

LUXACT 1D Rail

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

The LUXACT® 1D Rail 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, RS-485, TTL pulses and can be processed by all industry standard CAN loggers and DAQ systems.

LUXACT® 1D Rail corresponds to requirements of modern automotive and railways 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

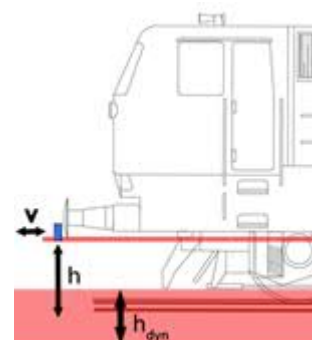
- Speed and distance uncertainty ≤ 0.1 %
- Distance uncertainty for a passenger car during ABS brake test from 100 km/h (ca. 40 m): ≤ 0.1 %
- Tested on typical surface conditions without re-calibration: asphalt, wetness, ice/snow, cobblestones, etc.
- Low & constant latency
- Dynamic speed correction according to yaw, roll and pitch angle
- Clear speed signal on start-up from 0.2 km/h and clear 0 km/h at standstill
- Integrated high precision brake triggers with automatic brake test analysis
- New shielding concept for railway applications: sensor housing 100 % insulated against all internal components. All electronic assemblies are specially shielded. CAN, RS485, TTL galvanically isolated
- External ground connection directly on the sensor housing

LUXACT® Optical 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 Rail 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 Rail

General		
Parameter	Unit	Value
Velocity measurement range		
LXT-1DRspeed-0.1-100	km/h	0.1 to 100
LXT-1DRspeed-0.2-300	km/h	0.2 to 300
LXT-1DRspeed-0.3-400	km/h	0.3 to 400
LXT-1DRspeed-0.4-500	km/h	0.4 to 500
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
Acceleration resolution	m/s ²	0.005
Angular rate resolution	°/s	0.02
Bandwidth of outputted inertial data	Hz	0 to 20 Hz (256 Hz without filter)
Nominal Mounting height h	mm	600
Dynamic height working distance h _{dyn}	mm	±180 w/o influencing measurement error
Measurement frequency and output rate	Hz	250 (800 optional)
Filtering		none needed
Latency from physical event		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 and 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

Output interfaces

RS485 (optional, RS485 cable not included in delivery)	output of all measured values like CAN Bus (after technical clarification)
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Physical properties

Parameter		
Dimension (L x W x H)	mm	90 x 82 x 187 w/o connectors
Weight	g	1050
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	18

Measurement parameters and connectivity

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

Optional mounting on a vehicle

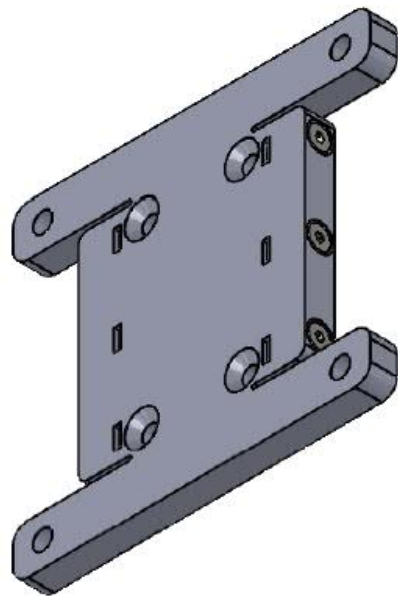
Frontal mounting with MPL-1DR mounting plate



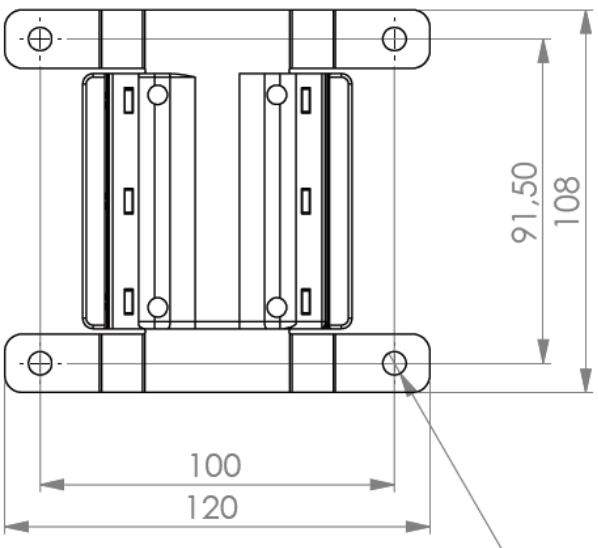
Top mounting with MPL-1DR mounting plate



MPL-1DR mounting plate



Dimensions



4x Ø6.6 mm; use M5 or M6 bolts with washers

Included in delivery

1x LUXACT 1D Rail incl. 1x standard carbon splashguard and 4x side mounting angles MAS-1DC
 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-1DR	13300115	basic version LUXACT 1D Rail sensor, order speed range separately
LXT-1DRspeed-0.1-100:	13300122	option: vRangeDR 0.1 to 100 km/h
LXT-1DRspeed-0.2-300:	13300123	option: vRangeDR 0.2 to 300 km/h
LXT-1DRspeed-0.3-400:	13300124	option: vRangeDR 0.3 to 400 km/h
LXT-1DRspeed-0.4-500:	13300125	option: vRangeDR 0.4 to 500 km/h

Firmware options

D080	13300074	signal output rate: 800 Hz
GPS	13300073	GPS input for LUXACT certified RS485 GPS sensors all GPS data (including time) are included in CAN data
EXT	13300072	TTL input for additional sensors, consumption measurement devices, Odometer, speed sensor
RS485	13300000	RS485 data output additional to CAN and TTL data output identical to CAN output (w/o RS485 cable)

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
side mounting with flexible MF3C (magnetic)		side mounting with flexible SF3C suction cup
		
3SC-Kit2	133000XX	set of suction cups as replacement
TFX3	13300119	Universal towing lug mounting (magnetic holder into suction cup)
TWB-C	13300092	Universal mounting on a tow-bar with Ø 50 mm ball with height adjustment
MPL-1DR	13300116	Mounting plate for the LUXACT 1D Rail sensor and for LUXACT 1D Compact, see drawings
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 other options
LXT	-	1DR	-	600	-	300	-	250	/	LC10	/	LT10		
LXT	-		-		-		-		/	LC..	/	LT		

Dimensional drawing

