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ELECTRONIC STABILITY PROGRAM

Electronic Stability Program, ESP

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.

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 reduces the torque from the engine/the electric drive unit or activates the brakes individually in order to reduce speed and straighten up the vehicle combination.

ESP functionality control

When starting the vehicle, the ESP mode is active. With the option ESPC-RO, the ESP function can be adjusted to demanding driving conditions and combinations.

With a switch it is possible to reduce or turn off the function. In reduced mode, the ESP system is active, but with later intervention. In off mode, the ESP system is off up to 40 km/h, but when the speed is increasing above 40 km/h, the ESP system is activated.

SAFETY

- Reduces the risk of skidding and rolling over.
- Efficiently straightens up the vehicle combination by braking each wheel individually.

PRODUCTIVITY

- ESPC-RO gives flexibility in demanding driving conditions.

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Sales variants
Electronic Stability Program (ESP) package

ESP-BAS1 ESP 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* ESP package intended for vehicle combinations with multiple trailers without ABS.

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

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

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

*** Only available for diesel/LNG vehicles.**

ESP functionality control

ESPC-RO ESP functionality control – Reduced / Off

ESP for tractor/rigid

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

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

ESP-BAS2* for TRACTOR is intended for vehicle combinations that tow multiple trailers which might not be equipped with ABS (for example, road trains in Australia or double combinations in South America).

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

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

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

NOTE! ESP reduces the risk of rolling over and skidding. The vehicle 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 provides more stable braking, while making it possible to distribute braking force between axles/wheels.

In simple terms, ESP monitors the way the vehicle should behave, based on the actions of the driver, and the way the vehicle actually behaves. If the actual behaviour differs from the expected behaviour, ESP makes a correction by braking one or more wheels.

ESP reduces the risk of skidding and rolling over.

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 torque from the engine/the electric drive unit.
- Requested braking torque.

The primary parameters that indicate how the vehicle is actually behaving 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 the torque from the engine/ the electric drive unit 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.

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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 the torque from the engine/the electric drive unit. If necessary, the wheels are braked to slow down the vehicle and reduce the lateral forces to an acceptable level.

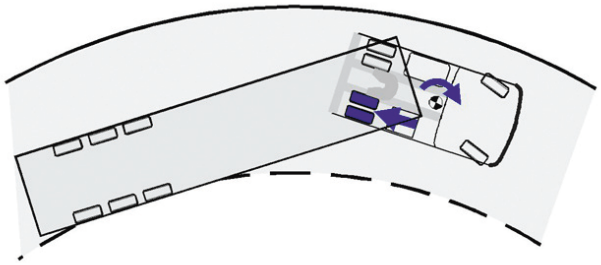
When the second roll over stage of ESP is utilized, a light braking is applied to the inner wheels. If the system senses that one or more wheels on the vehicle have locked, this indicates that the wheel is about to lift. The wheel brakes are immediately activated to slow down the entire vehicle combination. In this way, the speed and the corresponding 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 combination understeers in a curve, the entire vehicle tends to continue moving straight ahead.

The tractor's front wheels lose their 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.

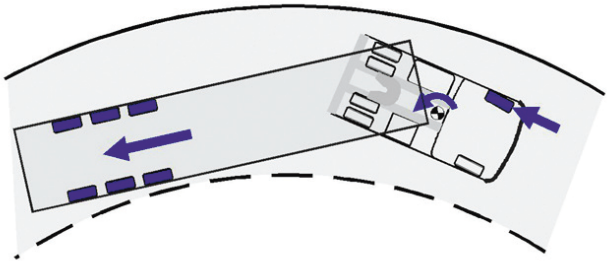


ESP brakes the inner rear wheel and turns the trailer into the curve, enabling the front wheels to regain grip.

Example tractor – skid with oversteering

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

In this type of situation, ESP senses that the yaw angle speed, the steering angle, and the 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.



ESP brakes the outer front wheel to turn the tractor back and give the rear wheels grip. The trailer's wheels are braked to avoid jack-knifing.

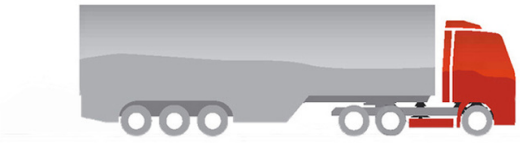
Recommended choice of ESP variant

The following variants affect the setting of ESP 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

Tractors have two or three different variants of roll over protection settings and ESP trailer braking strategies to choose between.



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

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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 that tow 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.

*** Only available for diesel/LNG vehicles.**

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

Recommended when the payload in the trailer can exceed more than 3.8 m above the ground, or when other critical factors can be expected.

Example: Timber, wood chip, car transporter, dry bulk tanker, concrete mixer, hanging meat.

RIGID

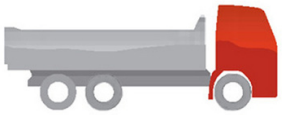
The four available variants for rigid trucks have different roll over protection settings.

Note: With an exchangeable body (for example hooklift, swap body carrier and 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 or extra 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 or extra high centre of gravity height when laden, but when the unladen vehicle is heavy and has a low centre of gravity.

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.