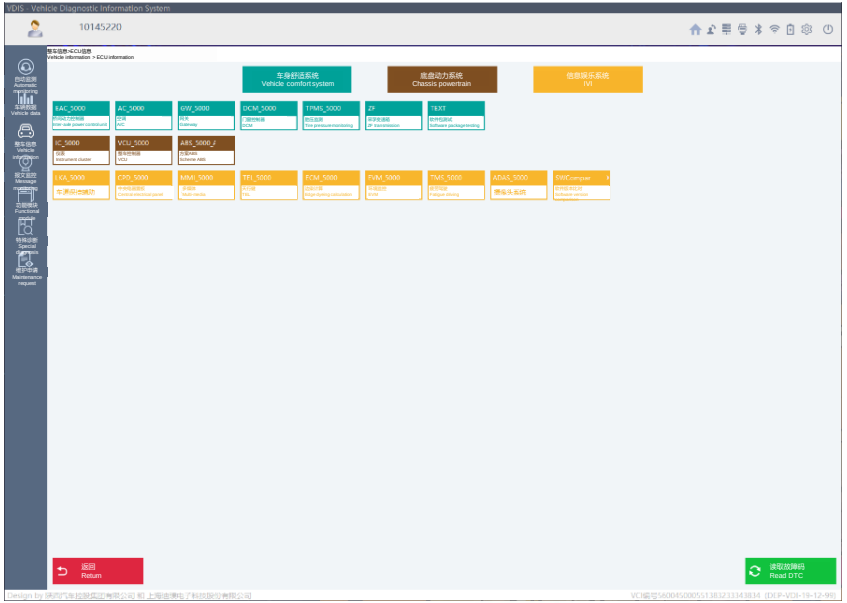
## 三、ESC标定
## III. ESC calibration

■ **选择车型，进入整车信息-ECU信息：（ECU列表）**
**Select the model and enter vehicle information - ECU information: (ECU list)**

① 进入ECU信息界面如图所示，选择 ABS 或 EBS 控制器（具体如何选择见步骤②）；
Enter the ECU information interface as shown in the figure, and select ABS or EBS control unit (see step ② for details on how to choose);

② 系统会根据车辆配置信息识别车辆装配的是ABS还是EBS，以及装配的厂家，ABS和EBS控制器共有四个厂家，有八个模块分别为“克诺尔ABS”、“克诺尔EBS”、“科密ABS”、“科密EBS”、“万安ABS”、“万安EBS”、“威伯克ABS”和“威伯克EBS”，系统识别好车辆配置，会显示车辆对应的ESC控制器类型（本次标定在**万安ABS**车辆上进行，故界面上模块为“万安ABS”）；
The system will identify whether the vehicle is equipped with ABS or EBS based on the vehicle configuration information, as well as the assembly manufacturers. There are 4 manufacturers of ABS and EBS control units, with 8 modules, namely "Knorr-Bremse ABS", "Knorr-Bremse EBS", "Kemi ABS", "Kemi EBS", "VIE ABS", "VIE EBS", "WABCO ABS" and "WABCO EBS". After the system recognizes the vehicle configuration, the ESC control unit type corresponding to the vehicle will be displayed (as the calibration this time is performed on VIE ABS vehicles, the module on the interface is "VIE ABS");

③ 不同配置模块的标定流程不同，因此请进入模块前查看模块名称，再参考对应的标定流程进行标定操作。
As the calibration process differs as per different configuration modules, please check the module name before entering the module, and then perform calibration by referring to the corresponding calibration process.



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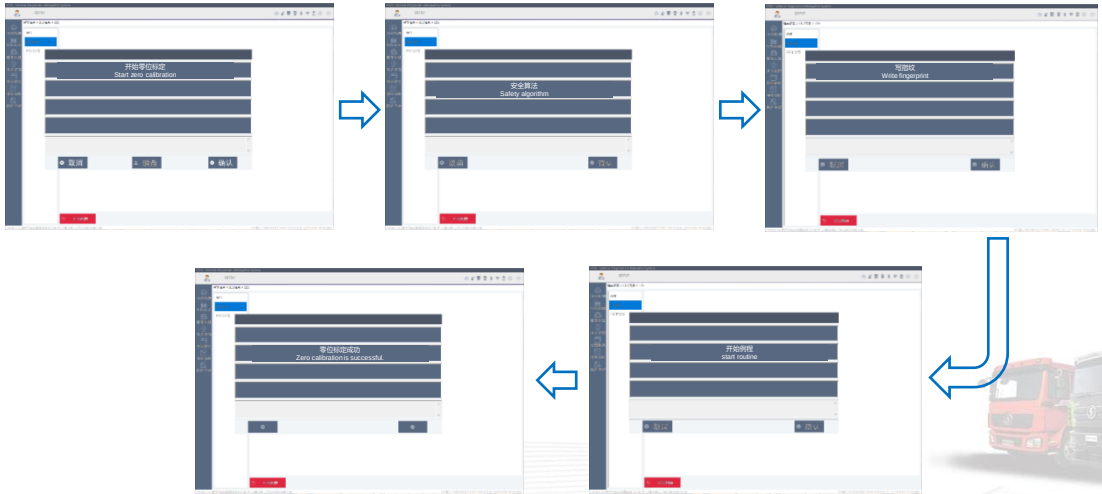
# EBS

**三、ESC标定**
**III. ESC calibration**
**威伯克ABS/EBS**
**WABCO ABS/EBS**
**进入整车信息-ECU信息-威伯克ABS 或 威伯克EBS控制器，然后准备标定，标定流程如下:**
**Enter the vehicle information - ECU information - WABCO ABS or WABCO EBS control unit, and then prepare for calibration, and the calibration process is as follows:**
点击左侧“零位标定”按钮，然后点击“确认”确认开始零位标定;
Click the "Zero Calibration" button on LH, and then click "Confirm" to confirm starting zero calibration;
开始标定过程，并自动进行请求种子、通过安全算法和发送种子等过程（无需任何操作）；
Start the calibration process, and automatically perform the process of requesting seeds, passing safety algorithms and sending seeds (without any operation);
① 通过安全算法后，自动进行写指纹、开始例程（无需任何操作）；
After passing the safety algorithm, automatically write the fingerprint and start the routine (without any operation);
② 零位标定成功。
Zero calibration is successful.



# EBS系统
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**三、ESC标定**
**III. ESC calibration**
**威伯克ABS/EBS---ESC自学习**
**WABCO ABS/EBS - ESC adaptation**
**进入整车信息-ECU信息-威伯克ABS 或 威伯克EBS控制器，然后准备标定，标定流程如下：**
**Enter the vehicle information - ECU information - WABCO ABS or WABCO EBS control unit, and then prepare for calibration, and the calibration process is as follows:**

① 点击左侧“ESC自学习”按钮，**然后启动**车辆点击“确认”开始ESC自学习；
Click the LH button "ESC adaptation", **then turn on** the vehicle and click "Confirm" to start ESC self-learning;

② 开始自学习过程，并自动进行请求种子、通过安全算法和发送种子等过程（无需任何操作）；
Start the adaptation process, and automatically perform the processes of requesting seeds, passing safety algorithms and sending seeds (without any operation);

③ 通过安全算法后，自动进行写指纹、开始例程（无需任何操作）；
After passing the safety algorithm, automatically write the fingerprint and start the routine (without any operation);

④ 按照提示要求以20Km/h的车速直线行驶至少250米，要求行驶路面平坦。
Follow the prompts and drive in a straight line at a vehicle speed of 20 Km/h for at least 250 meters, and it is required to drive on a flat road.