



APS

DRIVER ASSISTANCE DURING PUSHBACK,
MAINTENANCE AND MANEUVER TOWING

Driver assistance systems

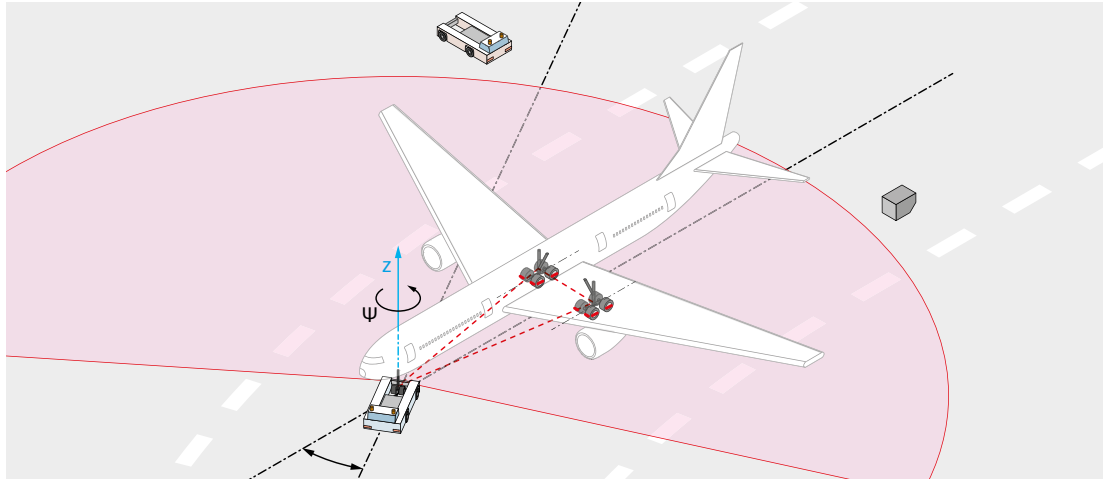
SICK
Sensor Intelligence.

APS: QUICKLY MAKE THE RIGHT DRIVING DECISIONS

Collision warning and driver assistance for aircraft tugs

As aircrafts do not have their own wheel drive to enable them to drive to the runway or into the hangar for maintenance themselves, they are moved by aircraft tugs. While they are being moved, collisions with objects on the runway or in the hangar or even other aircrafts are possible, and this can cause costly damage. SICK has developed the APS (Aircraft Protection System) driver assistance system to help aircraft tug drivers to move aircrafts safely. This takes some of the strain off drivers and reduces the risk of collisions and accidents, thereby avoiding high repair, maintenance, and aircraft downtime costs. In brief, using the APS facilitates smooth and efficient pushback, maintenance, and maneuver towing procedures.





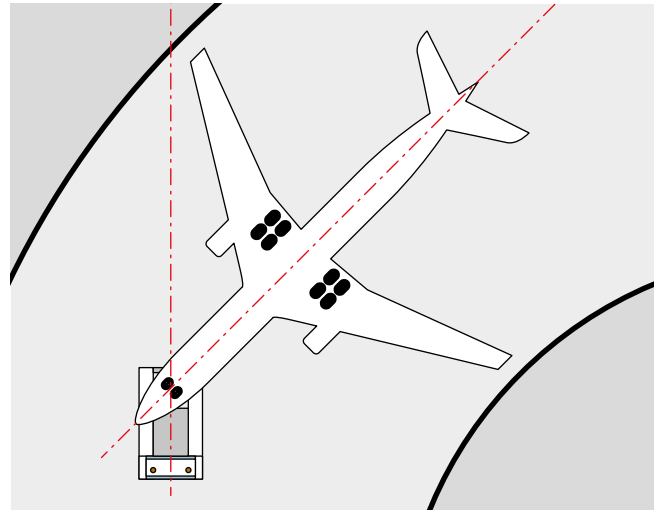
Challenges when driving aircraft tugs

Moving aircrafts with an aircraft tug presents great challenges for an aircraft tug driver. Aircrafts can be pushed or pulled but doing so may block the driver's view in some circumstances. And then there are the weather-related obstacles, as aircrafts need to be moved in all weathers. Guidelines on the runway can sometimes be difficult or even impossible for aircraft tug drivers to detect. Even when moving the aircraft into the hangar, wings frequently collide with the doors. The APS driver assistance system monitors the towing corridor, shows drivers any obstacles, and warns them of possible collisions in good time. The system comprises an LMS511 2D laser scanner and a touch display with an integrated processing unit including application software. The integrated installation wizard makes it easy to commission and configure the APS.



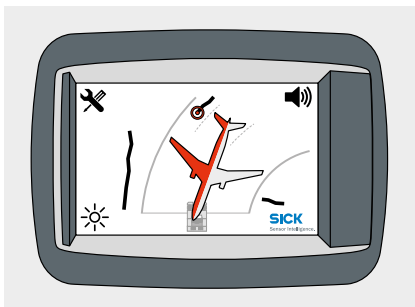
Determining the dimensions and position of the aircraft

Once the aircraft type has been selected, the corresponding aircraft silhouette stored in the database is displayed. The tug driver can use the display to detect the wing span, type, outline, and position of the aircraft clearly. The APS calculates the angle of the aircraft to the tug using the landing gear geometry. Factoring in the wing span information, the system determines the aircraft driving path and shows this on the display using curve radii to the right and left alongside the wings.



Displaying collision hazards and warning the tug driver

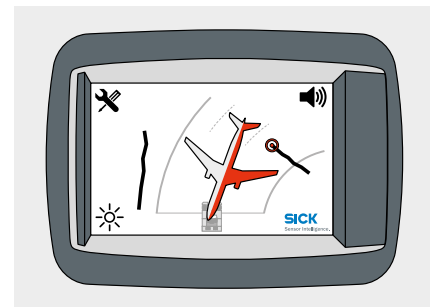
If an object appears in the aircraft's driving path, the at-risk side of the aircraft is visually highlighted on the display and an acoustic signal warns the tug driver at the same time. This signal increases awareness and reduces the response time of the driver significantly. The APS distinguishes between three different collision scenarios so that the driver is quickly able to detect where the potential danger is without interpretation and searching time. The driver's attention is always first directed to the at-risk side of the aircraft and then to the collision object:



The right side of the aircraft is highlighted in red if the collision object is on the right side of the aircraft.



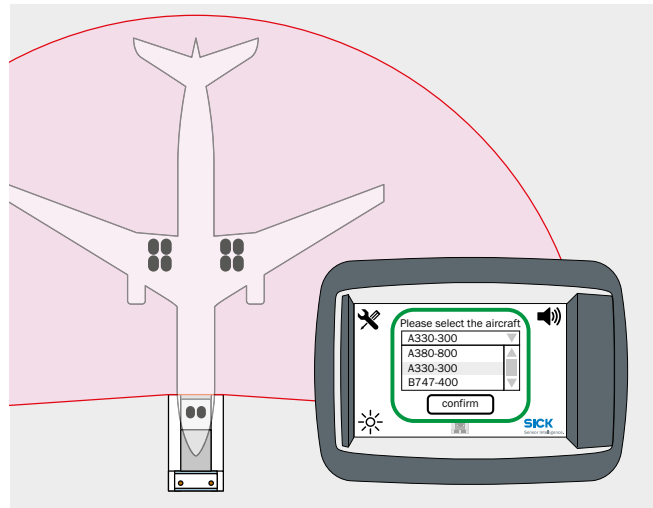
The entire aircraft is highlighted in red if the collision object is behind the aircraft.



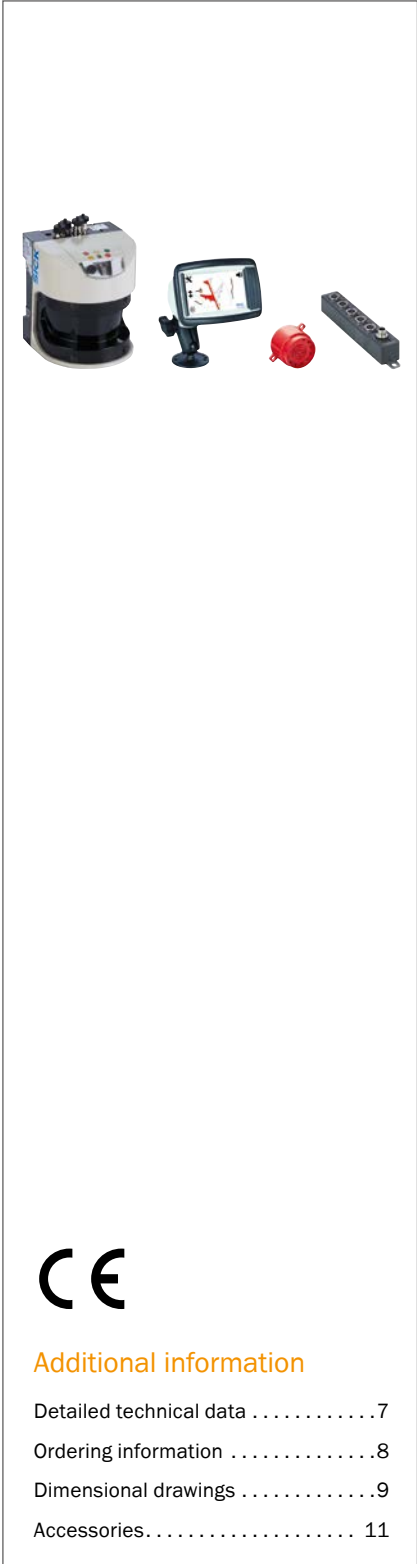
The left side of the aircraft is highlighted in red if the collision object is on the left side of the aircraft.

Determining the aircraft type

The aircraft tug grips the nose wheel, lifts it up, replacing the front landing gear. The aircraft is now only on the rear main landing gear. The LMS511 2D laser scanner is mounted on the rear of the tug facing backward and scans the entire area under the aircraft parallel to the ground. The LMS511 measures the wheels of the aircrafts; the APS driver assistance system determines the aircraft type using the landing gear geometry. The APS features a database where the various aircraft types are stored and suggests all possible aircraft types that match the corresponding landing gear geometry to the tug driver using a selection list on the display. The driver selects the correct aircraft and confirms the selection.



DRIVER ASSISTANCE DURING PUSHBACK, MAINTENANCE, AND MANEUVER TOWING



Product description

The APS (Aircraft Protection System) driver assistance system is designed for cost-effective retrofitting on aircraft tractors. The system provides reliable warnings against collisions with other ground vehicles and airport infrastructure. It also provides the tractor driver with assistance during pushback, maintenance, and maneuver towing. The display shows all the obstacles that are in the vicinity of the aircraft. In the event that an obstacle is detected

within the aircraft's towing corridor, the driver receives an audible and visual warning so that the aircraft tractor can be stopped in order to avoid a collision. Obstacles that pose a risk of collision are highlighted. This provides the driver with support when driving into a hangar, for example. It also enables hazardous situations to be detected more quickly and the correct driving decision to be made in good time.

At a glance

- Towing corridor monitoring for collision awareness
- Warning system provides the driver with warnings of collisions and initiates a response
- Obstacles are shown on a display
- Configurable safety distances
- High driver acceptance
- Self-diagnostics for straightforward troubleshooting and maintenance

Your benefits

- Prevention of collisions and accidents reduces aircraft repair costs and downtime
- Excellent aircraft tractor availability enables smooth, efficient pushback, maintenance and maneuver towing
- Integrated installation wizard simplifies installation and operation
- Self-diagnostics makes system maintenance easy



Additional information

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For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



Detailed technical data

APS

Features

Field of application	Airport
Vehicle	Pushback tractors without towbar
Laser class	1, eye-safe (IEC 60825-1 (2007-6))
Requirements for objects to be protected	Aircraft properties: Aircraft fuselage height: > 80 cm Track: 4,5 m - 15 m Wheelbase: 10 m - 32 m

Performance

Display	4.3" touch display
Functions	Acoustic and optical collision awareness during aircraft tugging processes
Number of laserscanners	1
Monitored area	Docked aircraft behind the pushback tractor
Warning zones	2
Self-diagnostics	✓
WebInterface	Software updates

Interfaces

Ethernet	Function	Software updates
Operator interface		Touch display

Mechanics/electronics

Supply voltage	24 V DC, 19.2 V DC ... 28.8 V DC
Power consumption (typ., max.)	27 W, 92 W, With heating
Weight	3.7 kg, 4.286 kg with brackets (LMS511) 360 g, 600 g with mounting (Display)
Dimensions display (W x D x H)	142 mm x 44 mm x 98 mm (with mounting 130 mm depth)
Installation position	Pushback tractor, rear side left or rear side right, 20 cm - 60 cm from ground (LMS511)

Ambient data

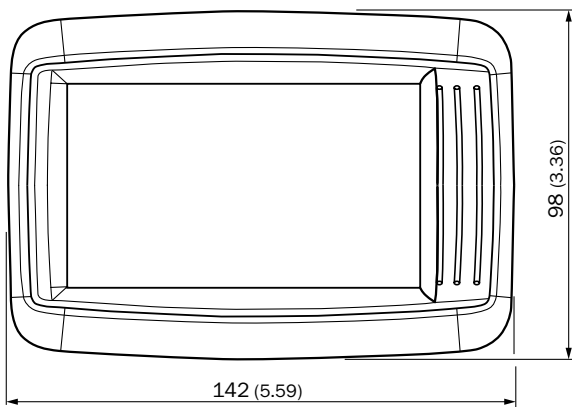
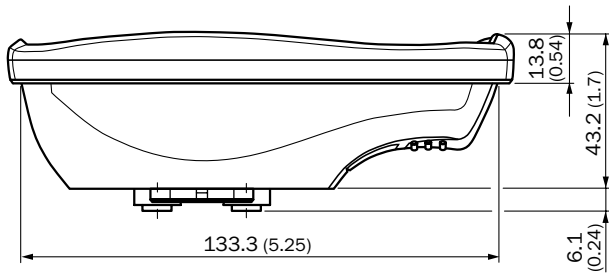
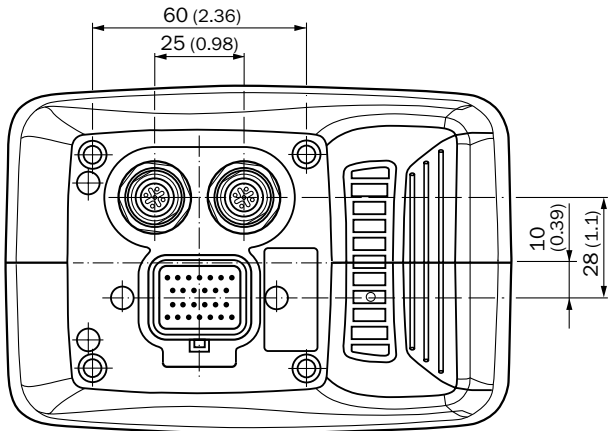
Ambient temperature operation	-25 °C ... +50 °C
Ambient storage temperature	-25 °C ... +60 °C

Ordering information

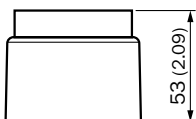
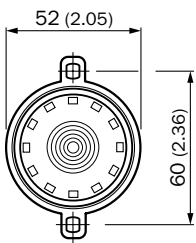
Application	Items supplied	Type	Part no.
Driver assistance system for aircraft tractors in order to avoid collisions between airplanes and other objects during the towing process	LMS511 Operator display Mounting set for operator display Ethernet switch Buzzer USB stick with operating instructions Mounting kit 1 for mounting the LMS511 Power supply cable (female connector open) for LMS511 Ethernet connection cable (straight) for LMS511 Ethernet connection cable (angled) for operator display Connecting cables for operator display Mounting kit 2 for adjusting the LMS511 on mounting kit 1 Power supply cable (female connector open) for the Ethernet switch	APS-5101	1069176

Dimensional drawings (Dimensions in mm (inch))

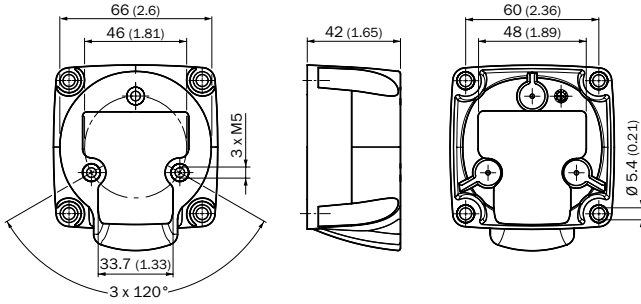
Operator display



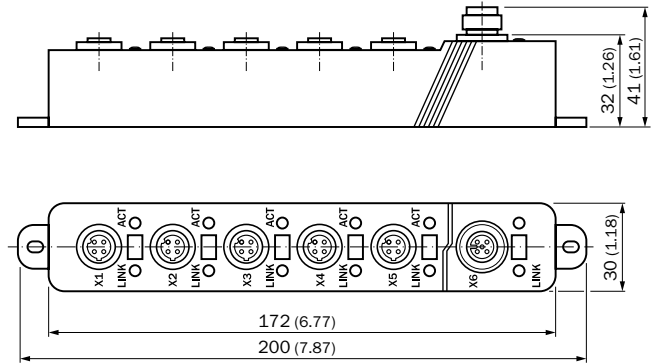
Buzzer



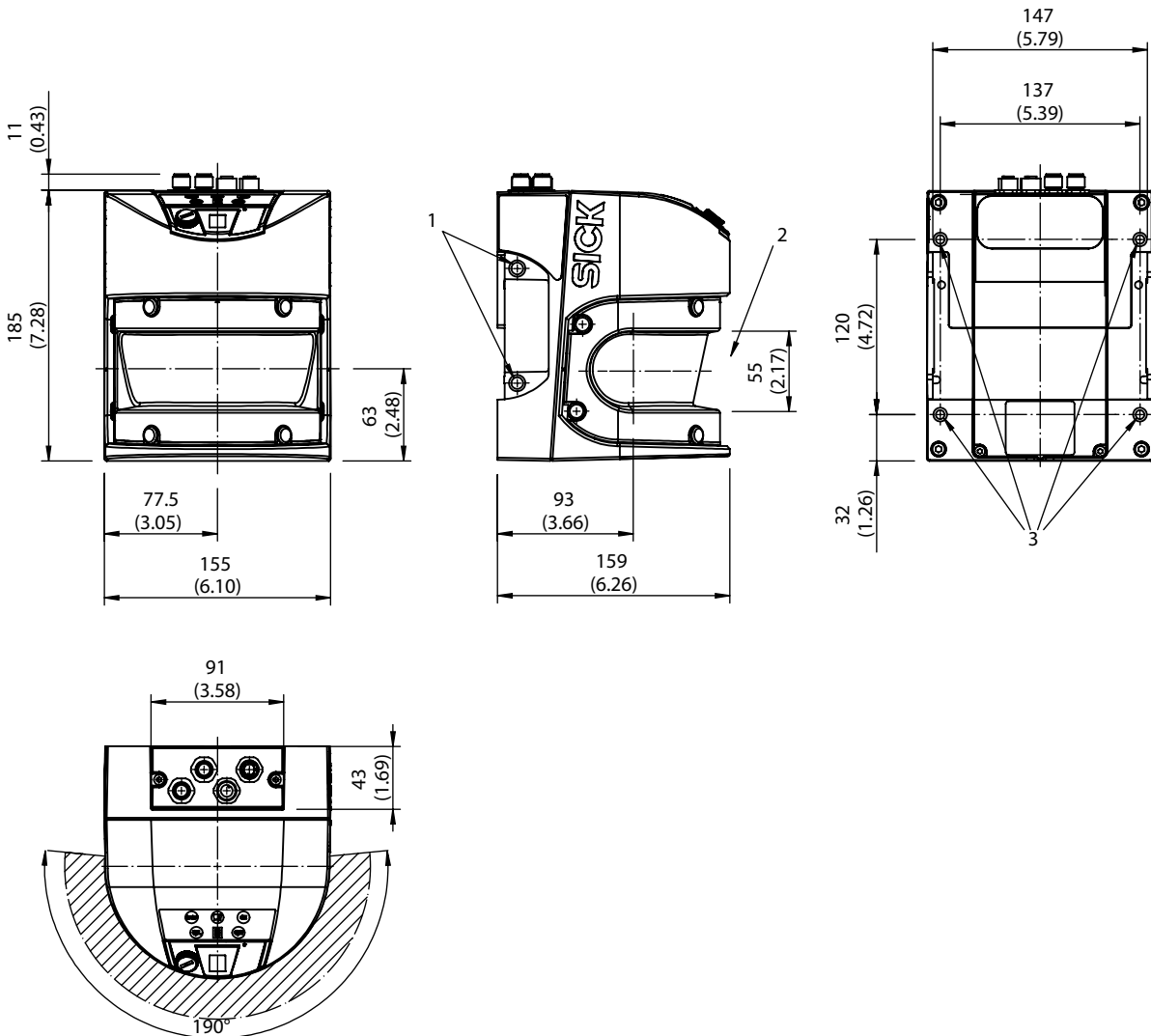
Mounting set for operator display



Ethernet switch



LMS511



- ① 4 screw holes M8 x 9
- ② Do not block front screen
- ③ 4 screw holes M6 x 8

Accessories

Mounting systems

Device protection (mechanical)


Protective housings and protective pipes

Figure	Brief description	Type	Part no.
	Protection hood	Protection cover	2056850

Connection systems

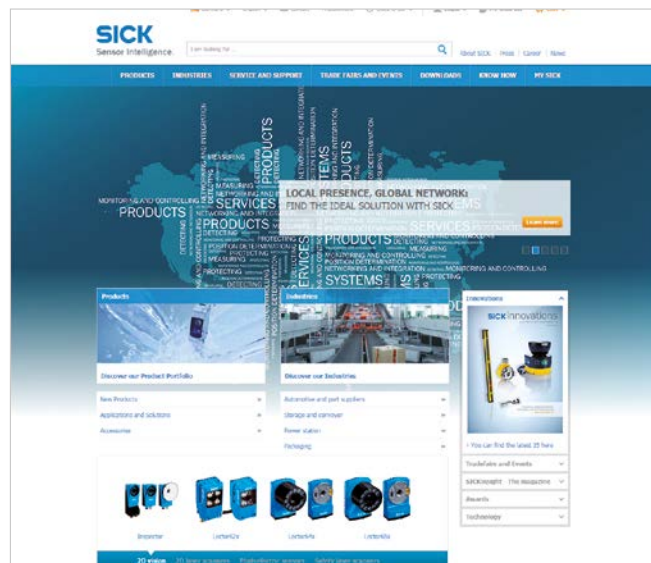
Modules and gateways

Connection modules

Figure	Brief description	Type	Part no.
	Connection box for power (sensors, display, sound generator, Ethernet switch)	Connection box	2070552

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SICK AT A GLANCE

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We have extensive experience in various industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

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