Electronic Stability Program ESP/ESC

Electronic Stability Program – ESP (also called Electronic Stability Control – ESC) is an important safety feature available for a wide range of truck specifications. The program reduces the risk of skidding and rolling over.

ESP-BASX is an option for the Electronically controlled Brake System packages EBS-STD and EBS-MED.

The control unit continuously receives information from a variety of sensors and makes a new evaluation of the driving situation several times per second.

If the system detects that the truck is starting to lurch or behave abnormally in some other way, the ESP reduce engine torque or activates the brakes individually in order to reduce speed and straighten up the vehicle combination.

Sales variants
ESP-BAS1 Electronic Stability Program package intended for RIGID single vehicles or vehicle combinations with standard centre of gravity height when laden and for TRACTOR vehicle combinations with a single trailer or multiple trailers with ABS/EBS.

ESP-BAS2 Electronic Stability Program (ESP) package intended for vehicle combinations with multiple trailers without ABS.

ESP-BAS3 Electronic Stability Program (ESP) package intended for single vehicles or vehicle combinations with low centre of gravity height when laden.

ESP-BAS4 Electronic Stability Program (ESP) package intended for single vehicles or vehicle combinations with high centre of gravity height when laden.

ESP-BAS5 Electronic Stability Program (ESP) package intended for single vehicles or vehicle combinations with high centre of gravity height when laden, but unladen vehicle is heavy with a low centre of gravity.

ESP for tractor/rigid

ESP-BAS1 for TRACTOR is intended for vehicle combinations with a single trailer, or multiple trailers with ABS.

ESP-BAS2 for TRACTOR is intended for vehicle combinations towing multiple trailers which might not be equipped with ABS (e.g. road trains in Australia or double combinations in South America).

ESP-BAS1 for RIGID is intended for single vehicles or vehicle combinations with standard centre of gravity height when laden.

ESP-BAS3 for RIGID is intended for single vehicles or vehicle combinations with low centre of gravity height when laden.

ESP-BAS4 for RIGID is intended for single vehicles or vehicle combinations with high centre of gravity height when laden.

ESP-BAS5 for RIGID is intended for single vehicles or vehicle combinations with high centre of gravity height when laden, but when the unladen towing vehicle is heavy and has a low centre of gravity (e.g. timber body with a fixed crane).

FEATURES AND BENEFITS

• ESP reduces the risk of skidding and rolling over.
• ESP brakes each wheel on the truck individually.
• Increases traffic safety.

NOTE! ESP reduces the risk of rolling over and skidding. The vehicles can still roll over if the centre of gravity is very high, if the wheels hit a curb at high speed, or through careless driving. A vehicle can skid on slippery surfaces even if it has ESP. The vehicle should be driven in the same way as vehicles without ESP.
Electronic Stability Program (ESP)

ESP provides more stable braking, while making it possible to distribute braking force between axles/wheels.

The system is available for tractors and rigid with 4x2, 6x2, and 6x4 drive. In simple terms, ESP monitors the way in which the driver would like the vehicle to handle, after which the system monitors the way in which the vehicle is actually handling. If these two parameters differ, ESP makes a correction by braking one or more wheels.

Advanced monitoring of a large number of parameters

The primary parameters that are affected by the driver's actions are:
- Steering angle, where a sensor in the steering column measures steering wheel angle.
- Requested engine torque.
- Requested braking torque.

The primary parameters that indicate how the vehicle is handling are:
- Lateral forces – the forces that enable the vehicle to stay on the road in a curve (lateral acceleration).
- Yaw rate – the speed at which the vehicle pivots around its own centre of gravity, which occurs when it turns and changes direction.
- Wheel speed – the speed at which the vehicle is moving and if one of the wheels locks.

How the system works

In practical terms, ESP acts to reduce engine torque to the driven wheels, and controls wheel braking individually. The system also brakes the trailer's wheels in certain situations, thereby providing stability for the entire vehicle combination, both laterally and longitudinally.

ESP monitors if the vehicle is travelling at excessively high speed, for example, during sudden evasive actions or in a curve, which could result in skidding or the risk of rolling over. ESP also counteracts jack-knifing and trailer swing.

When the sensor for lateral acceleration indicates that the vehicle is approaching a point at which there is a risk of rolling over, ESP reduces engine torque. If necessary, the wheels are braked to slow down the vehicle and reduce lateral forces to an acceptable level.

When ESP's second roll over stage is utilized, a light braking is applied to the inner wheels. If the system senses that one or more wheels on the vehicle have locked, this indicates that the wheel is about to lift. The wheel brakes are immediately activated to slow down the entire vehicle combination. In this way, speed and correspondingly lateral forces are reduced to avoid rolling over.

An EBS-equipped trailer can communicate fully with the ESP system, and ESP can in this way sense if a wheel on the trailer is about to lock and lift.

Example tractor – skid with understeering

When a tractor-trailer rig understeers in a curve, the entire vehicle tends to continue moving straight ahead.

The tractor's front wheels lose grip and the trailer pushes from behind. In this situation, ESP senses that the steering angle does not correspond to the lateral forces and the yaw angle speed, and the system counteracts understeering by braking the inner rear wheel.

Example tractor – skid with oversteering

When a vehicle with a trailer oversteers in a curve, the tractor's rear wheels lose grip and the rear-end skids out. The entire weight of the trailer acts to force out the rear-end even more. The rig is close to jack-knifing.

In this type of situation, ESP senses that the yaw angle speed, steering angle, and lateral forces do not correspond to each other, and intervenes to steer in the opposite direction. By braking the tractor’s outer front wheel the tendency to turn is counteracted. By braking the wheels on the trailer, the trailer acts to straighten out the vehicle combination and prevent jack-knifing.
Recommended choice of ESP-variant
The following variants affect the setting of ESP (Electronic Stability Program) and are available as a customer choice on certain markets. Some restrictions based on other vehicle variants are present.

The ESP setting can be changed by an authorized Volvo workshop, in case the setting is not suitable for the truck’s current usage.

TRACTOR
The two available variants for tractors have different ESP trailer braking strategies.

ESP-BAS1 is intended for vehicle combinations with a single trailer, or multiple trailers with ABS. Recommended when towing single trailers, and when towing multiple trailers all equipped with ABS.

In case of an ESP intervention full trailer braking can be utilized if trailer ABS is detected as fully operational. If trailer ABS is detected as faulty or missing, the trailer braking will be reduced and done in pulses. Example: Tractors towing trailer(s) where all trailers are equipped with ABS.

ESP-BAS2 is intended for vehicle combinations towing multiple trailers which might not be equipped with ABS. Recommended when towing multiple trailers on markets where trailers might not be equipped with ABS.

In case of an ESP intervention, the trailer braking will be done in pulses. Example: Tractors used in road trains in Australia, A-double and B-double combinations in South America.

RIGID
The four available variants for rigid trucks have different roll over protection settings. Note: With an exchangeable body (i.e. Hook lift, Swap body carrier, Skip loader), the correct variant must be chosen according the vehicle’s critical usage.

ESP-BAS1 is intended for single vehicles or vehicle combinations with standard centre of gravity height when laden.

Recommended when the payload in the truck or trailer does not exceed 3,8 m above the ground. Example: Most vehicles for general cargo, not specially high or low.

ESP-BAS3 is intended for single vehicles or vehicle combinations with low centre of gravity height when laden.

Recommended when the payload in the truck or trailer does not exceed 3,4 m above the ground. Example: Tipper body or dump body for stone and gravel transports, unless exceptionally high or heavily loaded.

ESP-BAS4 is intended for single vehicles or vehicle combinations with high centre of gravity height when laden.

Recommended when the payload in the truck or trailer can exceed more than 3,8 m above the ground, or when other critical factors can be expected. Example: Timber body, Wood chip body, Car transporter, Dry bulk tanker, Concrete mixer, Hanging meat.

ESP-BAS5 is intended for single vehicles or vehicle combinations with high centre of gravity height when laden, but when the unladen vehicle is heavy and has a low cog.

Recommended when the payload in the truck or trailer reaches more than 3,8 m above the ground. Example: Timber body with a fixed crane.