

# SMX.igs-e

## 动态倾角陀螺仪传感器

### 主要特点

- 惯性测量单元 (IMU)
- 测量3个轴的加速度
- 测量3轴的角速度
- 测量一个轴或两个轴的倾角
- 紧凑而坚固的设计，可在恶劣工况下使用
- 内部可调数字信号滤波器，如卡尔曼滤波器
- 集成到STW的openSYDE软件平台中
- 具有ECE认证

### 技术参数

- 加速度测量范围 $\pm 2\text{ g}$
- 陀螺仪测量范围 $\pm 1000^\circ/\text{s}$
- 可配置的倾角测量范围为 $\pm 90^\circ$ 或 $360^\circ$
- 温度范围  $-40^\circ\text{C}$  至  $+85^\circ\text{C}$
- 可配置的接口CAN、CANopen或SAE J1939
- 状态指示灯
- 防护等级IP6K5/IPX7/IPX9K



## 技术参数

### 传感器

参数	SMX.igs-e
加速度	±2 g
加速度分辨率	1 µg
陀螺仪测量范围	±1000°/s
陀螺仪分辨率	0.001°/s
角度测量范围(可配置)	±90° or 360°
角度分辨率	0.01°
角度精度	静态 ±0.3° 动态 ±0.5°
温度系数	0.01°/K
滤波方式可选(可配置)	Butterworth filter 8 <sup>th</sup> order Critical damped filter 8 <sup>th</sup> order Kalman filter

### CAN 通信端口

特征	描述
输出信号	CAN, bit rate 100 ... 1000 kBit/s
通信端口(可配置)	CAN, CANopen 或 SAE J1939
电气保护	防短路保护 (signal on GND/VCC)
双色 LED	绿 / 红

### 电源

特征	描述
电源电压 (电源引脚 VCC)	8 ... 36 V DC 电源线反极性保护
电流功耗	50 mA @12 V DC

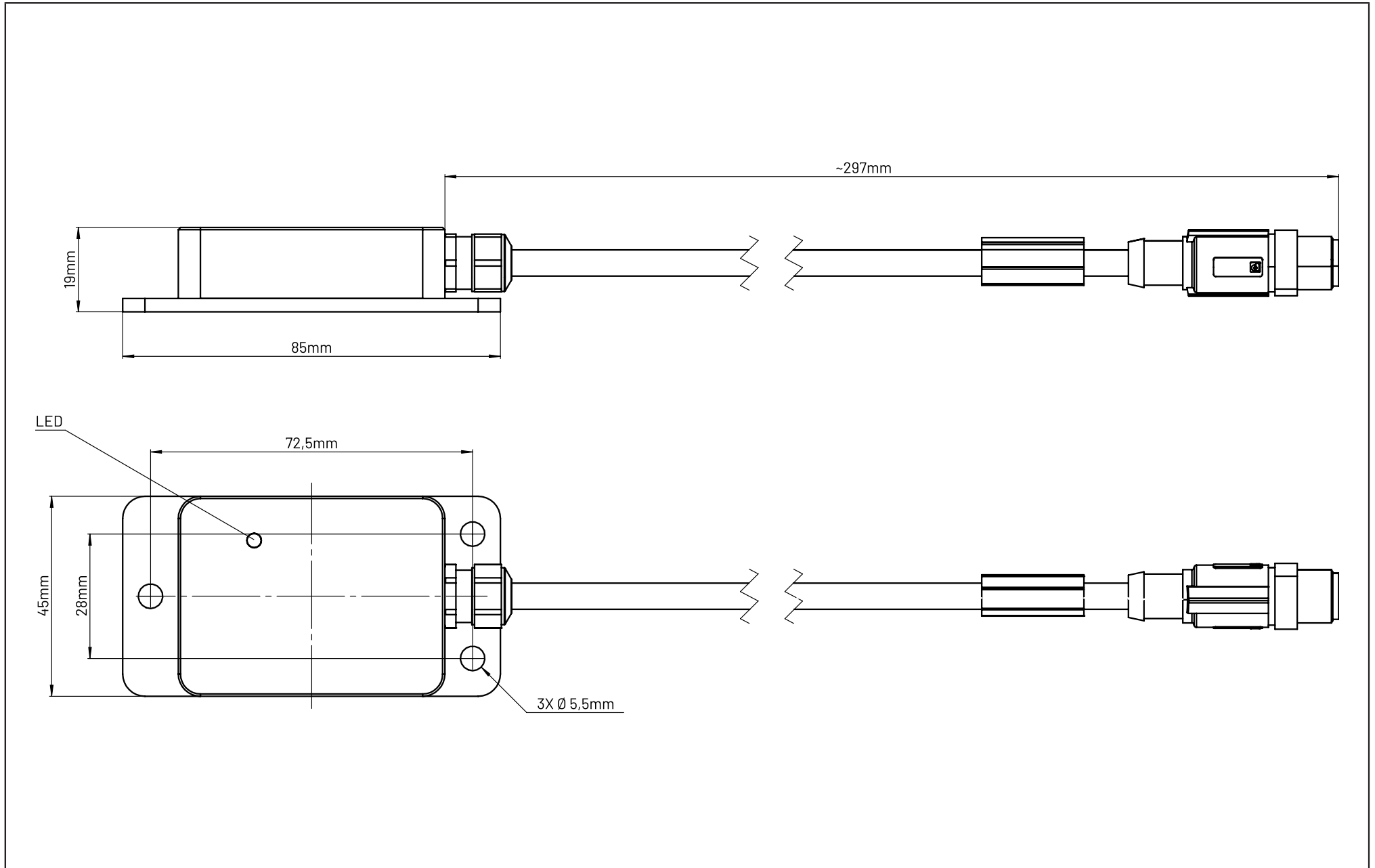
### 外观

特征	描述
外壳材料	铸造铝合金
防护等级	IP6K5/IPX7/IPX9K
电气连接	5针M12 连接线, A 型
尺寸 (L x W x H)	85 x 45 x 19 mm
原配线缆长度	300 mm
重量	约 130 g
运行温度	-40 °C ... +85 °C / -40 °F ... +185 °F
储存温度	-40 °C ... +85 °C / -40 °F ... +185 °F

### 安全型

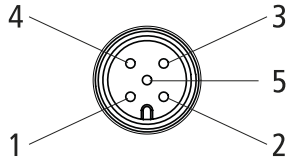
标准	描述
SN 29500	MTTF = 381.25 年

# 技术图纸



## 针脚分配

引脚分配 5 针 M12 连接器：



针脚	名称	描述
1	CAN_SHLD	屏蔽层
2	VCC	供电电源, 8 ... 36 V DC
3	GND	接地
4	CAN_H	CAN 高
5	CAN_L	CAN 低

## 技术认证

符合标准

标准	描述	参数
ISO/IEC 17050-1	Conformity	请参阅标准声明
KBA (Kraftfahrt-Bundesamt)	Certification	根据 UN ECE 法规 No. 10 No. 10R06/01 9376 00

## 认证明细

### 电磁兼容性和电气测试-EMC(CE标准)

标准	测试内容	测试参数
DIN EN 61326-1:2013-07 DIN EN 55016-2-1:2014 + A1:2017	Emissions - Electrical equipment for measurement, control and laboratory use	150 kHz to 30 MHz conducted emission
DIN EN 61326-1:2013-07 DIN EN 55016-2-3:2017	Emissions - Electrical equipment for measurement, control and laboratory use	30 MHz to 1000 MHz radiated emission, 10 m
DIN EN 61326-1:2013-07 DIN EN 61000-4-2:2009	Immunity - Electrical equipment for measurement, control and laboratory use - Electrostatic discharge immunity test	330 $\Omega$ / 150 pF Contact discharge $\pm 4$ kV Air discharge $\pm 2, \pm 4,$ $\pm 8$ kV
DIN EN 61326-1:2013-07 DIN EN 61000-4-3:2006 + A1:2008 + A2:2010	Immunity - Electrical equipment for measurement, control and laboratory use - Radiated, radio-frequency, electromagnetic field immunity test	80 MHz to 1.0 GHz $\rightarrow$ 10 V/m 1.0 GHz to 6.0 GHz $\rightarrow$ 3 V/m 3 m, horizontal and vertical AM 80 %, 1 kHz
DIN EN 61326-1:2013-07 DIN EN 61000-4-4:2012	Immunity - Electrical equipment for measurement, control and laboratory use - Electrical fast transient / burst immunity test	Supply lines $\pm 2$ kV data lines $\pm 1$ kV waveform: 5/50 ns tr/ th repetition frequency 100 kHz
DIN EN 61326-1:2013-07 DIN EN 61000-4-5:2014 + A1:2017	Immunity - Electrical equipment for measurement, control and laboratory use - Surge immunity test	Supply lines (symmetrical) $\pm 0.5,$ $\pm 1$ kV Supply lines (asymmetrical) $\pm 0.5,$ $\pm 1, \pm 2$ kV

### 电磁兼容性和电气测试-EMC(CE标准)

标准	测试内容	测试参数
DIN EN 61326-1:2013-07 DIN EN 61000-4-6: 2014	Immunity - Electrical equipment for measurement, control and laboratory use - Immunity to conducted disturbances, induced by radio-frequency fields	150 kHz to 80 MHz, 3 V 80 % AM, sine at 1 kHz 150 $\Omega$ source impedance

## 认证明细

### 电磁兼容性和电气测试-EMC (E1)

标准	测试内容	测试参数
UN ECE R10 DIN EN 55025:2003-11, IEC/ CISPR 25:2002	Emissions - Radiated emissions from components - ALSE method	30 MHz to 1 GHz
UN ECE R10 ISO 11452-2:2004, ISO 11452-5:2002-04	Immunity - For components to electromagnetic Energy	ALSE - 1 GHz - 2 GHz, 30 V/m Stripline - 20 MHz - 1 GHz, 60 V/m
ISO 7637-2:2004	Emissions - Voltage transient emissions	12 V: +75/-100 V
ISO 7637-2:2004	Emissions - Voltage transient emissions	24 V: +150/-450 V
UN ECE R10 ISO 7637-2:2004-09	Immunity - Electrical transient conduction along supply lines only (12V and 24V System) - Level 3	Pulse 1 (24 V) -450 V, 5000 pulses Pulse 2a (24 V) +37 V, 5000 pulses Pulse 2a (12 V) +37 V, 5000 pulses Pulse 2b (24 V), +20 V, 10 pulses Pulse 2b (12 V), +10 V, 10 pulses Pulse 3a (24 V), -150 V, 1 h Pulse 3b (24 V), +150 V, 1 h Pulse 4 (24 V), -12 V, 1 pulse Pulse 4 (12 V), -6 V, 1 pulse

### 电磁兼容性和电气测试-EMC (E1)

标准	测试内容	测试参数
ISO 16750-2:2012-11	Immunity - Environmental conditions and testing for electrical and electronic equipment — Part 2: Electrical loads (12V System)	Load Dump - Test B 35 V, 400 ms, 2 $\Omega$ , 10 pulses
ISO 7637-3:2016-07	Immunity - Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines (24V System) - Level 4	CCC Pulse 3a: -150 V, 10 min. Pulse 3b: +150 V, 10 min. ICC Pulse Slow-: -150 V, 10 min. Pulse Slow+: +150 V, 10 min.
ISO 10605:2008-07	Immunity - ESD component test method -Powered-up test	330 $\Omega$ /330 pF, 330 $\Omega$ /150 pF, 2 k $\Omega$ /330 pF, 2 k $\Omega$ /150 pF Contact discharge: $\pm 2$ , $\pm 4$ , $\pm 6$ , $\pm 8$ kV Air discharge: $\pm 2$ , $\pm 4$ , $\pm 8$ , $\pm 15$ kV Indirect contact discharge: $\pm 2$ , $\pm 4$ , $\pm 8$ kV
ISO 10605:2008-07	Immunity - ESD component test method - Packaging and Handling test (unpowered test)	330 $\Omega$ /150 pF Contact discharge on pins and contacts: $\pm 2$ , $\pm 4$ kV Air discharge on surfaces: $\pm 2$ , $\pm 4$ , $\pm 8$ kV

# 认证明细

## FCC 47 CFR Part15

标准	测试内容	测试参数
FCC Part15 class B: 2017 ANSI C63.4: 2014	Emissions - Conducted emission from power port	Frequency: 150 kHz - 30 MHz
FCC Part15 class B: 2017 ANSI C63.4: 2014	Emissions - Radiated emission	Frequency: 30 MHz - 1 GHz, 10 m

## 环境测试

标准	测试内容	测试参数
ISO 16750-4:2010-04	Tests at constant temperature: Low temperature - storage	-40 °C for 24 h
ISO 16750-4:2010-04	Tests at constant temperature: High temperature - storage	+85 °C for 48 h
ISO 16750-4:2010-04	Tests at constant temperature: Low temperature - operation	-40 °C for 24 h
ISO 16750-4:2010-04	Tests at constant temperature: High temperature - operation	+85 °C for 96 h
CLAAS - CN 05 0215-1:2017-01-01	Tests at constant temperature: High temperature - operation	+85 °C for 240 h
ISO 16750-4:2010-04	Temperature step test	+20 °C to Tmin to Tmax, 5 °C steps Duration: 16 h (-40 °C to +85 °C) Perform functional tests when DUT has reached the new temperature
ISO 16750-4:2010-04 IEC 60068-2-14	Temperature cycling test - Rapid change of Temperature	Test Na 100 cycles, -40 °C to +85 °C Transfer time < 5 s Dwell time: 60 min. Duration: 8 days 8 h
ISO 16750-4:2010-04 DIN EN 60068-2-14	Temperature cycling test - specified change rate of Temperature	Test Nb 30 cycles, -40 °C to +85 °C Duration 240 h

# 认证明细

## 环境测试

标准	测试内容	测试参数
ISO 16750-4:2010-04	Ice water shock test - Splash water test	Test Fluid: de-ionized water Chamber Temperature: +85 °C Water Temperature: 0 to +4 °C Water Flow: (3 to 4 l)/3 sec (splash duration) Cycle Duration: 66 min Number of cycles: 100 Total Duration 110 h In operation during splash
ISO 16750-4:2010-04 and CLAAS - CN 05 0215-1:2017-01-01 IEC 60068-2-11	Salt spray test - Leakage and function	Test Ka 8 h salt spray and 16 h without spray minimum 6 cycles á 24 h In operation between fourth and fifth hour of each cycle
ISO 16750-4:2010-04 DIN EN 60068-2-52: 2018-08	Salt spray test - Corrosion test	Severity 4 Duration: 14 days

## 环境测试

标准	测试内容	测试参数
ISO 16750-4:2010 IEC 60068-2-38	Humid heat - Test 2: Composite temperature / humidity cyclic test	Test Z/AD 10 cycles, upper temperature +65 °C 93% relative humidity, 5 cycles with frost phase (-10 °C) Duration: 11 days In operation when the maximum cycle temperature is reached
ISO 16750-4: 2010-04 IEC 60068-2-30: 2005	Humid heat - Test 3: Dewing test	Test Db Lower temperature: +25 °C Upper temperature: +80 °C 5 cycles and 98% relative humidity In operation
ISO 16750-4: 2010-04 DIN EN 60068-2-78:2014-02	Damp heat, steady-state test	Severity: (40 ±2) °C and (85 ±3) % relative humidity Not in operation for 20 days 23 h In operation for the last hour Duration: 21 days



## 认证明细

### 环境测试

标准	测试内容	测试参数
ISO 16750-1:2018-11	Life-time Temperature cycling test - Rapid change of Temperature (Weibull)	Annex B Test duration: 10 days Min. temperature: -40 °C Max. temperature: +85 °C Holding time: 45 min. Cycles: 166 Not in operation
ISO 16750-3:2012-12 Test VII IEC 60068-2-64:2008, Test Fh IEC 60068-2-14:2009, Test Nb	Vibration (random and broadband) with temperature superimposition	10 - 2000 hz, 32 h/axis, 3 axes, random and broadband vibration Temperature superimposition: -40 °C to +85 °C, 4 cycles per axis
ISO 16750-3:2012-12 DIN EN 60068-2-27	Mechanical shock	Acceleration: 50 g, half sine Time: 6 ms 10 Shocks/direction, 6 directions
ISO 16750-3: 2012 IEC 60068-2-31:2008	Free fall	3 devices, 2 falls every device on the opposite side of the housing drop height: 1 m to concrete ground or steel plate

### 环境测试

标准	测试内容	测试参数
ISO 16750-5:2010	Chemical resistance	Code D: Mounting on the exterior Agents: Urea and windscreen washer fluid After test: drying at +85 °C, 22 h and 2 h respectively Agents: Cavity protection, protective lacquer, protective lacquer remover, cold cleaning agent and ammonium containing cleaner After test: drying at +25 °C, 22 h Agents: car wash chemicals, glass cleaner, wheel cleaner, denatured alcohol and runway de-icer After test: drying at +25 °C, 2 h Application method: Protective lacquer and glass cleaner - spraying All other agents - brushing
ISO 16750-4:2010 ISO 20653:2013	IP Protection grade	IP6K5 / IPX7 / IPX9K