

LUXACT 1D Compact

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

The 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, EM noise and objects crossing the field of vision or testing neighborhood properties. In addition, the compact housing also includes an inertial measurement unit (IMU) and performs onboard speed calculations in real-time. Measurement results are available directly in CAN bus and can be processed 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 is responsible for highly dynamic and accurate yaw, pitch and roll corrections of the optical signal increasing significantly the repeatability of test results during dynamic testing scenarios. Unlike other systems, surface-specific re-calibration or IMU setup are not required making the testing process more efficient.



Highlights

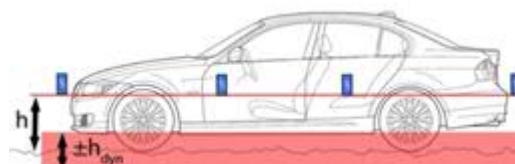
- Speed and distance uncertainty $\leq 0.1 \%$
- Distance uncertainty for a passenger car during ABS brake test from 100 km/h (ca. 40 m): $\leq 0.1 \%$
- Any typical surface conditions without re-calibration: asphalt, wetness, ice/snow, cobblestones, etc.
- Low & constant latency
- Dynamic speed correction according to yaw, roll and pitch angle
- Clear start-up and standstill
- Integrated precision trigger with automatic brake test analysis including output of all spatial angles during braking process

LUXACT® Technology

The LUXACT sensors are based on an unique, proven and tested optical measurement design concept which enables contactless measurement of displacement and velocity, independent of the reflecting surface's texture, and allows large working distances. LUXACT® 1D Compact covers fields of application for this technology, in which the distortions of the optically measured speed caused by the vehicle's motion over ground is compensated by an IMU and appropriate measurements of 6 degrees of freedom. This setup provides reliable and precise results in real time, even in dynamic processes such as brake or performance testing of vehicles. The results feature high repeatability and improved data integrity even under adverse conditions.

Technical Specs - LUXACT 1D Compact

General		
Parameter	Unit	Value
Velocity measurement range	km/h	0.2 to 300 in x axle
Acceleration measurement range	m/s ²	±156 in x, y, z axle
Angular velocity measurement range	°/s	±2000 around x, y, z axle
Velocity measurement error 3σ	% FS RMS	≤0.1
Displacement measurement error 3σ	%	≤0.1 at s>200 m
Displacement measurement error under real world conditions – typical car ABS brake test 100 to 0 km/h (ca. 40 m)	cm	≤3
Acceleration resolution	m/s ²	0.005
Angular velocity resolution	°/s	0.02
Bandwidth of outputted inertial data	Hz	0 to 20 Hz (256 Hz without filter)
Nominal Mounting height h	mm	400
Dynamic height working distance h _{dyn}	mm	±120 w/o influencing measurement error
Measurement frequency and output rate	Hz	250 (800 optional)
Filtering		none needed
Latency from physical event	ms	constant 3 to 50 ms, depending on IMU data filter
Light source / MTTF		invisible LED light / 100.000 h



Output interfaces		
Parameter		Default values
CAN-Bus (standard including 5 m cable)		Intel/Motorola format, 2.0A/2.0B Baud rate: 500, 1000 kBit/s
TTL Output (standard, TTL-cable not included in delivery)		0 to 5 V TTL quadrature, galvanically isolated Standard: 277.77 Hz per 1 km/h; 1 Pulse = 1 mm
TTL Input (standard, TTL-cable not included in delivery)		Quadrature / TTL for wheel odometer & consumption measurement devices; output to CAN Bus
Trigger Input (standard, trigger cable not included in delivery)		all isolated triggers, TTL signals incl. power supply to sensors for light barriers, brake pedals, 3 rd -party triggers
RS485 (standard, RS485 cable not included in delivery)		output of all measured values like CAN Bus (after technical clarification)

Physical properties		
Parameter		
Dimension (L x W x H)	mm	90 x 82 x 141 w/o connectors
Weight	g	950
Protection class		IP66 & IP68
Operating conditions		-40 °C to +85 °C, 10 to 90 % relative humidity w/o condensation
Schock / vibration resistance w/o damage to hardware		50 g half-sine 6 ms / 30 g, 10 to 150 Hz Measurement performance can be restricted
Power supply	V DC	9 to 36 with overvoltage and inverse-polarity protection EM Filter EN-55022 Class B
Power consumption	W	12

Measurement parameters and connectivity		
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AUX connector
Trigger input
 brake pedal / light barrier

TTL input:
 quadrature / TTL e.g. from
 consumption measurement
 device or
 wheel odometer



CAN connector
Permanent signals:

- vehicle velocity
- distance
- acceleration x, y, z
- angle rate around x, y, z
- optical signal quality

Trigger-event signals:

- rel. spatial angle since trigger
- path after/between trigger(s)
- velocity at trigger instant (high-precision)
- time since trigger
- average delay after trigger until standstill: $a(v,t)$, $a(s,t)$, $a(v,s)$, MFDD

TTL output:

- quadrature distance/velocity signal

Installation on vehicle

It is highly recommended to use original and tested mounting accessories. LUXACT® has standard mounting systems for magnetic or suction cup surface mounting on car's body, towing eye mounting and non-rotating wheel hub mounting.

All mounting systems allow mounting height adjustment, fit curved body surfaces and fit most cars.

Additionally, LUXACT® 1D is delivered with a set of mounting brackets that fit dovetails on the housing and allow for uncomplicated mounting to any available mounting structures.

Side mounting with flexible
MF3C magnetic mounting



(Fig. similar)

Side mounting with flexible
SF3C suction cup mounting



(Fig. similar, the shown sensor is the 1D Rail sensor)

Mounting with **TWB-C** on a
car's tow-bar with Ø50 mm ball



Mounting with **TF3** on a
car's standard towing eye



Included in delivery

1x LUXACT 1D Compact incl. 1x standard carbon frame
 1x CAN & power cable, 5 m, with 9-pin DSUB female connector and 4 mm banana jacks. IP68 on sensor side
 1x Manufacturer's calibration certificate according to ISO/IEC 17025
 1x carrying case ABS with additional room for LUXACT mounting fixture and cables
 1x USB stick with CAN DB

Options and accessories

Name	article no.	description
LXT-1DC	13300050	LUXACT 1D Compact sensor
Option:Rail	13300126	recommended for tram, light train and similar machines
Option:DTC	13300127	different from standard: different mounting height, different speed range

Firmware options

Option:D080	13300074	Output rate: 800 Hz
Option:GPS	13300073	GPS input for LUXACT certified RS485 GPS sensors; all GPS data (incl. time) are included in CAN data
Option:EXT	13300072	TTL input for external sensors like odometers or flowmeters

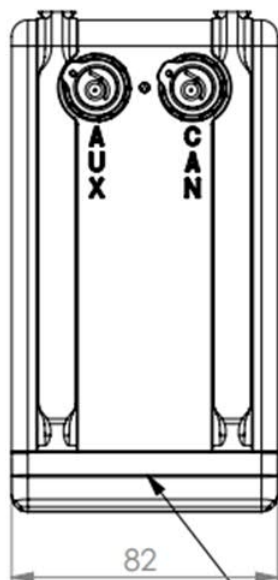
Cables

KVC10	13300065	extension of originally delivered CAN cable (5 m) into 10 m length or 20 m length (others upon request), both IP68 at sensor's side, power cable is not extended (remains 2 m)
KVC20	13300053	
KR10	13300117	extra cable for CAN and RS485 output, length 10 m or 20 m, others upon request, IP68 at sensor's side, power cable 2 m
KR20	13300118	
KT05	13300079	extra cable for TTL, length 5 m or 10 m, others upon request, IP68 at sensor's side, power cable 2 m
KT10	13300080	
KC05	13300077	extra cable for CAN bus, length 5 m, 10 m or 20 m, others upon request, IP68 at sensor's side, power cable 2 m, CAN DSUB-9 (female) standard pinning
KC10	13300031	
KC20	13300078	
KCG05	13300083	combined cable for the use of CAN and GPS on RS485 at the same time, data cable length 5 m (CAN DSUB-9, female, standard pinning and GPS DSUB-9 male), IP68 at sensor's side, power cable remains 2 m
KCT05	13300085	combined cable for the use of CAN and TTL at the same time, data cable length 5 m (CAN DSUB-9, female and TTL DSUB-15 male standard pinning), IP68 at sensor's side, power cable remains 2 m
KTR02	13300009	trigger cable for all LUXACT sensors, length 2 m, IP68 at sensor's side, for the use of integrated trigger functionality of Compact & Rail sensors, Sensor side: Fischer plug (triangular coding), Trigger side: M12 socket, incl. M12 mating connector

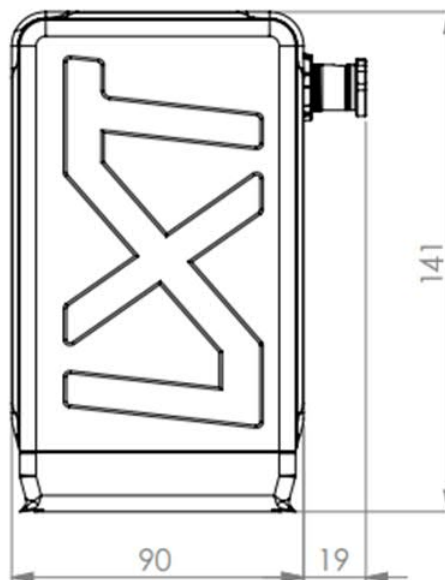
Mounting accessories		
Name	article no.	description
MF3C	13300066	flexible magnetic holder, for straight and curved surfaces, with height adjustment and easy replacement mechanism, third magnetic holder movably mounted directly on the sensor (ADH-C-M), for Compact & Rail sensors
SF3C	13300095	flexible pumpsuction holder, for straight and curved surfaces, with height adjustment and easy replacement mechanism, third suction cup movably mounted directly on the sensor (ADH-C-SC), for Compact & Rail sensors
3SC-Kit2	133000XX	set of suction cups as replacement
TF3	13300119	universal towing lug holder (magnetic holder into suction cup), incl. 1x flexibly adjustable support with suction cup, with aluminum profile for height adjustment, for Compact sensors with mounting height 400 mm and 200 mm
TWB-C	13300092	Universal mounting on a tow-bar with Ø 50 mm ball with height adjustment
MPL-1DR	13300116	Mounting plate for LUXACT 1D Rail sensor as well as the 1D Compact
MAF-1DC	13300093	Mounting bracket for mounting the LUXACT 1D Rail and/or 1D Compact sensor on the dovetail - for frontal mounting
MAS-1DC	13300094	Mounting bracket for mounting the LUXACT 1D Rail and/or 1D Compact sensor on the dovetail - for side mounting
Splash guards		
SGCC	13300099	protection cover for harsh operating conditions, carbon fiber reinforced plastic
SGCC-H	13300098	protection cover for harsh operating conditions with integrated heating elements, carbon-fiber reinforced plastic
Triggering tools		
BPT	13300061	Brake pedal switch as a trigger, bounce-free switch, with quick strap system, cable length 2 m with M12 connector (male)
Services		
CAL-1D	150000497	Manufacturer calibration of 1 optical axle and firmware upgrade
CAL-ISO-S	150000498	Calibration of measured value speed by an ISO 17025 certified laboratory
CAL-ISO-D	150000499	Calibration of measured value distance by an ISO 17025 certified laboratory
Ordering product code		

	model	nom. height [mm]	max. velocity [km/h]	output- rate [Hz]	cable length LC=CAN LT=TTL
LXT	- 1DC	- 400	- 300	- 250	/ LC10 / LT10
LXT	- <input type="text"/>	- <input type="text"/>	- <input type="text"/>	- <input type="text"/>	/ LC.. / LT

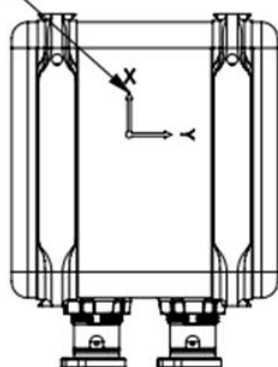
Dimensional drawing



Height reference
Nominal height to ground: 400 mm



positive driving
direction



LUXACT 1D Compact & 1D Rail sensors