The Eaton GFX machine dynamics sensor. Intelligence in motion.

Global positioning (GPS), speed detection and 3-axis inertial measurement (IMU), NMEA 2000 (CANBus) and NMEA 0183 (RS232)

As off-highway machinery becomes smarter and more dynamic, the need to track vehicle performance and equipment usage is only growing. The Eaton GFX sensor provides the data required to monitor and control intelligent machine functions such as geopositioning and vehicle dynamic sensing. It also enables users to optimize operations such as seeding, harvesting and earthmoving.

The GFX machine dynamics sensor is a GPS position sensor, ground speed sensor and inertial measurement unit (IMU) in one compact device. With the ability to monitor machine speed, acceleration, direction, location, tilt, pitch and roll, the GFX device can help keep operators and their machinery safe and productive. The compact, three-in-one device saves space and reduces costs compared to single-function sensors, while the IP67 rating and wide operating temperature range ensure it can perform in rugged, off-highway environments. Through CANBus or serial output messaging, the GFX device delivers the data you need to enable intelligent machine functions.

Key features:

- IMU provides 3-axis: Linear acceleration, angular rate and magnetic field
- NMEA 2000 (CAN) and NMEA 0183 (RS232) output messaging
- Easy to install and use
- Wide operating temperature range (-40°C to 85°C)
- Compact and rugged package allows for flexible vehicle mounting
- Dustproof and waterproof design, suitable for open-cab environments
- Low current consumption (up to 120mA)

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Technical data

Technical data		
Size	125mm x 43mm x H 22.25mm	(Length x width x height)
Weight	160 gram	
Mounting torque	1.8Nm ± 0.2Nm	
Mounting size	5.35mm hole	2 locations
Color	RAL 9005 Jet black	Potted assembly

Operating voltage & input current		
Operating voltage	5VDC to 36VDC	Vehicle battery operated
Nominal voltage	12VDC and 24VDC	
Input current	Up to 120mA	at full operating voltage range

Digital speed output		
Signal format	PWM	Duty cycle: 77%
PWM frequency	36Hz to 1.85KHz for 1kph to 50kph speed	Linearly varying
Signal amplitude	Equal to supply input	
Accuracy	±5%	
Source impedance	100Ω ± 10Ω	
Load impedance	>3kΩ	

Note: 1. Digital speed output is disabled at speed less then 1Kph.

2. When digital speed output is disabled, output will be equal to supply input (100% duty cycle).

Caution: Pay attention to Digital Output Pin Wiring. This pin should not be short circuit with ground terminal.

GPS specification		
GPS L1 frequency	1575.42 MHz	
Accuracy	4.77m CEP	Circular error probability (radius of a circle centred on the true value)
Acquisition time	Hot start 4 Sec Warm start 38 Sec Cold start 60 Sec	
Sensitivity	Tracking -160dBm Acquisition -145dBm	
GPS data update rate	5Hz	
SBAS (WAAS, EGNOS) Capable		

Technical data

Electrical specifications		
Short circuit protection	Yes	Short condition: output to battery & input to GND CANH & CANL pins: Up to 36V TX & RX pins: Up to 32V
Reverse polarity	Yes	Up to -36V
Hot plug	Yes	Live connection and disconnection to power supply

Connector		
Supply and I/O connector	Deutsch DTM04-08PA	Male type (8 pin)
Mating connector	Deutsch DTM06-08SA	Female type (8 pin)
GPS antenna connector	SMA Female Board/ bulkhead mount connector	Female type

Environmental specifications		
Operating temperature	-40°C to +85°C	
Storage temperature	-40°C to +85°C	
Humidity	90% RH	
Altitude	40000 ft	Air shipment, device off state
Mechanical shock	50Grms, 11mSec 30Grms, 18mSec	6 pulses at each axis, Total: 36 pulses 10 pulses at each axis, Total: 60 pulses
Ingress protection	IP67	ISO 20653 Road vehicles - Degrees of protection (IP code) Protection of electrical equipment against foreign objects, water and access
Salt spray	96 hrs. in salt fog atmosphere	
Chemical resistance	Cab mounting	Alcohol, detergents, diesel fuel, waxes, spray paint, hydraulic fluid, etc.
Free fall	<1m	
Vibration **Sine sweep** **Random vibration**	10Hz to 2000Hz, 3.5Grms 10Hz to 2000Hz, 2.18Grms	

Communication protocols		
CAN	SAE J1939	Baud rate 250Kbps
Serial	RS232	Default: 115200 bps Configurable baud rate 9600/19200/38400/57600/115200 bps

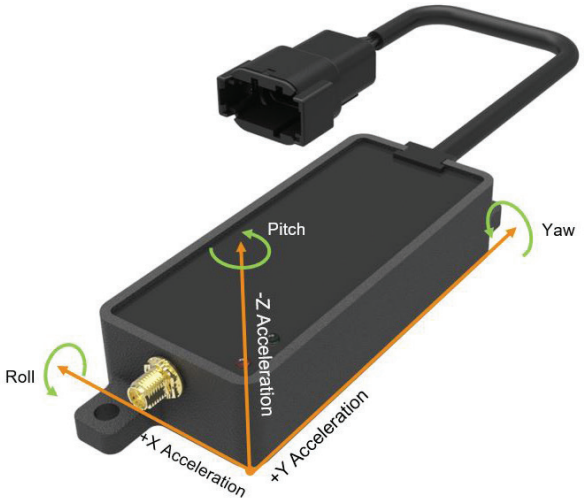
LED indication		
Power ON / OFF	Green	Continuous ON when powered up
Diagnostic / health monitoring	Red	Continuous ON when faults persist • Over voltage (>36V) & under voltage (<5V) • GPS antenna open & short • Over temperature fault (95°C) • GPS and IMU fault

Technical data

European Commission Directives			
Electromagnetic Compatibility (EMC) Directive 2014/30/EU EN ISO 14982:2009 Agriculture and Forestry machinery			
	Conducted Electrical Transient Pulses	ISO7637:2004	Level: IV for 12V & 24V (all pulses)
	Radiated Emission	CISPR 25:2016	30MHz to 1000MHz
	Bulk Current Injection	ISO11452-4:2011	Functional Class A 20MHZ-200MHZ, 60mA
	Radiated Immunity	ISO11452-2:2004	Functional Class A 200MHZ to 1GHZ, 30V/m
	ESD	ISO 10605:2008	Functional Class A - Contact & Air discharge (Powered and Unpowered) Direct discharge (3 pulses with > 1s interval) Contact: ±4kV Air: ±4kV Indirect Discharge: (50 pulses with > 50ms interval) ±4kV
Radio Equipment Directive (RED) 2014/53/EU ETSI EN 301 489-19 V2.1.0:2017 EMC for Radio Equipment and Services			
	Conducted Electrical Transient Pulses	ISO7637:2004	Level: IV for 12V & 24V (all pulses)
	Conducted Immunity	IEC 61000 4-6:2013	Functional Class A 150KHZ- 80MHZ, 3Vrms
	Conducted Emission	Reference Clause 8.3 CISPR 32:2015 / EN 55032:2015	Quasi-peak: Product Class A 0.15-0.5MHZ: 79dB(uV) 0.5-30MHZ: 73dB(uV) Average: Product Class A 0.15-0.5MHZ: 66dB(uV) 0.5-30MHZ: 60dB(uV)
	Radiated Immunity	IEC 61000 4-3:2006	80MHZ to 6GHZ, 3V/m, Class A
	Radiated Emission	EN 55032	30MHz to 6GHz
ETSI EN 303 413 V1.1.1 (2017-06) Harmonised EU standard for GNSS essential requirement			
	Spurious Emission	Reference: Clause No 4.2.2	30MHz-8.3GHz (Radiated & Conducted Method)
	Adjacent Frequency Band	Reference: Clause No 4.2.1	Δ C/N0 ≤ 1 dB Conducted Method
Low Voltage (LVD) Directive 2014/35/EU2014/53/EU			
IEC 62368-1:2014	Safety: Audio/video, information and communication technology equipment - Part 1: Safety requirements (Hazard Based Safety Standard)		
EN 62479:2010	Health: Assessment of the compliance of low-power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)		
RoHS 2 Directive 2011/65/EU			
	Restriction of the Use of Certain Hazardous Substances in Electronic and Electrical Equipment		

Other Directives		
FCC SDoC (Suppliers Declaration of Conformity)	FCC part 15B	Part 15-Low Power Unlicensed Devices Radiated Emissions Section 15.109 (30MHz to 1GHz)

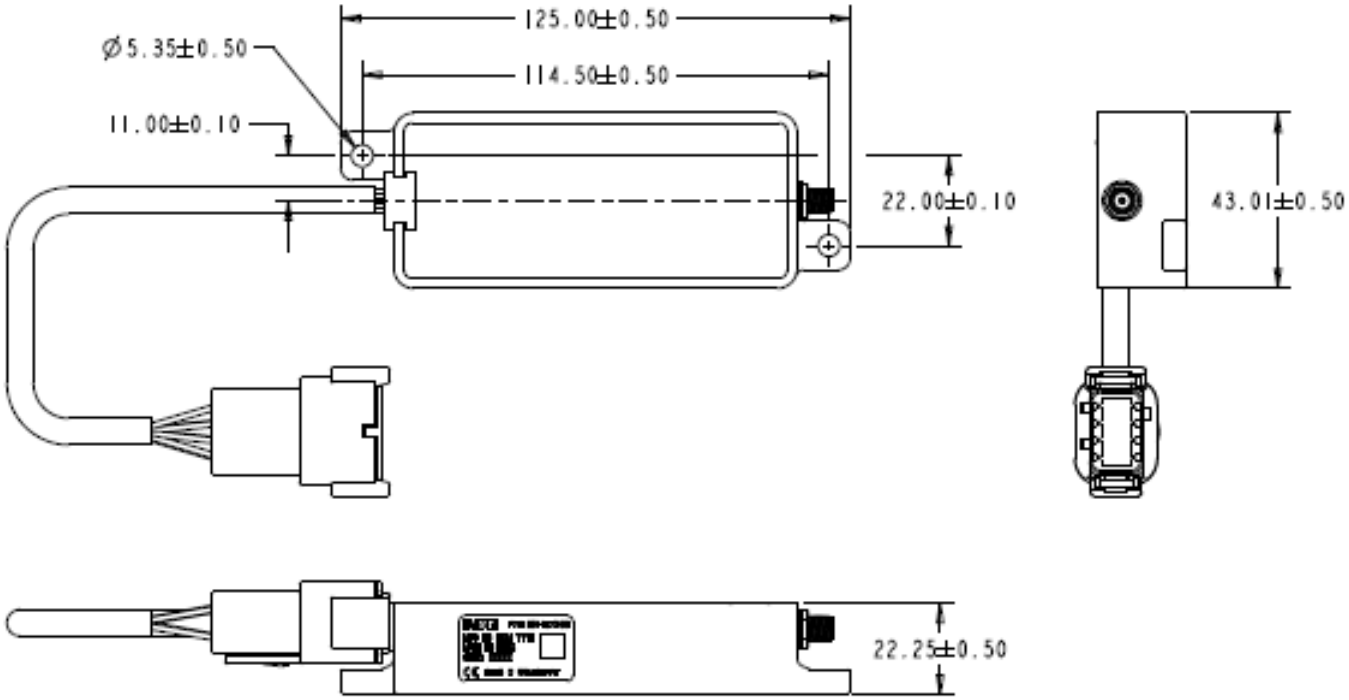
Mounting diagram



Pin out details

Pin No.	Pin name
1	Supply Input
2	CAN High
3	RS232 RX
4	Digital Out - Speed signal
5	Not used
6	RS232 TX
7	CAN Low
8	Ground

Note: Use supply ground for RS232 GND.



ALL DIMENSIONS ARE IN MM

NMEA 2000 Messages

PGN	Description
126992	UTC time and date
129025	Latitude and longitude
129033	Time, date and local offset
129026	Course Over Ground (COG) and Speed Over Ground (SOG)
127250	Headling and Variation
127258	Age of Service and Variation
129539	GNSS State and Dilution of Precision Components (DOP)
129029	GNSS Parameters, Position and Altitude

NMEA 0183 Messages

Message	Description
GGA	GPS Fix Data
ZDA	UTC, day, month and year
GSA	GPS DDP and active satellites
VTG	Track Made Good and Speed Over Ground (SOG)
RMC	Position, velocity and time

ISOBUS Ground Speed

Message

PGN	Description
65097	Speed Over Ground

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Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

Eaton
EMEA Headquarters
Route de la Longeraie 7
1110 Morges, Switzerland
Eaton.eu

Eaton
Asia Pacific Headquarters
No.3, Lane 280, Linhong Road
Shanghai 200335, P.R. China
Eaton.com.cn

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