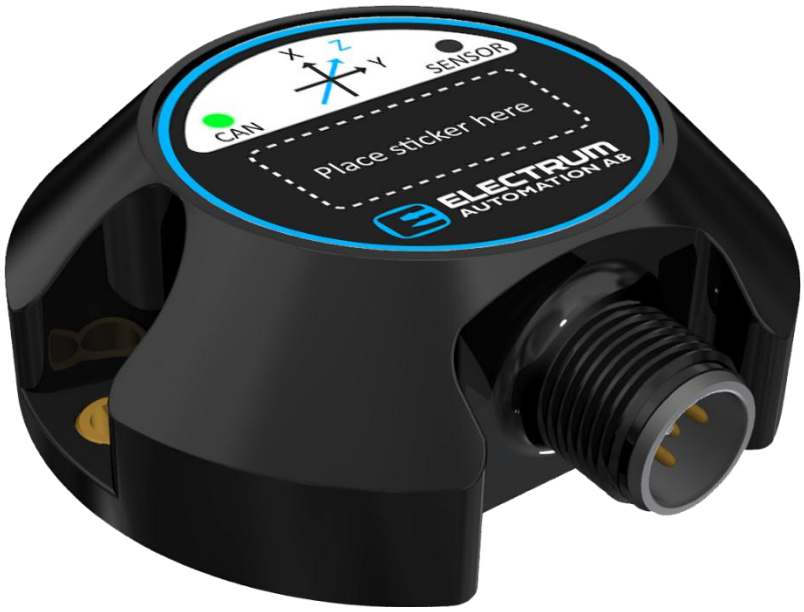
AOS
FULL MANUAL

Introduction

The **A**bsolute **O**rientation **S**ensor distinguishes itself from the general tilt-sensor products on the market today, by delivering a precise angle, even when stressed with vibration, acceleration, shocks and temperature variations. The AOS module delivers angle, acceleration and gyro in the X, Y and Z axis.



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AOS Overview

Technical data

- Input voltage range 6 - 32Vdc power supply
- Designed for use in vehicles and mobile machinery

Mechanical data

- Operating ambient temperature -40° to +85°C
- Dimensions: D:60xH:22mm Fastening pattern CC 50mm.
- IP67 protection rating

Communication

- Supports CAN 2.0A and 2.0B with bus speed up to 1Mbit/s
- Electrum is a member of *CAN in Automation* and supports the CANopen protocol
- Default CANopen node id: 2
- Default CANopen baud rate: 250kbit/s

Modes of operation

- Fusion mode, combines different sensors to provide a more reliable output. Update rate 100Hz. Gravity vector is removed from acceleration output.

Suitable applications

- Cost sensitive applications.
- Dynamic applications, such as capturing the angle of a fast moving object with fast response and good accuracy.
- Capturing the angle of an object in rough conditions where vibrations and acceleration are commonly present.
- Measure acceleration forces of an object to determine how it is being used by the customer.

Less suitable applications

- Safety critical applications.
- Applications which demand extreme angle accuracy for static and dynamic conditions.
- The axis perpendicular to earth's surface (heading) uses the earth magnetic field as a reference for the angle output. Depending on the magnetic environment, it can take some time before the sensor gets a good bearing after power on. If the sensor can't sense the earth magnetic field at power on, the heading will shift to a different position once it has found the actual earth magnetic field. The sensor may also drift if it is shielded from the earth magnetic field for an extended period.
- Capture of angle perpendicular to high acceleration vector for fast moving objects.

Table of content

1 Electrical characteristics

Parameter	Condition	Min.	Typ.	Max.	Units
Operational voltage		6		32	V_{DC}
Power consumption	32V > V_{IN} > 6V	0.3	0.5	0.7	W
Operating temperature		-40		85	°C

2 Sensor characteristics

Parameter	Condition	Min.	Typ.	Max.	Units
Accelerometer range	Sensor fusion mode	-8		8	g
Gyro range		-2000		2000	°/s
Angle accuracy	Static		±2		°
	Dynamic		±3.5		°
Linear acceleration	Dynamic		±0.35		m/s^2
Gyroscope	Dynamic		±3.1		°/s
Sensor update rate				100	Hz

3 Vibration tolerance

Parameter	Condition			Level	Units
Sinusoidal sweep (1)	5-500Hz			3	g
	500-2000Hz			0.5	g
Random vibration (1)	10-1000Hz	10 Hz: 50 Hz: 1000 Hz:	0.10398 g2/Hz 0.10398 g2/Hz 0.00104 g2/Hz	3.45	g RMS
Non-repetitive shock (2)	11ms Half-sine			40	g

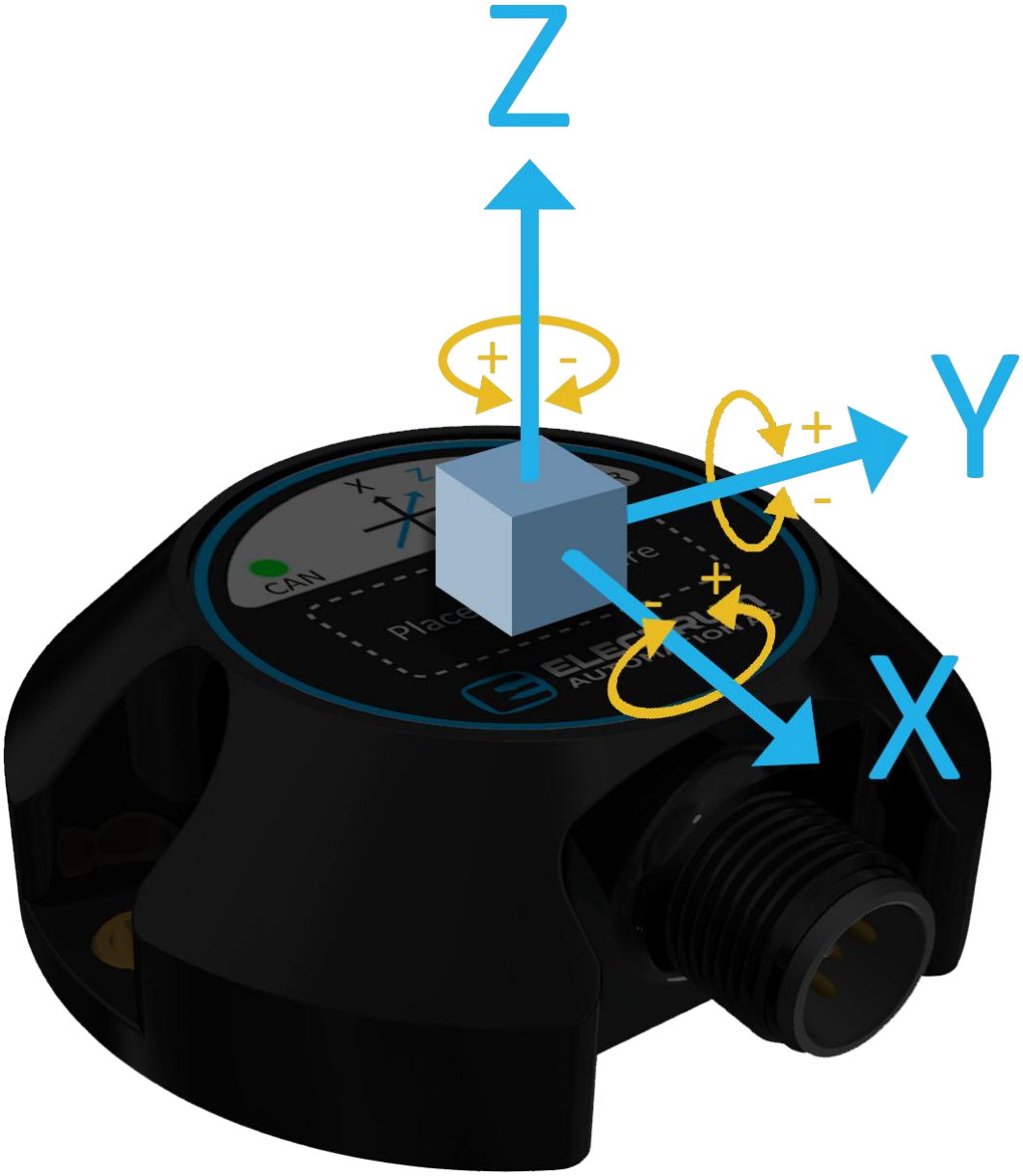
Note: 1. Sensor output is within specification.
2. Output may be out of specification. Sensor will return to normal after shock. Typical recovery time for shock is 300 ms.

4 Absolute maximum ratings

Parameter	Condition	Min.	Typ.	Max.	Units
Input voltage(1)		-150		150	V_{DC}
Input voltage CAN_L & CAN_H (1)		-36		36V	V_{DC}
Storage temperature(1)		-55		125	°C

Note: 1. Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

5 Axis orientation

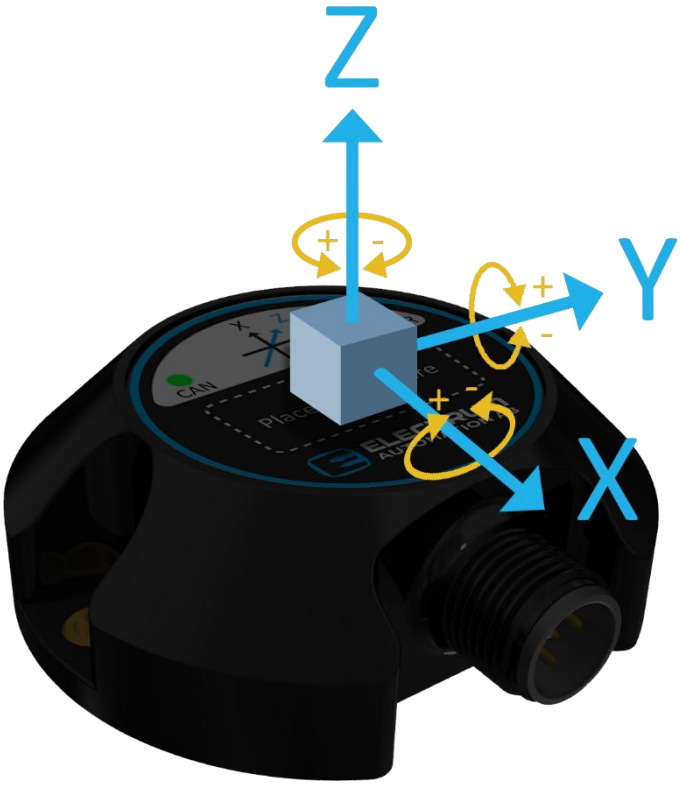


When the AOS is placed on a horizontally aligned flat surface (on a table), the X and Y angles are 0°.

5.1 Legacy output mapping

The picture below shows the axis mapping used in AOS firmware version 2.0.2 and earlier.

The gyro rotation direction for the X-axis is reversed. When the AOS is placed on a horizontally aligned flat surface (on a table), the X and Y angles are in the middle of the range, i.e. at 180°.

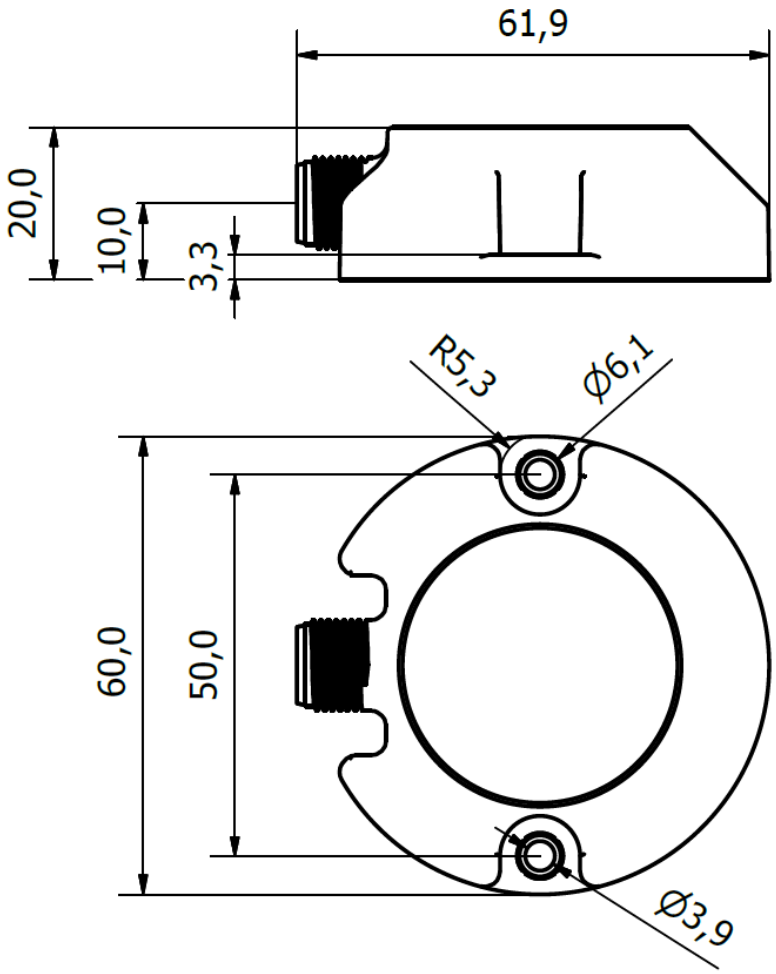


This legacy output mapping can be enabled or disabled using index 0x3730.

In product 254971 the legacy mode is enabled by default. In other products the legacy mode is disabled by default.

6 Mechanical properties

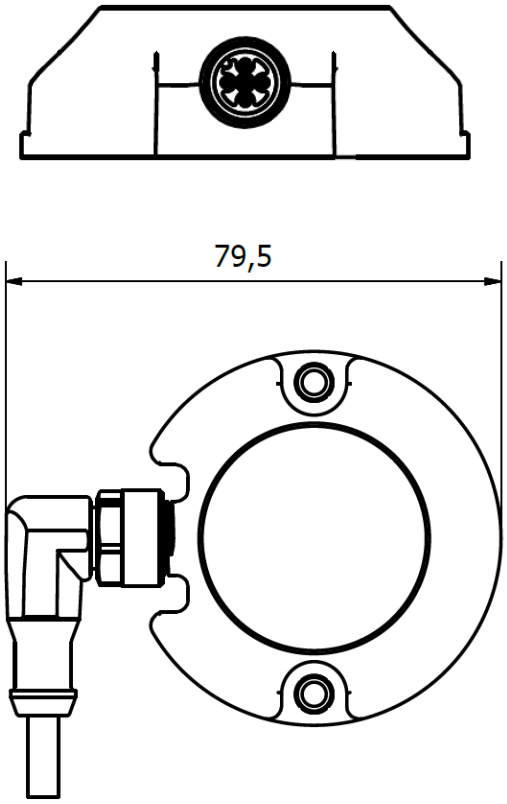
The AOS is to be mounted on a flat surface. The mounting holes are fitted with a brass bushing to ensure a secure attachment over time. Use the supplied screws (Torx M4x12) and washer for best mounting properties.


61,9
20,0
10,0
3,3
R5,3
Ø6,1
60,0
50,0
Ø3,9

6.1 Orientation of M12 connector

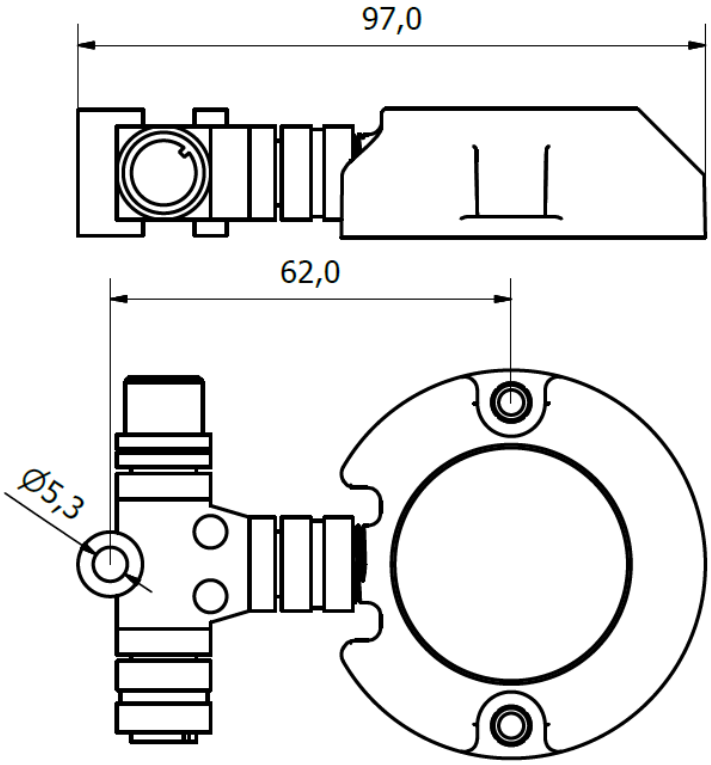
The connector is orientated so that a standard angled cable connects as the picture describes.

MALE CAN in



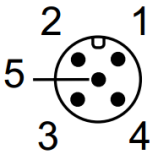
6.2 M12 connector feed thru

With a M12 T-junction accessory, the AOS becomes CANopen feedthrough compatible.



7 Connector configuration

The AOS is equipped with a CANopen compatible pin out, using a M12-5pin male connector for communication and power supply.



Standard	
5p M12 A-code Male connector	
1	Not connected
2	6V-32V_{dc}
3	GND
4	CAN_H
5	CAN_L

8 Indicator LEDs

The AOS module is equipped with two LEDs. A green LED that is constantly on as long as the sensor delivers data. A red LED that blinks on CAN errors.

Both LEDs flashes once at power-on.

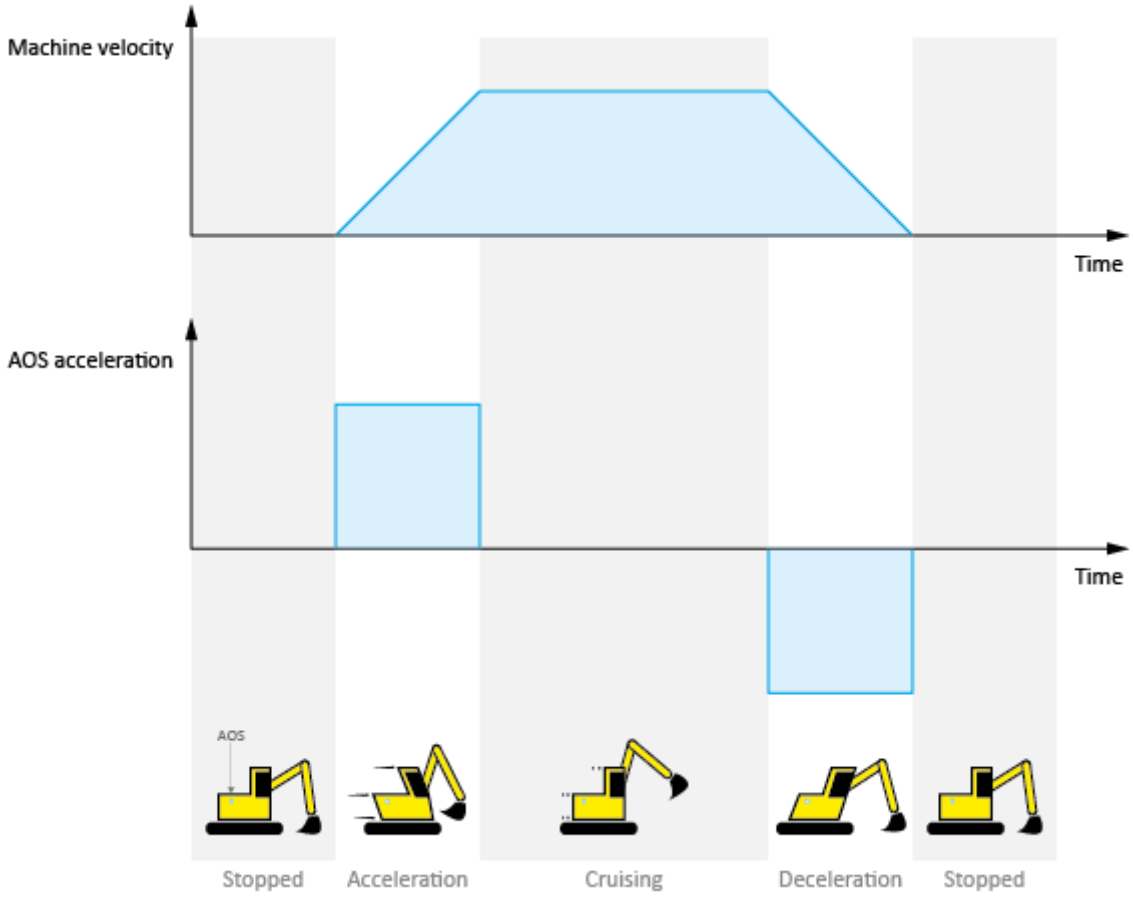
LED color		Sensor update LED
	Green	Green LED is on as long as the sensor delivers data
	Off	Possible causes: 1. Power supply not connected 2. No sensor data available

LED color		Error LED
	Off	No CAN errors
	Red	Possible causes: 1. Termination error. 2. Bus overrun. 3. Incorrect baud rate. 4. No ACK received on transmitted messages. (AOS alone on the CAN bus?).

9 Sensor theory

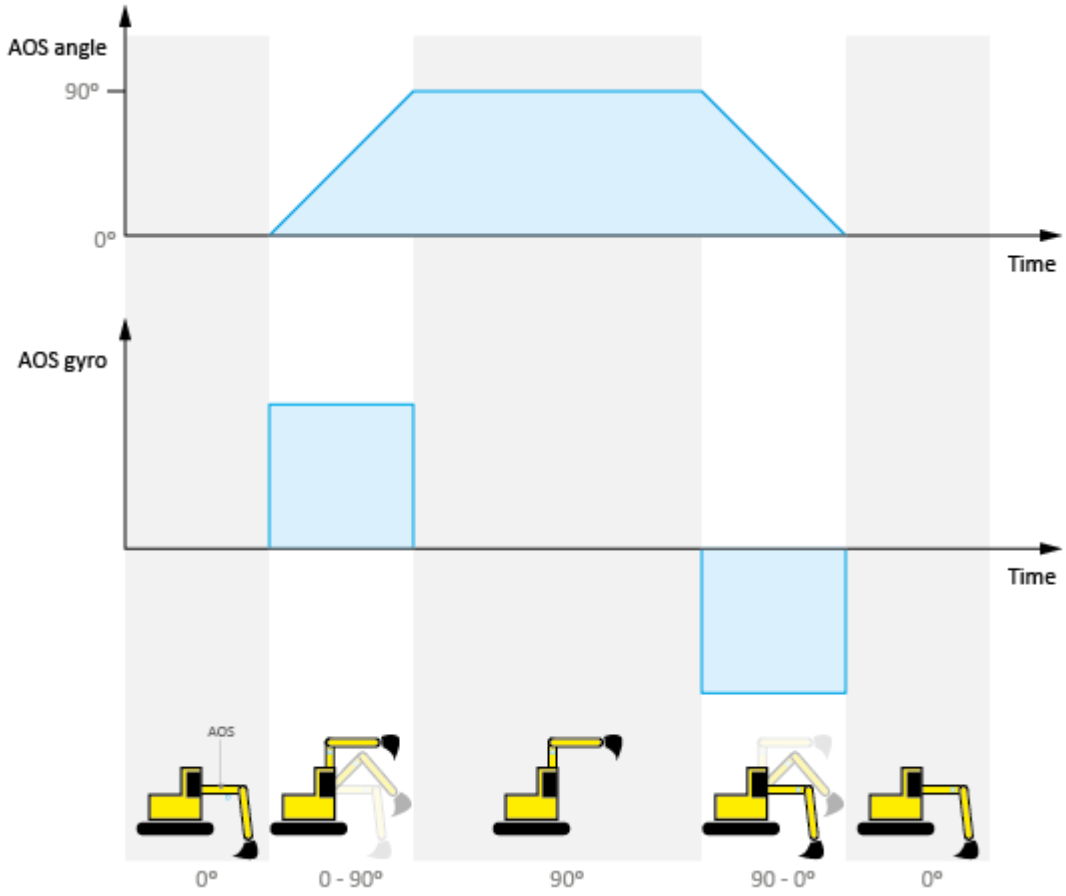
9.1 Accelerometer

In fusion mode the accelerometer measures linear acceleration. Acceleration is measured as a change in velocity. In the example below the excavator begins at a standstill. The AOS reads 0g acceleration. As the excavator starts accelerating towards cruising speed the AOS sensor outputs a value proportional to the rate of change in velocity. At cruising speed, the AOS accelerometer outputs 0g again. When the excavator breaks and decelerates to a standstill, the AOS accelerometer senses an acceleration in the opposite direction.



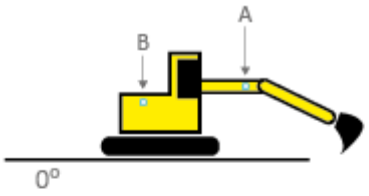
9.2 Gyroscope

The gyroscope measures rotation speed. The unit is degrees per second. In the example below, the gyro senses the change in angle and outputs a value proportional to the rate of change.

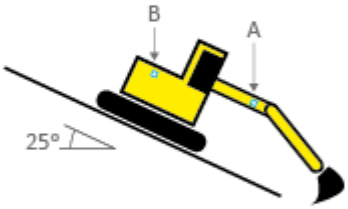


9.3 Absolute orientation

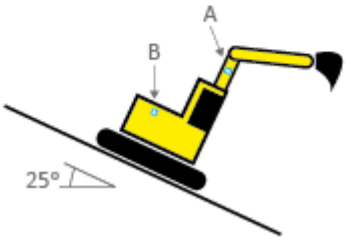
In fusion mode, the sensor angle output is absolute with respect to earth. An additional AOS can be used to relate the output to another arbitrary frame of reference. In the example below, sensor B is used as a reference.



A = 0°
A-B = 0°



A = 25°
A-B = 0°



A = 65°
A-B = 90°

10 Sensor operating mode

The default fusion operating mode combines all the internal sensors to provide a more reliable output. It has a fixed update frequency of 100Hz.

10.1 Fusion mode

10.1.1 Angle output

Angle data is mapped with index 0x6404, sub-index 1-3. By default, this is transmitted in PDO1. All angles X, Y, and Z have a range of 360°.

X have a singularity when Y is ±90°. Y, Z have a singularity when X is ±90°.

10.1.2 Linear acceleration

Linear acceleration, i.e. acceleration with the gravity vector removed, is available in transmit PDO2. Linear acceleration data is mapped with index 0x6404, sub-index 4-6.

10.1.3 Gyro

Offset compensated angular velocity data is transmitted in PDO3. Gyro data is mapped with index 0x6404, sub-index 7-9.

10.1.4 Quaternion

Quaternion data resides in index 0x6404, sub-index 0xA through 0xD. The quaternion is a unit quaternion scaled by 16384. The quaternion components W, X, Y, Z are all mapped to transmit PDO4. Where W is the real part and X, Y, Z are the imaginary parts.

10.1.5 Temperature

Internal sensor temperature can be read from index 0x5051. This index is mappable and mapped to transmit PDO 1-3. Temperature is a signed 8-bit value and the unit is degree Celsius.

10.1.6 User offset

The user offset can add a rotation to all angle and quaternion output values. Acceleration and gyro are unaffected. This can be used to correct for various mounting positions. The offset is in the format of a quaternion and is stored in index 0x3601. Writing “save” to index 0x3600 will create an offset from the current position and save it to index 0x3601. The quaternion output is rotated to be equal a unit quaternion, W=16384, X=0, Y=0, Z=0, at the position where the offset is created.

11 Vibration tolerance

11.1 Sinusoidal sweep

Between 5-500Hz the sensor output is within specification when the level is 3g or less. For 500-2000Hz the output is within specification when the level is 0.5g or less.

Parameter	Condition	Level	Units
Sinusoidal sweep	5-500Hz	3	g
	500-2000Hz	0.5	g

11.2 Random vibration

The sensor will produce an output which is within specification when subjected to the following random vibration.

Frequency range	ASD		RMS
10-1000Hz	10 Hz: 50 Hz: 1000 Hz:	0.10398 g2/Hz 0.10398 g2/Hz 0.00104 g2/Hz	3.45g

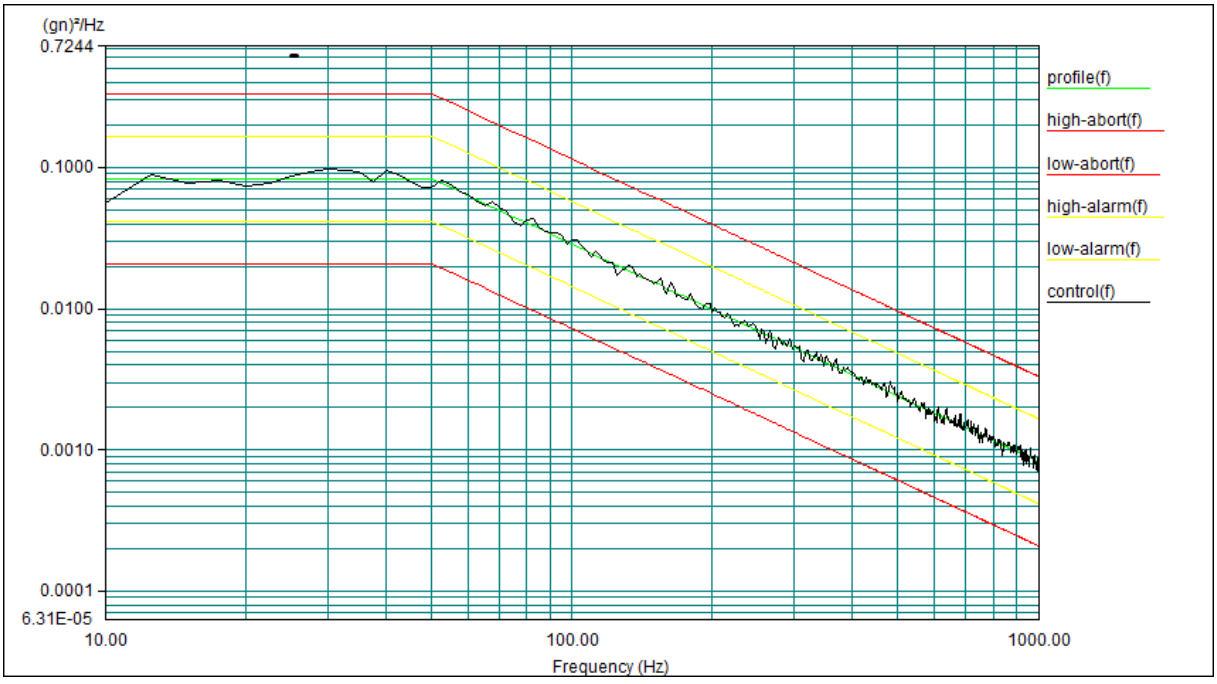


Figure 1 ASD (acceleration spectral density) for the random vibration tests, modeled after IEC-60068-2-64, performed for the devices under test, displaying the structure of the test.

11.3 Non-repetitive shock

The AOS sensor has been subjected to non-repetitive shock of 40g. The sensor can lose its bearing but will recover. Typical recovery time for shock is 300 ms.

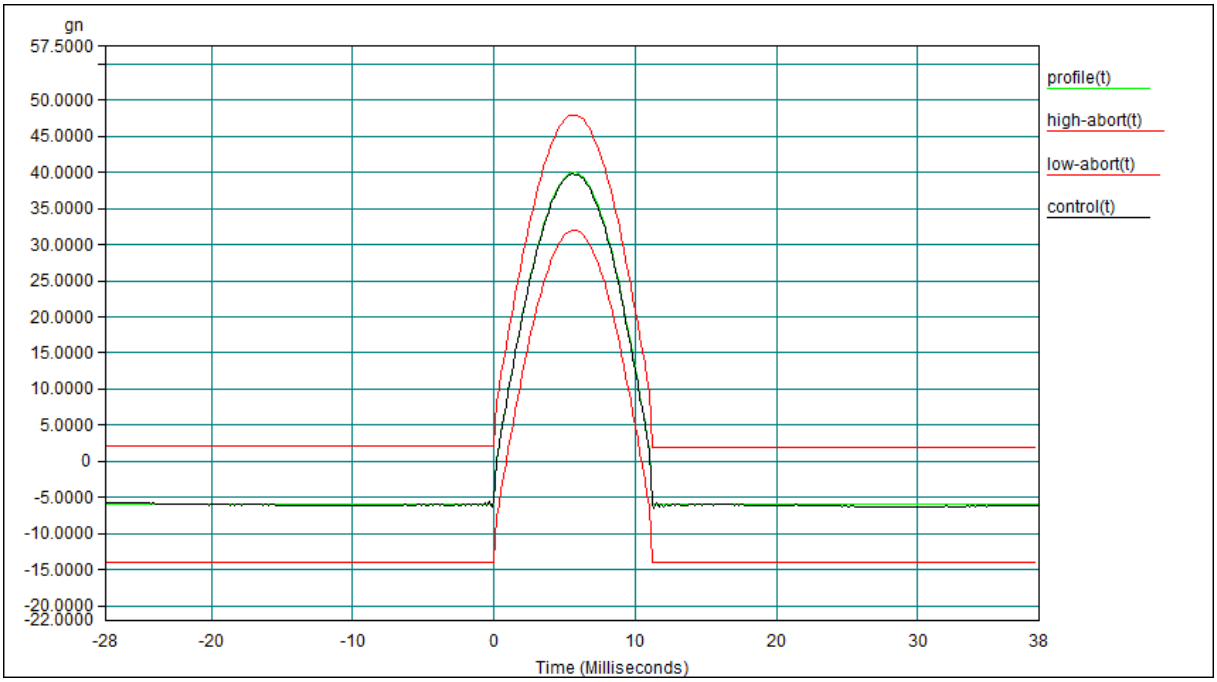


Figure 2 Time vs shock acceleration amplitude for the shock test performed for the devices under test, displaying an upwards shock.

12 CANopen object dictionary

Index	S-idx	Name	Type		Default	Description	Savable
0x1000	0x00	Moduletype	ro	u32	0x00003232	Nonstandard description of this module.	
0x1001	0x00	Error register	ro	u8	0x00		
0x1005	0x00	COB ID SYNC	rw	u32	0x00000080		x
0x1008	0x00	Module name	ro	str	Electrum AOS		
0x1009	0x00	Revision HW	ro	str	REV X	Starting at char ”A”.	
0x100A	0x00	Revision SW	ro	str	REV X.X.X	Software revision. Starting at 1.0.0	
0x1010	0x00	Number of save options	ro	u8	0x01		
	0x01	Save parameter	rw	u32	0x00000002	0x00000000 = No save. 0x00000001 = Store when “save” is written to this index. 0x00000002 = Auto store.	x
0x1011	0x00	Number of restore options	ro	u8	0x01		
	0x01	Restore default parameters	rw	u32	0x00000001	Restores all parameters to default values if string ’load’ is written to this entry. The default values are valid after the device is reset or power cycled.	
0x1014	0x00	COB ID EMCY	rw	u32	0x00000080+ Node ID	Module generates EMCY messages (bit 31=0)	x
0x1016	0x00	Number of monitored devices	ro	u8	0x01		
	0x01	Consumer heartbeat time	rw	u32	0x00000000	Heartbeat monitoring time for node n monitoring only one node is supported. 0x0nn**tttt** = monitoring time (ms) 0x0**nn**tttt = node number (If nn or tttt = 0, no monitoring is carried out.)	x
0x1017	0x00	Producer heartbeat time	rw	u16	0x00FA	Time interval (ms) where the module generates a producer heartbeat.	x
0x1018	0x00	Number of identity objects	ro	u8	0x04		
	0x01	Vendor ID	ro	u32	0x00000356		
	0x02	Product code	ro	u32	0x00000000		
	0x03	Revision number	ro	u32	0x00000000		
	0x04	Unique ID nr	ro	u32	0x????????	A unique 32 bit number used to identify the AOS.	

Index	S-idx	Name	Type		Default	Description	Savable
0x1400	0x00	Receive PDO 1 Communication Parameter	ro	u8	0x05	Number of entries	
	0x01	COB-ID used by PDO	rw	u32	0x80000200 + $NODEID		x
	0x02	Transmission type	rw	u8	0		x
	0x03	Inhibit time	rw	u16	0		x
	0x05	Event timer	rw	u16	0		x
0x1401	0x00	Receive PDO 2 Communication Parameter	ro	u8	0x05	Number of entries	
	0x01	COB-ID used by PDO	rw	u32	0x80000300 + $NODEID		x
	0x02	Transmission type	rw	u8	0		x
	0x03	Inhibit Time	rw	u16	0		x
	0x05	Event timer	rw	u16	0		x
0x1402	0x00	Receive PDO 3 Communication Parameter	ro	u8	0x05	Number of entries	
	0x01	COB-ID used by PDO	rw	u32	0x80000400 + $NODEID		x
	0x02	Transmission type	rw	u8	0		x
	0x03	Inhibit time	rw	u16	0		x
	0x05	Event timer	rw	u16	0		x
0x1403	0x00	Receive PDO 4 Communication Parameter	ro	u8	0x05	Number of entries	
	0x01	COB-ID used by PDO	rw	u32	0x80000500 + $NODEID		x
	0x02	Transmission type	rw	u8	0		x
	0x03	Inhibit time	rw	u16	0		x
	0x05	Event timer	rw	u16	0		x

Index	S-idx	Name	Type		Default	Description	Savable
0x1600	0x00	Receive PDO 1 Mapping Parameter	rw	u8	0x00	Number of entries	
	0x01	PDO Mapping Entry 1	rw	u32	0x00000000		x
	0x02	PDO Mapping Entry 2	rw	u32	0x00000000		x
	0x03	PDO Mapping Entry 3	rw	u32	0x00000000		x
	0x04	PDO Mapping Entry 4	rw	u32	0x00000000		x
	0x05	PDO Mapping Entry 5	rw	u32	0x00000000		x
	0x06	PDO Mapping Entry 6	rw	u32	0x00000000		x
	0x07	PDO Mapping Entry 7	rw	u32	0x00000000		x
	0x08	PDO Mapping Entry 8	rw	u32	0x00000000		x
0x1601	0x00	Receive PDO 2 Mapping Parameter	rw	u8	0x00	Number of entries	
	0x01	PDO Mapping Entry 1	rw	u32	0x00000000		x
	0x02	PDO Mapping Entry 2	rw	u32	0x00000000		x
	0x03	PDO Mapping Entry 3	rw	u32	0x00000000		x
	0x04	PDO Mapping Entry 4	rw	u32	0x00000000		x
	0x05	PDO Mapping Entry 5	rw	u32	0x00000000		x
	0x06	PDO Mapping Entry 6	rw	u32	0x00000000		x
	0x07	PDO Mapping Entry 7	rw	u32	0x00000000		x
	0x08	PDO Mapping Entry 8	rw	u32	0x00000000		x
0x1602	0x00	Receive PDO 3 Mapping Parameter	rw	u8	0x00	Number of entries	
	0x01	PDO Mapping Entry 1	rw	u32	0x00000000		x
	0x02	PDO Mapping Entry 2	rw	u32	0x00000000		x
	0x03	PDO Mapping Entry 3	rw	u32	0x00000000		x
	0x04	PDO Mapping Entry 4	rw	u32	0x00000000		x
	0x05	PDO Mapping Entry 5	rw	u32	0x00000000		x
	0x06	PDO Mapping Entry 6	rw	u32	0x00000000		x
	0x07	PDO Mapping Entry 7	rw	u32	0x00000000		x
	0x08	PDO Mapping Entry 8	rw	u32	0x00000000		x
0x1603	0x00	Receive PDO 4 Mapping Parameter	rw	u8	0x00	Number of entries	
	0x01	PDO Mapping Entry 1	rw	u32	0x00000000		x
	0x02	PDO Mapping Entry 2	rw	u32	0x00000000		x
	0x03	PDO Mapping Entry 3	rw	u32	0x00000000		x
	0x04	PDO Mapping Entry 4	rw	u32	0x00000000		x
	0x05	PDO Mapping Entry 5	rw	u32	0x00000000		x
	0x06	PDO Mapping Entry 6	rw	u32	0x00000000		x
	0x07	PDO Mapping Entry 7	rw	u32	0x00000000		x
	0x08	PDO Mapping Entry 8	rw	u32	0x00000000		x

Index	S-idx	Name	Type		Default	Description	Savable
0x1800	0x00	Transmit PDO 1 Communication Parameter	ro	u8	0x05	Number of entries	
	0x01	COB-ID used by PDO	rw	u32	0x180 + $NODEID		x
	0x02	Transmission type	rw	u8	255		x
	0x03	Inhibit Time	rw	u16	300		x
	0x05	Event timer	rw	u16	50		x
0x1801	0x00	Transmit PDO 2 Communication Parameter	ro	u8	0x05	Number of entries	
	0x01	COB-ID used by PDO	rw	u32	0x280 + $NODEID		x
	0x02	Transmission type	rw	u8	255		x
	0x03	Inhibit time	rw	u16	300		x
	0x05	Event timer	rw	u16	50		x
0x1802	0x00	Transmit PDO 3 Communication Parameter	ro	u8	0x05	Number of entries	
	0x01	COB-ID used by PDO	rw	u32	0x380 + $NODEID		x
	0x02	Transmission type	rw	u8	255		x
	0x03	Inhibit time	rw	u16	300		x
	0x05	Event timer	rw	u16	50		x
0x1803	0x00	Transmit PDO 4 Communication Parameter	ro	u8	0x05	Number of entries	
	0x01	COB-ID used by PDO	rw	u32	0x480 + $NODEID		x
	0x02	Transmission type	rw	u8	255		x
	0x03	Inhibit time	rw	u16	300		x
	0x05	Event timer	rw	u16	50		x

Index	S-idx	Name	Type		Default	Description	Savable
0x1A00	0x00	Transmit PDO 1 Mapping Parameter	rw	u8	0x05	Number of entries	
	0x01	PDO Mapping Entry 1	rw	u32	0x64040110		x
	0x02	PDO Mapping Entry 2	rw	u32	0x64040210		x
	0x03	PDO Mapping Entry 3	rw	u32	0x64040310		x
	0x04	PDO Mapping Entry 4	rw	u32	0x50500008		x
	0x05	PDO Mapping Entry 5	rw	u32	0x50510008		x
	0x06	PDO Mapping Entry 6	rw	u32	0x00000000		x
	0x07	PDO Mapping Entry 7	rw	u32	0x00000000		x
	0x08	PDO Mapping Entry 8	rw	u32	0x00000000		x
0x1A01	0x00	Transmit PDO 2 Mapping Parameter	rw	u8	0x03	Number of entries	
	0x01	PDO Mapping Entry 1	rw	u32	0x64040410		x
	0x02	PDO Mapping Entry 2	rw	u32	0x64040510		x
	0x03	PDO Mapping Entry 3	rw	u32	0x64040610		x
	0x04	PDO Mapping Entry 4	rw	u32	0x00000000		x
	0x05	PDO Mapping Entry 5	rw	u32	0x00000000		x
	0x06	PDO Mapping Entry 6	rw	u32	0x00000000		x
	0x07	PDO Mapping Entry 7	rw	u32	0x00000000		x
	0x08	PDO Mapping Entry 8	rw	u32	0x00000000		x
0x1A02	0x00	Transmit PDO 3 Mapping Parameter	rw	u8	0x03	Number of entries	
	0x01	PDO Mapping Entry 1	rw	u32	0x64040710		x
	0x02	PDO Mapping Entry 2	rw	u32	0x64040810		x
	0x03	PDO Mapping Entry 3	rw	u32	0x64040910		x
	0x04	PDO Mapping Entry 4	rw	u32	0x00000000		x
	0x05	PDO Mapping Entry 5	rw	u32	0x00000000		x
	0x06	PDO Mapping Entry 6	rw	u32	0x00000000		x
	0x07	PDO Mapping Entry 7	rw	u32	0x00000000		x
	0x08	PDO Mapping Entry 8	rw	u32	0x00000000		x
0x1A03	0x00	Transmit PDO 4 Mapping Parameter	rw	u8	0x04	Number of entries	
	0x01	PDO Mapping Entry 1	rw	u32	0x64040A10		x
	0x02	PDO Mapping Entry 2	rw	u32	0x64040B10		x
	0x03	PDO Mapping Entry 3	rw	u32	0x64040C10		x
	0x04	PDO Mapping Entry 4	rw	u32	0x64040D10		x
	0x05	PDO Mapping Entry 5	rw	u32	0x00000000		x
	0x06	PDO Mapping Entry 6	rw	u32	0x00000000		x
	0x07	PDO Mapping Entry 7	rw	u32	0x00000000		x
	0x08	PDO Mapping Entry 8	rw	u32	0x00000000		x

Index	S-idx	Name	Type		Default	Description	Savable
0x1F80	0x00	NMT Startup	rw	u32	0	Set to 0x8 to autostart.	x
0x20F2	0x00	CAN baudrate	rw	u16	250	Supported baudrates: 50 = 50kbit/s 125 = 125kbit/s 250 = 250kbit/s 500 = 500kbit/s 1000 = 1Mbit/s	x
0x20F3	0x00	CAN baudrate	rw	u16	250	Baudrate must be written to index 20F2 first, and then written to this index.	x
0x3000	0x00	Number of parameters	ro	u8	0x01		
	0x01	Node ID	rw	u8	2	1-127	x
0x3600	0x00	Save user offset	rw	u32	1	Stores offset when “save” is written to this index.	
0x3601	0x00	User offset	ro	u8	4		
	0x01	User offset x	rw	s16	0		x
	0x02	User offset y	rw	s16	0		x
	0x03	User offset z	rw	s16	0		x
	0x04	User offset w	rw	s16	16384		x
0x3720	0x00	Update rate	rw	u16	100	Sets sensor update rate: 50-400Hz	x
0x3730	0x00	Legacy output mapping	rw	u8	0	Set to 1 to enable old output format.	x

Index	S-idx	Name	Type		Default	Description	Savable
0x5050	0x00	AOS runtime calibration	ro	u8	-	Mappable Obsolete – always reads 0	
0x5051	0x00	AOS sensor temperature	ro	s8	-	Mappable Sensor temperature in °C	
0x6404	0x00	Manufacturer-specific Analog input	ro	u8	0xD	Number of entries	
	0x01	X Angle	ro	u16	-	Mappable	
	0x02	Y Angle	ro	u16	-	Mappable	
	0x03	Z Angle	ro	u16	-	Mappable	
	0x04	X Linear Acceleration	ro	s16	-	Mappable	
	0x05	Y Linear Acceleration	ro	s16	-	Mappable	
	0x06	Z Linear Acceleration	ro	s16	-	Mappable	
	0x07	X Gyro	ro	s16	-	Mappable	
	0x08	Y Gyro	ro	s16	-	Mappable	
	0x09	Z Gyro	ro	s16	-	Mappable	
	0x0A	W Quaternion	ro	s16	-	Mappable	
	0x0B	X Quaternion	ro	s16	-	Mappable	
	0x0C	Y Quaternion	ro	s16	-	Mappable	
	0x0D	Z Quaternion	ro	s16	-	Mappable	

13 CANopen PDO

The default transmit PDO mapping is shown in the table below:

TX	ID	Data							
		0	1	2	3	4	5	6	7
PDO1	180+Node ID[1]	X Angle Low byte	X Angle High byte	Y Angle Low byte	Y Angle High byte	Z Angle Low byte	Z Angle High byte	-	Sensor temperature[5]
PDO2	280+Node ID[2]	X Acceleration Low byte	X Acceleration High byte	Y Acceleration Low byte	Y Acceleration High byte	Z Acceleration Low byte	Z Acceleration High byte	-	-
PDO3	380+Node ID[3]	X Gyro Low byte	X Gyro High byte	Y Gyro Low byte	Y Gyro High byte	Z Gyro Low byte	Z Gyro High byte	-	-
PDO4	480+Node ID[4]	W Quaternion Low byte	W Quaternion High byte	X Quaternion Low byte	X Quaternion High byte	Y Quaternion Low byte	Y Quaternion High byte	Z Quaternion Low byte	Z Quaternion High byte

1. The angle is presented as an unsigned 16 bit integer with the value 0 to 36000, corresponding to the angle 0-360°. (0.01°/bit)

2. The acceleration is presented as a signed 16 bit integer with the value -8000 to 8000, corresponding to the acceleration -8g to 8g. (0.001g/bit)

3. The gyro is presented as a signed 16 bit integer with the value -20000 to 20000, corresponding to the angular rate -2000°/s to 2000°/s. (0.1°/s per bit. NOTE: Firmware 2.0.4 and earlier had a resolution of 0.1 radians/s per bit = 5.73°/s per bit)

4. Quaternion output. Quaternion output is scaled by a factor of 16384. Quaternion output is normalized after rescaling.

5. Sensor temperature as signed 8-bit value, reported in °C. (1°C/bit)

14 Ordering information

Description	Part no
AOS, CAN-Open with X1 Male connector, default node ID = 2 This is the default configuration	256028
AOS, CAN-Open with X1 Male connector, default node ID = 1	256997
AOS, CAN-Open with X1 Male connector, default node ID = 2, legacy axis mapping	254971

Differences in CANopen settings between the orderable parts.

Part no	CANopen dictionary index/subindex values	
	Index 0x3000/0x00	Index 0x3730/0x00
256028	2	0
256997	1	0
254971	2	1

15 Firmware revision history

Firmware revision	Description	Release date
2.0.0	• Initial release for new sensor hardware	2017-04-20
2.0.1	• Added 500Hz accelerometer output mode • Update rate configurable	2017-05-30
2.0.2	• Hardware revision information read from hardware setting	2017-09-20
2.0.3	• New axis mapping • Index 0x3730 selects new or legacy mapping	2017-11-08
2.0.4	• Accelerometer format set to linear	2018-02-08
2.0.5	• Gyroscope scaling corrected to 0.1°/s per bit (unintentionally was 0.1 radians/s per bit)	2018-10-18
2.0.6	• Support for AOS hardware revision -D (Production improvements)	2019-08-08
2.0.7	• Automatic sensor communication restart, for improved ESD resilience	2019-09-04
2.0.8	• CANopen NMT restart always properly resets the application	2020-02-13

16 Document history

Document revision	Description	Release date
C 0.1	• Initial release	2016-09-28
C 0.2	• Added vibration data	2016-11-22
C 0.3	• Removed sensor element shock data. • Added z-axis angle power on value clarification.	2017-03-06
C 0.4	• Updated sensor characteristics • Updated pictures	2017-09-26
C 0.5	• New orientation picture • Updated index 3720, 3730	2018-02-08
C 0.6	• Description of legacy axis mapping	2018-04-11
D	• Updated ordering information • Clarification of CANopen PDO format • Added firmware revision history	2018-10-23
E	• Removed obsolete calibration status information • Removed the “preliminary” watermark	2019-02-22
F	• Updated firmware history • LED description updated • Updated product images	2023-04-03
G	• Updated ordering information with new product 256997	2024-03-07
H	• Corrected ordering information table	2025-08-27

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17 Contact us

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