

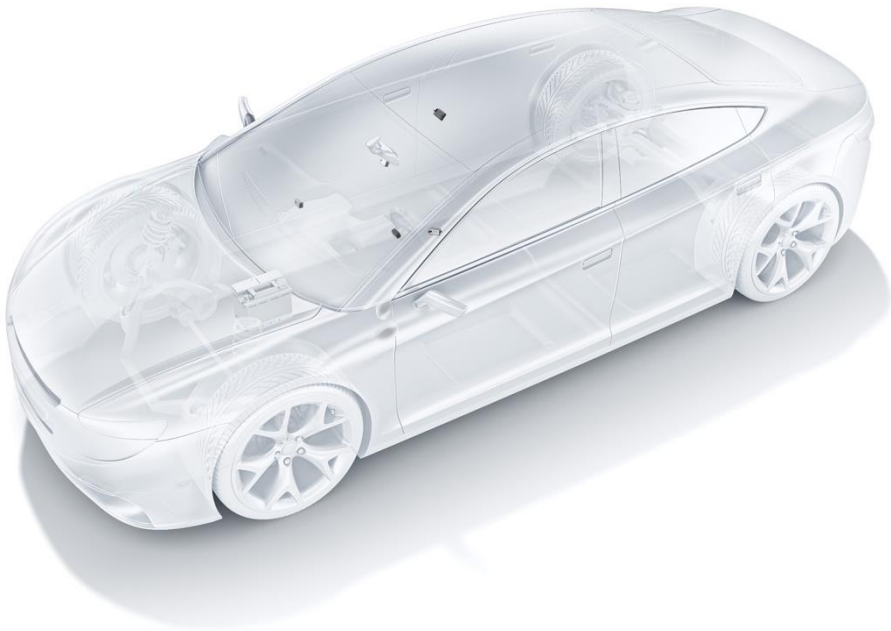
Interior sensing solutions

Scalable solutions for
increased safety and comfort
for all vehicle occupants

Interior sensing solutions

Product portfolio

Advanced driver
assistance systems



Cabin
sensing
radar



Occupant
monitoring
camera



Driver
monitoring
camera



Interior
monitoring
ECU



Interior
monitoring
software (SaaP)



Steering
angle software
(DDD)



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Interior sensing solutions

Advanced driver
assistance systems



Scalable solutions for increased occupant safety and comfort



Interior sensing solutions

Driver engagement: Sensor overview



The driver and/or occupant monitoring camera can detect driver impairment, such as distraction, drowsiness or even by illicit substances. It can warn of inattentiveness and recommend breaks if signs of drowsiness are detected.

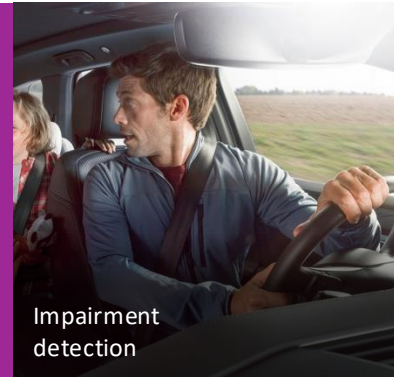
The driver and/or occupant monitoring camera can be installed in different locations in the cockpit (e.g., on the steering column, A-pillar, rearview mirror or display).

Sensors and features

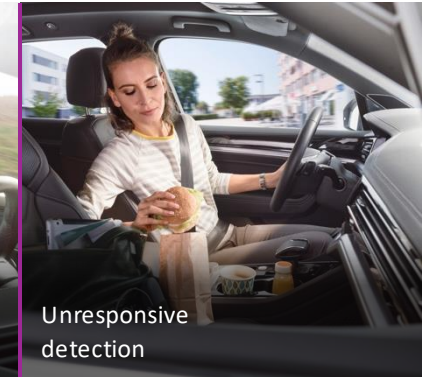
Driver
monitoring
camera



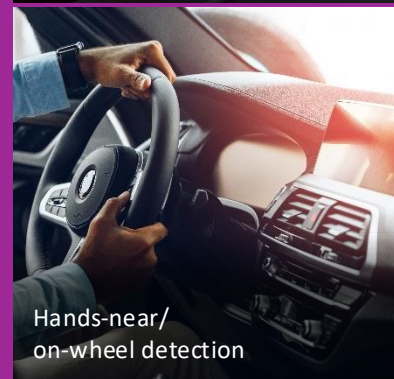
Occupant
monitoring
camera



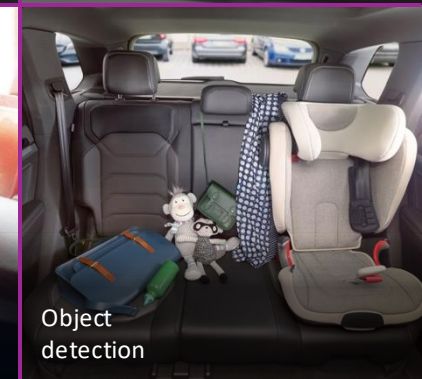
Impairment
detection



Unresponsive
detection



Hands-near/
on-wheel detection



Object
detection



Interior sensing solutions

Occupant safety: Sensor overview



The occupant monitoring camera has a wider field of view and can capture occupants in the passenger and rear seats. The camera can classify the occupant (i.e., adult, child) and even detect seatbelt misuse, if an occupant is out of position or even a child restraint system.

The cabin sensing radar can localize where occupants are seated in the cabin and detect the presence of life in the vehicle.

Combining the camera and radar can increase robustness of related safety features.

Sensors and features

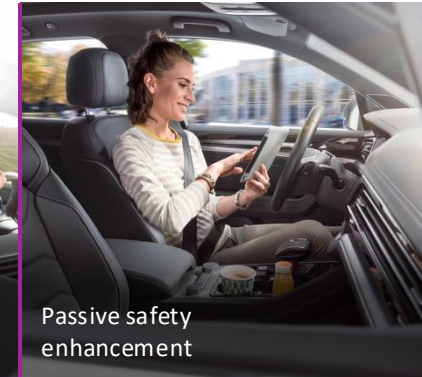
Occupant
monitoring
camera



Cabin
sensing
radar



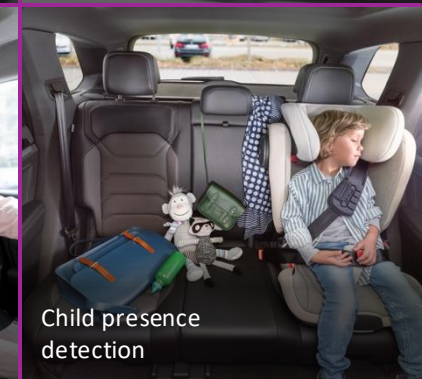
Occupant
classification



Passive safety
enhancement



Occupant
localization



Child presence
detection



Interior sensing solutions

Comfort and convenience: Sensor overview

Advanced driver
assistance systems



Sensors and features

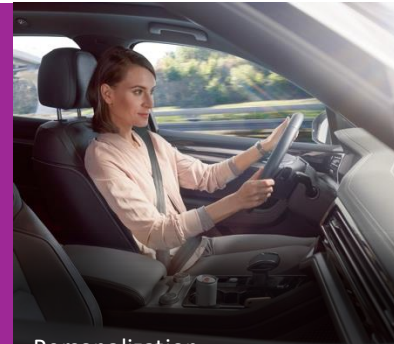
Driver
monitoring
camera



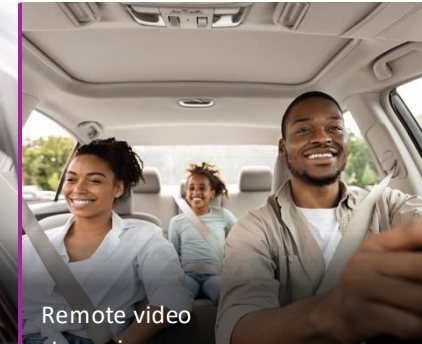
Occupant
monitoring
camera



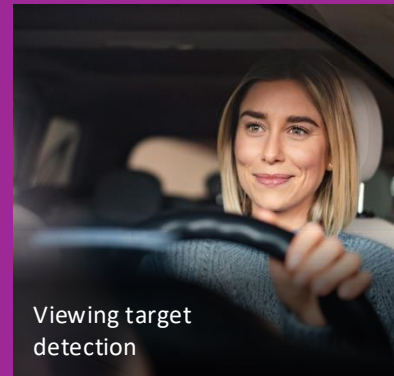
Cabin
sensing
radar



Personalization



Remote video
streaming



Viewing target
detection



Intrusion and
proximity detection

The interior monitoring camera can create a more comfortable and convenient vehicle experience. Through facial recognition, the driver's seat can automatically adjust to the driver's preferences, while gaze detection can identify things the driver is looking at, such as a coffee shop.

The cabin sensing radar can even help detect unauthorized movement around the vehicle and can initiate a signal to alert the user about possible vehicle intrusion.



Interior sensing solutions

Hardware



	Driver monitoring camera	Occupant monitoring camera
Resolution	1.5 MP 1124 × 1364	5.1 MP 2560 × 1984
Pixel size	2.6 μm × 2.6 μm	2.2 μm × 2.2 μm
Max frame rate	60 fps	60 fps
HDR	–	100 dB
SDR	DR max 60 dB	62 dB
Working distance	400 – 900 mm	~0.3 m to 1.6 m
Color filter array	–	RGB NIR
HfoV	~40° VFoV ~50°	–
Function temperature range	–40 °C to 85 °C functional	–

	Cabin sensing radar
Bandwidth	4 GHz
Range resolution	3.75 cm
HPBW	115°H / 108°E
Angular accuracy (±30° span)	2°H / 6°E
Angular resolution	29°H / 38°E
Antenna FoV	115°Az / 110°El
Size	57 × 35 × 16 mm

Interior sensing solutions

More information: Regulatory and consumer testing

Consumer test

EUNCAP Driver drowsiness, distraction, unresponsive, child presence			CNCAP Driver drowsiness, distraction	CNCAP Child presence detection	IIHS Driver monitoring (L2)	EUNCAP Child presence (direct only)	JNCAP ³ Driver drowsiness, distraction	EUNCAP ³ Occupant monitoring, enhanced driver monitoring incl. DUI/fit-to-drive, seat belt routing	USNCAP Update and research phase for MY31 (i.e., DMS)	CNCAP ³ Additional test scenario for cognitive distraction and drowsiness	EUNCAP ³ Enhanced passive safety, intoxication, enhanced driver state evaluation	
2020 – 2023			2024		2025		2026		2027		2028	2029
UNECE R157 Driver availability recognition (L3)	GSR Driver drowsiness ¹	GB/T Driver drowsiness, dangerous behavior	GSR Driver drowsiness ² Driver distraction ¹	UNECE R171 DCAS (L2)	UNECE R171 DCAS (step 2 ³ , e.g. hands free)	IIJA ⁴ Impaired driving detection and child presence	AIS-184 ³ Driver drowsiness	GSR Driver Distraction ³	UNECE EV ³ Children left in vehicle	UNECE Drowsiness ³ and distraction ³	GSR Drafting for GSR III starts (i.e., Step 2 for ADDW)	

Laws and regulations

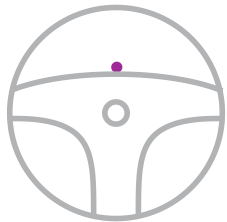
¹New types ²New cars ³Effective date & requirements ongoing ⁴Effective date defined in Infrastructure Investment and Jobs Act unknown but expected to include distraction, drowsiness and alcohol detection

Interior sensing solutions

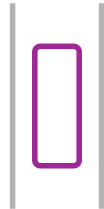
More information: Integration styles



Narrow field of view (nFOV)



Steering
column



A-Pillar
display

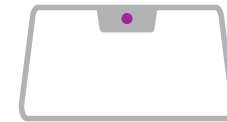
Wide field of view (wFOV)



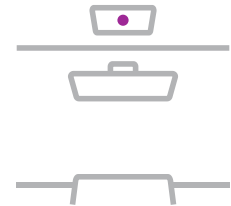
Static
below mirror



Notch
in mirror



Center
display



Overhead
console





Let's take driver assistance
to the next level.

Let's move #LikeABosch

Interior sensing solutions

Overview



1



2



3



4



5



6



7



8