LUXACT® 1D Compact

Slip-free, speed-over-ground sensor with dynamic yaw, pitch and roll correction

The new LUXACT® 1D COMPACT sensor is a multifunctional, powerful tool for contactless, slip-free speed over ground measurement. This sensor incorporates the proven and tested, unique LUXACT® optical technology, which is free of environment disturbances, like abrupt changing surface properties, heights to the ground variations, splashes of water, EM noise and objects crossing the field of vision. In addition, sensor's versatile body contains a six degree of freedom inertial measurement unit (IMU) and performs onboard all calculations and compensations in real-time. Measurement results are available directly in CAN bus and can be processes by all industry standard CAN loggers and DAQ systems.

LUXACT® 1D COMPACT corresponds to requirements of modern automotive R&D engineers for a universal and robust high-precision speed over ground system. Integrated IMU increases dramatically the dynamic response and accuracy due to yaw, pitch and roll corrections of the optical signal during dynamic testing scenarios.
Unlike other systems, surface-specific recalibration or IMU setup are not required making the testing process more efficient.

Highlights

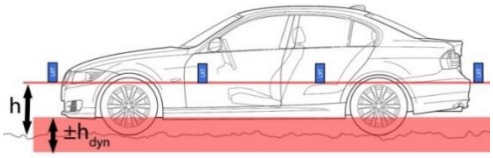
- Speed and distance uncertainty ≤0,1%
- Distance uncertainty for a passenger car during ABS brake test from 100 km/h (ca. 40m): ≤0,1%
- Tested on all industry typical surfaces without recalibration: asphalt, concrete, wetness, ice/snow, cobblestones etc.
- Low & constant latency
- Dynamic speed correction by yaw, roll and pitch angles
- Clear start-up and standstill
- Integrated high precision brake triggers processing with automatic brake test analysis incl. output of all orientation angles during the brake test

LUXACT® technology

LUXACT® sensors base on an unique, proven & tested optical measurement principle, which enables contactless speed and distance measurement over ground independent from surface properties and with strong height to ground fluctuations. LUXACT® 1D Compact opens new areas of application for this technology: the tiny size allows a practical mounting on the car's body, while integrated IMU corrects the optical speed using integrated 6DOF IMU. This device delivers in real-time precise and reliable results, even during highly dynamic testing scenarios, like brake or performance testing. All results show a high repeatability and increase data integrity even under adverse conditions.

Technical specification – LUXACT® 1D Compact

		Sensor versions		
Parameter	**Unit**	**ultraLow Speed**	**Low speed**	**Standard**
Speed range in x axle	km/h	**0.1 - 90**	**0.15 - 220**	**0,2 - 300**
Nominal mounting height h	mm	**150**	**200**	**400**
Dynamic height range h_{dyn} **without impact on accuracy**	mm	±40mm	±70mm	±120mm
Typical applications		forklift, robots	mobile mapping	passenger car testing
Measurement range accelerations	m/s^2	±156 in x, y, z axle		
Measurement range angular velocity	°/s	±2000 around x, y, z axle		
Speed uncertainty 3σ	% FS RMS	≤0,1		
Distance uncertainty 3σ	%	≤0,1 at s >200m		
Distance uncertainty under dynamic testing – standard brake test	cm	≤3		
Resolution acceleration	mg	0,5		
Resolution angular rate	°/s	0,02		
Bandwidth inertial data	Hz	0 to 32 Hz (256 Hz without Filter)		
Measurement rate (=Output rate)	Hz	250 (optional: 800)		
Filter		none needed		
Latency to physical Event	ms	constant 3-50ms, depending on IMU data filter		
Light source / MTTF		invisible IR LED light / 100.000h		



Data Interface	
Parameter	**Standard values**
CAN-Bus	Intel/Motorola format, 2.0A/2.0B Baud rate: 500, 1000 kbit/s
TTL Output	0-5V TTL, quadrature, 1 Puls = 1 mm (others on request)
Trigger Input	All potential-free Triggers, brake pedal, buttons, switches, external DO signals, light barrier
RS485	Output of all values as in CAN bus. / Protocol TBD

Physical properties		
Parameter		
Dimensions (L x W x H)	mm	90 x 82 x 141 without connectors
Weight	g	950
Ingress protection class		IP66 & IP68
Operational conditions		-40°C bis +85°C, 10 bis 90% rel. humidity non-condensing
Shock / Vibration **Without equipment damage**		50 g Half-Sine 6 ms / 30 g, 10 to 150 Hz High vibrations result in reduced measurement spec
Power supply	V	12…36 overvoltage and inverse-polarity protection. EM Filter EN-55022 Class B
Input power		18 W

Measurement parameters and connectivity

AUX connector

Trigger input
Brake pedal / light barrier

AUX **CAN**

CAN connector

Permanent signals:

- car speed
- distance
- acceleration x, y, z
- angle rate um x, y, z
- quality of optical signal

Triggered signals:

- Rel. Orientation angles since trigger
- Distance since trigger
- Speed at trigger moment
- Time since trigger
- Average deceleration from trigger to standstill: a(v,t), a(s,t), a(v,s), MFDD
- Braketest quality (traffic light indicator)

TTL output:

- ✓ TTL Quadrature signal

Mounting on a car

It is highly recommended to use original and tested mounting accessories. LUXACT has standard mounting systems for magnetic or suction cup surface mount on car's body and towing eye mounting.
All mounting systems allow a needed mounting height adjustment, fit curved body surfaces and fit most of the cars.

Further LUXACT 1D Compact is delivered with a set of mounting brackets fitting dove tails of the housing and allowing an easy mounting to any available mounting structures.

SFX2 mounting on car's sidewall

MFX2 mounting on vehicle's face side

TFX1 mounting on car's standard towing eye

All LUXACT mounting units incorporate a ball adjustment and offer a very high degree of adjustment & flexibility.

TFX1 Universal towing eye mounting with **SGCC-H** regulated heated splashguard during winter testing.

TFX1 mounting fits all standard towing eyes and vehicles.

Scope of delivery

1x LUXACT 1D Compact inkl. 1x standard carbon splashguard
1x CAN & power cable 5m with 9 DSUB female connector and 4mm Banana connector. IP69K on sensor side
1x Trigger cable 5m with M12 female Socket. IP69K on sensor side
1x Calibration certificate according to ISO/IEC 17025
1x ABS case offering enough space for sensor, mounting, logger & cables
1x USB stick with CAN .dbc files, Software and User Manual

Options & Accessoires

Name	Part number	Description
LC…	L20120 – 10m L20121 – 20m	Cable length extension of originally delivered CAN cable (5m). IP69K on sensor side, power cable remains 2m.
KC…	L20115 – 5m L20116 – 10m L20117 – 20m	Additional Y-Cable for CAN Bus, IP69K at sensor's side, power cable 2m. 9DSUB female on DAQ side, standard CAN pin out.
KT…	L20118 – 5m L20119 – 10m	Additional Y-Cable for TTL, IP69K at sensor's side, power cable 2m. 15DSUB female on DAQ side, imc INA & INC pin out
GPS	L20105	GPS input for LUXACT certified RS485 GPS sensors. All GPS data (incl. time) are included in CAN data
MFX2	L20130	Flexible magnetic mounting for curved surfaces with height adjustment and easy release mechanism.
SFX2	L20131	Flexible suction cup mounting for curved surfaces with height adjustment and easy release mechanism.
TFX1	L20136	Universal towing eye mounting with additional carbon fixator with suction cup.
D080	L20112	Output & measurement rate increase to 800 Hz
SGCC	L20134	Splashguard for rough environment, carbon fiber reinforced.
SGCC-H	L20135	Splashguard for rough environment with integrated heating, carbon fiber reinforced.
XLAS2	L30103	Optical light trigger, 1000 Hz switching frequency with 5pcs. Reflectors.
BPT	L30105	Brake pedal trigger, bounce-free, with quick strap system.

	Model	nom. Height [mm]	Max. Speed. [km/h]	Output rate [Hz]	Cable length LC=CAN LT= TTL	
LXT	**1DC**	**400**	**300**	**250**	**LC10**	**LT10**
LXT					**LC…**	**LT**