



System limits of the camera-based driver assistance system

This product information presents the advantages and system limits of the camera-based driver assistance system, referred to in the following as KaFAS.

It is part of the following series equipment/ optional equipment:

SA 5AV - Active Guard

SA 5AS - Driving Assistant

SA 5AT - Driving Assistant Plus

1. Concept

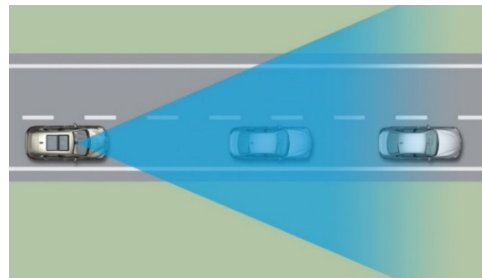
The front camera is able to detect vehicles ahead, up to a distance of 120 meters. In contrast to the established radar technology the front camera can also detect vehicles at standstill. Early detection allows for drivers to be aware of objects cutting in or cutting out relative to one's own vehicle due to its good lateral resolution, thus enabling predictive control.

At high speeds the front collision warning supports the driver by pre-pressurizing the brake system for a quicker response which results in a shorter braking distance. When driving within a city, braking is triggered automatically if the driver cannot prevent a collision with a vehicle driving ahead or a vehicle at standstill. In addition, pedestrians crossing the road are detected and, again, automatic emergency braking is triggered.

By using the front camera as the only sensor for headway monitoring, we are able to offer the customer a competitively priced proximity cruise control system. However the detection capability of the system and the automatic braking function are limited in certain situations.



Installation location of KaFAS camera



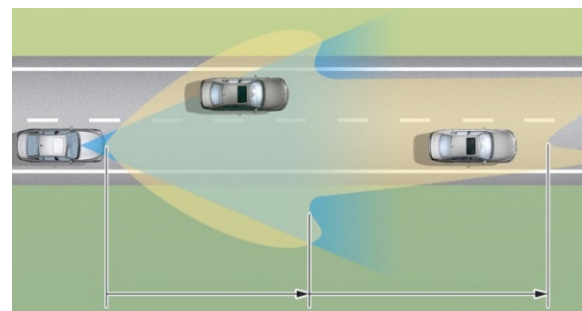
Camera-based detection

Difference compared to camera-based system:

Within a radar-based system, in addition to the camera, a sensor is fitted in the front apron.



Installation location of radar-based sensors



Detection range of radar- and camera-based system.



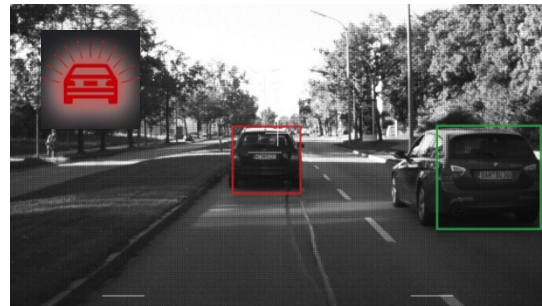
2. Product description

Description of the most important functions of the camera-based driver assistance system / KaFAS system (depending on equipment level). Refer also to owner's handbook „Driving comfort“ / „Security“.

a) Camera-based cruise control with braking function (Video-ACC)

Part of SA5AT (at MINI SA5AS / SA541)

- MINI: selectable speed between 30 and 140 km/h.
- BMW: Selectable speed between 0 and 140 km/h, braking to a full stop.
- Distance to a vehicle in front is maintained (within system limits).



Detection of a vehicle in front.

b) Camera-based front collision warning

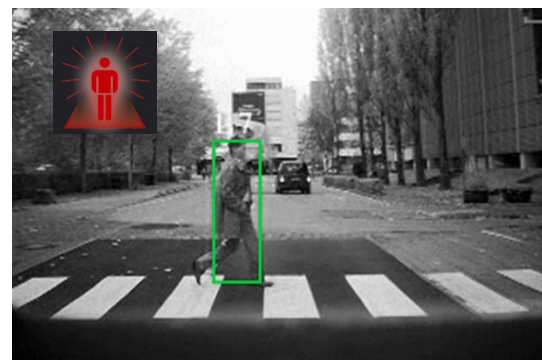
Part of SA5AV, SA5AT, SA5AS

- System warns about a collision with a vehicle in front.
- With an imminent warning, the braking system is pre-pressurized.
- Speeds above 60 km/h / 35 mph.

c) Camera-based city braking function

Part of SA5AV, SA5AT, SA5AS

- System warns about a vehicle ahead and brakes, after an audible warning alert, autonomously with 4m/s² for 1.5 seconds.
- Only within speed range 5 - 60 km/h / 3 - 35 mph.




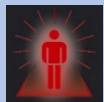


Detection of a pedestrian.

d) Camera-based person detection with city braking function

Part of SA5AT, SA5AS

- System warns, at sufficient brightness, as from approx. 10 - 60 km/h / 6 - 35 mph about a probable collision with pedestrians and supports the driver via brake interventions (4m/s² for 1.5 seconds) shortly before a collision.

System / Optional equipment (SA)	Pre-warning	Imminent warning	Active brake intervention	Speed range
Front collision warning SA5AV, SA5AT, SA5AS	 Pre-warning as from 15 km/h		No. The brake circuit is pre-pressurized and the activation thresholds of the braking assistant are lowered.	> 60 km/h / 35 mph
Front collision warning with city braking function SA5AV, SA5AT, SA5AS	-		4 m/s ² for max. 1.5 seconds	5 - 60 km/h / 3 - 35 mph
Front collision warning with pedestrian braking function SA5AT, SA5AS	-		4 m/s ² for max. 1.5 seconds	10 - 60 km/h / 6 - 35 mph

3. System limits

The quality of object detection and signal accuracy depends on the respective visibility conditions since the front camera is only an optical sensor. Thus, the performance decreases with deteriorating environmental conditions. **If reliable object detection is no longer ensured, this is detected by a camera-internal algorithm, the system is deactivated** and a visual and acoustical signal is issued, prompting the driver to take over control of the vehicle.

Generally, this takes place when the human eye also approaches its limits.

The following system limits may lead to an implausible system deactivation, camera misinterpretations or non-activation of the system:

- Adverse weather conditions like fog, rain, dust, spume formation on wet roads or snow.
- Field of vision of camera dirty or covered.
- Driving against the sunlight (counter light), low sun, sunlight reflections, tunnel entries and exits (quick change btw. bright / dark), shadow of traffic signs or trees.
- Vehicles without lights switched on at night as well as vehicles of „unconventional appearance“ (e.g. tractors).
- A vehicle suddenly cuts into one’s own lane (including oncoming traffic).
- Vehicles, pedestrians or other obstacles within curve radius in front of own vehicle.
- Vehicles, pedestrians or other obstacles protrude into own lane.

In case of a system-triggered de-activation of the system the following symbols may light up (depending on situation and equipment level): ⚠



Vehicle detection / Active Cruise Control (ACC) de-activated by the system.



Traffic jam assistant temporarily not available.

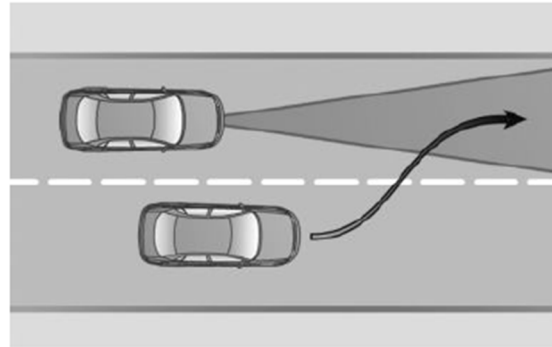


Front collision warning with limited function.

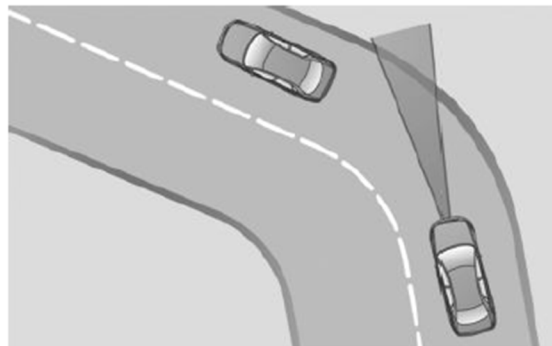


Limited pedestrian warning function.

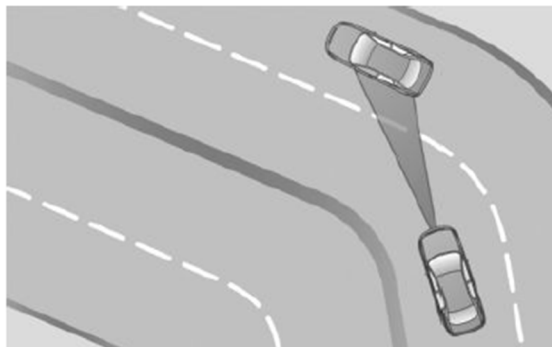
Are all disturbing influences eliminated and internal camera processes completed (duration depending on the switch-off condition), the warning message ⚠ disappears and the system can be reactivated by the driver.



System limit: unexpected lane change.



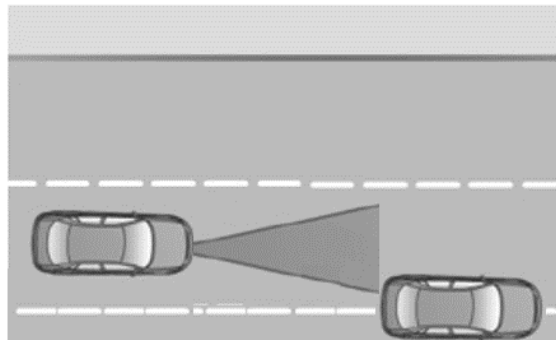
System limit: cornering, vehicle accelerates.



System limit: cornering, vehicle brakes.



System limit: driving against the sunlight (low sun).



System limit: parking vehicles protrude into lane.



4. Customer communication

The customer must be informed about the system conditions / system limits and about the possible settings described below. The driver assistance systems as applicable for a specific system or equipment level (series or SA) are described in detail in the vehicle owner’s manual in section “Driving comfort” and “Security”.

The system serves as a support for the driver but does not relieve the driver of her/his responsibility to adapt speed, headway and driving style to the traffic and environmental or weather conditions (“Personal Responsibility”).

Due to the mentioned system limits it may happen that warnings are either not issued or issued too late or that issued warnings are implausible. **Therefore, the driver must always be attentive as to be able to intervene in the process at any time, otherwise there will be a risk of an accident.**

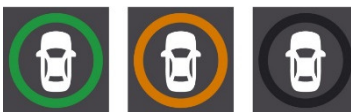
Possible settings:

Warning response times / De-activation of front collision warning:

In order to de-activate the front collision warning, the Intelligent Safety Button (see figures at the right) must be pressed twice. In addition, the warning response time can be set – early, medium, late. The more sensitive the warnings are set (e.g. the warning time) the more warnings are displayed. This may involve an increased number of false warnings.

Switching to manual speed control:

In case of a system-triggered de-activation of the camera-based cruise control, switching to manual cruise control is possible. This is done by extended pressing of the button “Increase / Decrease Headway”. In order to return to camera-based cruise control the button must be pressed again.



Intelligent Safety Button.



Setting of warning response time or de-activation of driver assistance systems (MINI).



Switching to "manual cruise control" (MINI).



Setting of warning response time or de-activation of driver assistance systems (BMW).



Switching to "manual cruise control"(BMW).