Dynamic vehicle measurement series

AD7863 Laser Ground Sensor

Speed and position data using laser measurement method

Measurable in clear weather

SIMULINK Enabled

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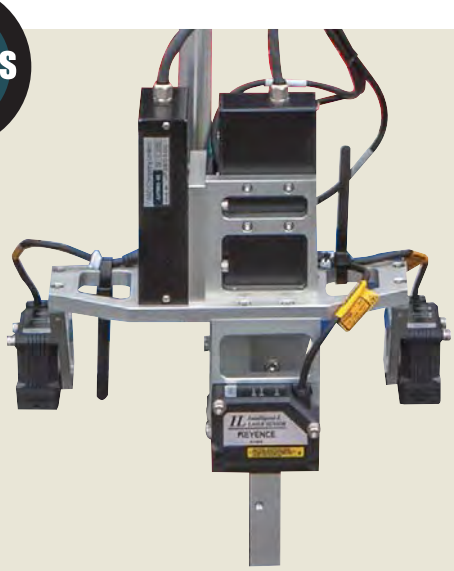
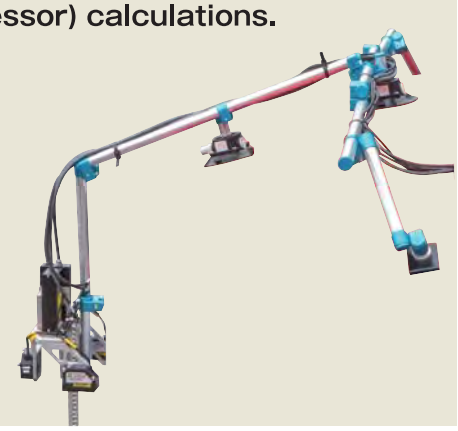
A&D Company, Limited

http://www.aandd.jp

Features



The Laser Ground Sensor (LGS) consists of 2 Laser Doppler Velocimeters (LDV) and 3 Laser Distance Sensors (LDS). The LDVs measure ground speed in two directions and tire rotation in a lateral direction. The 3 LDSs measure the distance from the ground to determine the changes in wheel height during the drive. Slip angle (output from the ground speed data), camber angle, pitch angle, roll angle (outputs from the distance data) can be obtained from DSP (Digital Signal Processor) calculations.



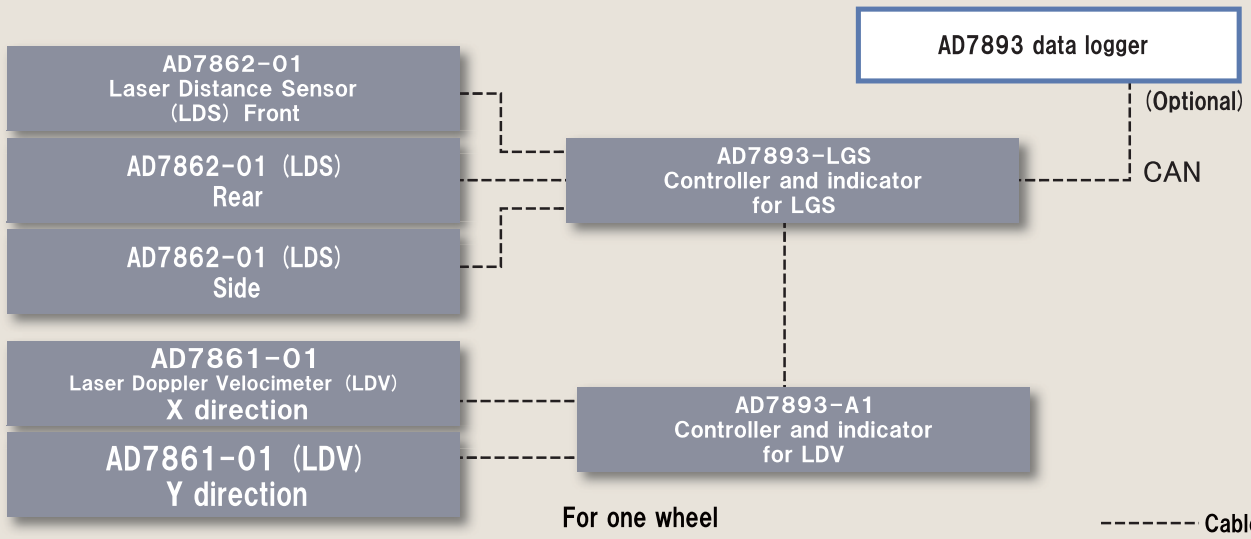
- ●IP65 waterproof rating
- ●LDS can be used on days with bright skies by attaching a filter
- ●LDV is operable at speeds starting at 0km/h
- ●Can be independently attached to a standard wheel
- ●Can be used in various combinations with A&D vehicle measurement systems
- ●Data is stored in a Micro SD card and is connectable with CAN logger

Principles of operation

Laser Displacement Sensor (LDS) : Displacement and height are measured by laser reflection.

Laser Doppler velocimeter (LDV) : A laser is split in two and the velocity measured at the cross point. This latest analysis method enables highly accurate measurement. The vehicle's drive path record is measured by integration calculations.

■System configuration



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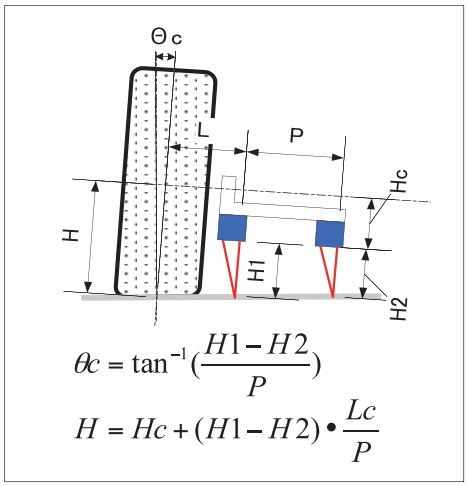
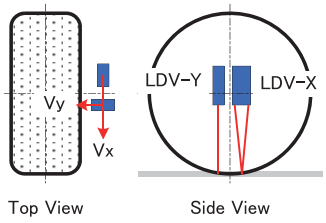
Logic



$$\theta c = \tan^{-1}\left(\frac{H1 - H2}{P}\right)$$

$$H = Hc + (H1 - H2) \bullet \frac{Lc}{P}$$

2 Laser Distance Sensors (LDS) measure the tire camber angle.



Ground velocity : Vx, Vy

Slip angle : $\theta s = \tan^{-1}\left(\frac{Vy}{Vx}\right)$

Velocity : $V = \sqrt{Vx^2 + Vy^2}$

Height from ground to the tire center is calculated from the LDS data.

Vehicle drive path record:
2 Laser Ground Sensor (LGS) systems are attached to the front and back of the vehicle to measure its drive path as well as its yaw angle. Horizontal velocity and driving distance data is used for this calculation.

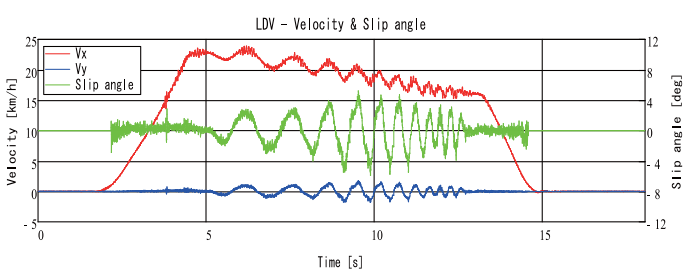
Appearance

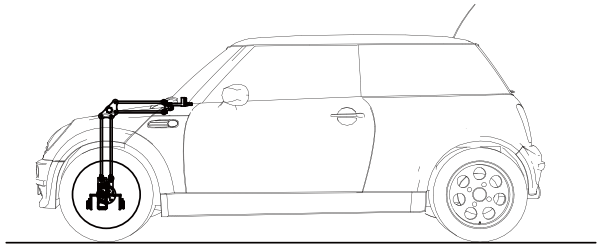
LGS

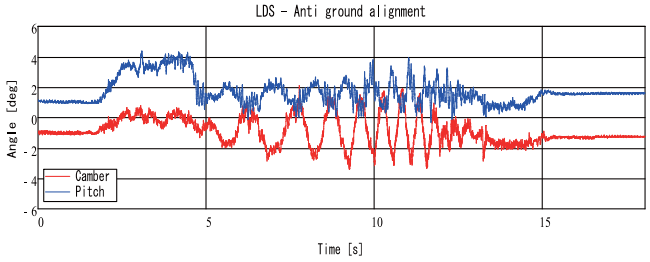
LGS+WPS

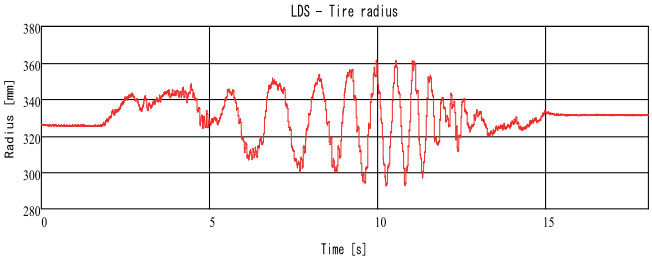
LGS+WPS+WFS

Data example









Vehicle used : Mini Cooper S
Testing pattern : Sweep steering
Sampled wheel : Front left

Measured values : Vx, Vy, Slip angle, Camber angle, Pitch angle and Tire radius
Measurement duration : 15 secs
Vehicle velocity : Up to 40km/h

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Specifications

AD7861-01(LDV) and AD7862-01(LDS) specifications

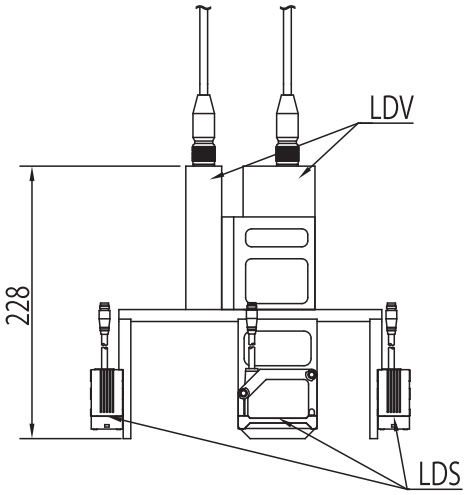
Item	Specifications	Remarks
Method	Laser Doppler system	Velocimeter
	Laser system	Distance sensor
Speed	SpX: Tire rolling speed	
	SpY: Side speed	
Tire angle	SA: Slip angle (angle formed by velocities in rolling and side directions)	
	CA: Camber angle (angle around X axis)	
	PA: Pitch angle (angle around Y axis)	
Physical tire radius	Tr: distance between tire center and ground	
Mileage	DdX: Mileage in rolling direction	Velocity integration
	DdY: Mileage in side direction	
Speed resolution	0.2% or 0.006km/h	
Ground distance resolution	50μm	
Tire angle resolution	SA: 0.002rad or 0.115deg	Distance between laser sensors
	CA: 3.57E-4rad or 0.0205deg	Rolling dir.: 240mm
	PA: 2.08E-4rad or 0.0119deg	Side dir.: 140mm
Speed measurement range	±144km/h or -4km/h to 318km/h	
Ground distance measurement range	Focal length ±50mm	
Mounting	Dedicated mounting bracket	
Weight	3.3kg	Including mounting bracket
		Reference value

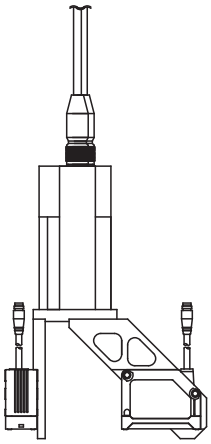
AD7893 - LGS

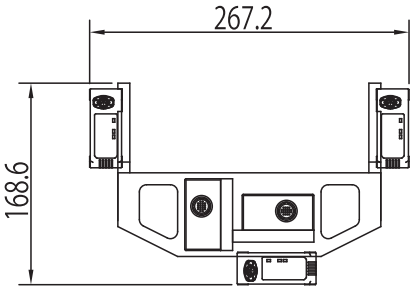
Item	Specifications	Remarks
Calculation / Measurement		
Ground speed calculation	Digital model calculation	
Calculation rate	1kHz	
Measurement items	Rolling speed, side speed, slip angle, camber angle, pitch angle, tire radius, rolling distance and side direction distance	
Data interpolation function	ON/OFF selectable	
Liquid Crystal Display		
Display items	Numerical display of the above measurements	
Data Output		
Output device	CAN	
Data output frequency	Selectable from 1/2/5/10/20/50/100/200/500/1k (Hz)	
General		
Size	Width 97mm x Height 97mm x Depth 208mm	DC 12V AC power adaptor
	Width 110mm x Height 115mm x Depth 310mm	
Power supply	AC 100 to 240V	
	DC 12V ±10%	
Operating temperature	5 to 40 °C	
Operating humidity	5 to 90%RH (no condensation)	
Weight	1.2kg	

Dimensions

Sensor part







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Safety Warning! ●Please read instruction manuals carefully before use.

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