DynaCube™ – DC30

FEATURES

- Embedded with MotionCore® Mini AHRS/IMU
- High data rate up to 100Hz for attitude (roll, pitch, yaw) and other auxiliary inertial sensor signals
- Advanced sensor fusion algorithm software based on proprietary EKF algorithm
- Low power consumption (< 0.5W)
- Rugged designed for harsh environment, IP66 waterproof
- Each unit fully compensated for temperature, non orthogonality, soft & hard iron and cross axis coupling errors

APPLICATIONS

- Aviation control system (UAV / Fixed-wing / Rotor, etc.)
- Ground vehicle control system (UGV, etc.)
- Surface vehicle control system (USV, etc.)
- Platform attitude control system
- Other applicable situations

GENERAL DESCRIPTION

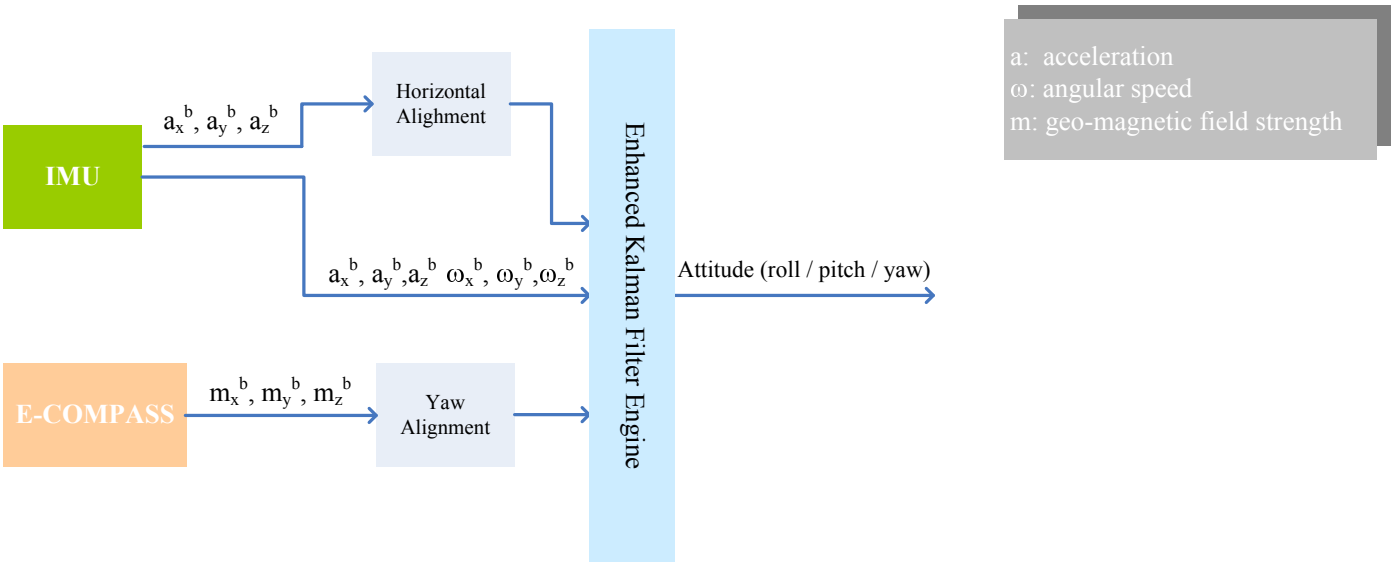
DynaCube™ DC30 miniature Attitude & Heading Reference System (AHRS) is a highly sophisticated system measuring a rigid body's inertial properties, including attitude (pitch, roll, yaw) and also the complete set of dynamic parameters (acceleration / angular speed). Its sensing principle is based on the state of of MEMS technology (MEMS: Micro Electro Mechanical System). As a result of batch processing and standardization of MEMS technology, cost of the system has been significantly lowered compared to its counterpart using optical fiber technology while the performance is not being compromised.

The system is equipped with a powerful sensing unit core called MotionCore™. This core unit, with both all the MEMS sensors & micro processor integrated into a ultra small form factor hardware platform, is running an embedded sensor fusion software based on Senlution's proprietary EKF algorithm (EKF: Enhanced Kalman Filter).

DynaCube™ DC30 is furnished with a standard RS-232 cable for data collection. The metal shell provides users with 6 alignment holes for installation and for electrically grounding (compatible with XSENS MTi series).

DynaCube™ DC30 is suitable for applications ranging from aeronautics, aerospace , surface vessels, ground vehicles to other military or civil adaptations.

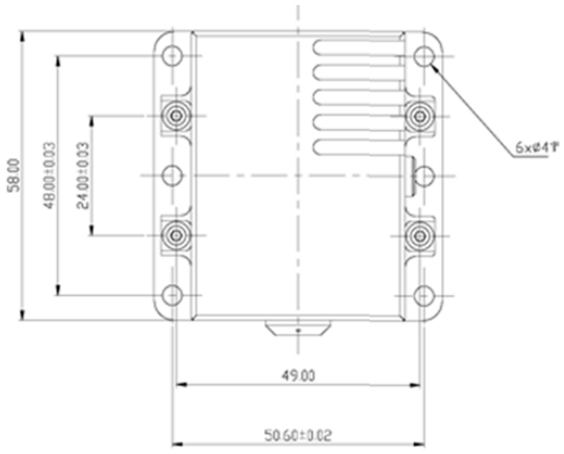
The following diagrams shows the basic hardware / software functions blocks and principles:



SPECIFICATIONS

1. Operating Conditions

Electrical	
Voltage Supply	5 – 12V
Current	≈ 80mA
Data Protocol	
Default	RS232
Optional	RS422; 10/100 Ethernet;
Update Rate	100Hz (can be customized)
Environment	
Temperature	-40 to +85°C
Water Proof Level	IP66
Mechanical	
Size	58mm X 58mm X 25mm
Weight	90g
Main Connector	ODU/LEMO 7PIN FEMALE (ODU PART#: GL0L0C-P07LCC0-0000)
Alighment Holes	6 holes, all grounded



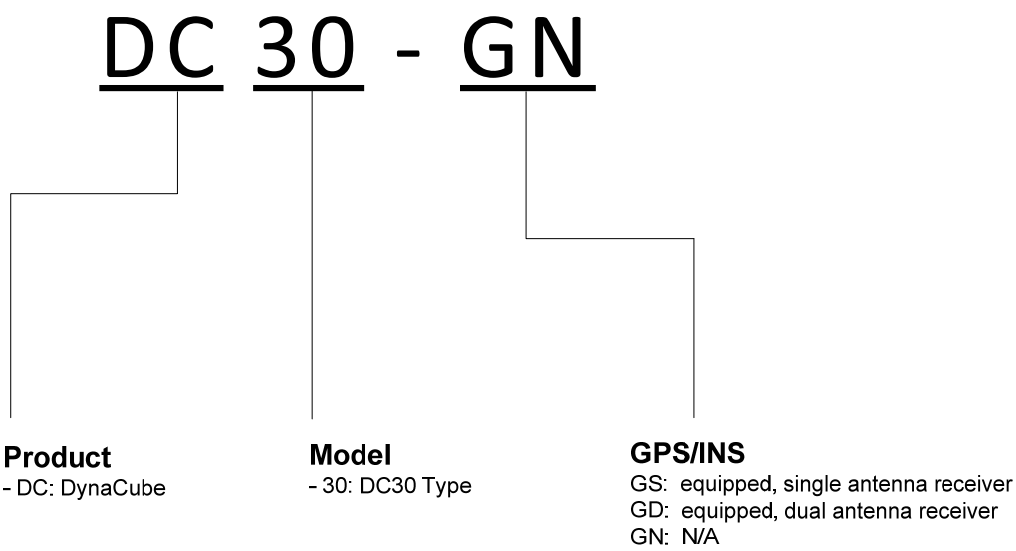
2. Inertial Sensors Specifications:

	Accelerometer	Gyroscope	Magnetic Sensor
Principle	MEMS, Capacitive	MEMS, Vibrational	MEMS, AMR
Range	+/- 2g	+/- 300 deg/s	+/- 2 Gauss
Noise (RMS)	1.5 mg	0.3 deg/s	0.6 mGauss
Offset Initial Error	< 5 mg	< 0.2 deg/s	< 2 mGauss
Bias Stability	5 mg	18 deg/hour	
Non-linearity (%)	0.2	0.1	0.1
Bandwidth (Hz)	60	160	20

3. Altitude Computation Specifications：

Static Accuracy	
Pitch	± 0. 5°
Roll	± 0. 5°
Yaw	± 2. 0° (homogenous magnetic field)
Dynamic Accuracy	3.0° RMS
Resolution (RMS)	
Pitch	0. 1°
Roll	0. 1°
Yaw	0. 2°
Measurement Range	
Pitch	± 90°
Roll	± 180°
Yaw	± 180°
Barometric Measurement	
Accuracy	100 Pa
Resolution	5 Pa
Range	0 – 110 kPa

ORDERING GUIDE



The following products is now available from Senlution Technologies:

Model Name	SAT System	YAW from SAT	Band	Status
DC30-GN	N/A	N/A	N/A	Available
DC30-GS	GPS/GLONASS	NO	L1 C/A, L2 C, L2 P(Y)	Available
DC30-GD	GPS/GLONASS	YES (dual ant.)	L1 C/A, L2 C, L2 P(Y)	Not offered, we recommend DC40-GD

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Appendix 1：Default RS232 Protocol

Electrical Specifications：

- Baud Rate：115200
- Data Bit：8
- Stop Bit：2
- Parity：none
- Flow Control：none
- Output Data Rate: 100Hz

Default Data Packet (Attn: do **NOT** send any data to the system after powering up)

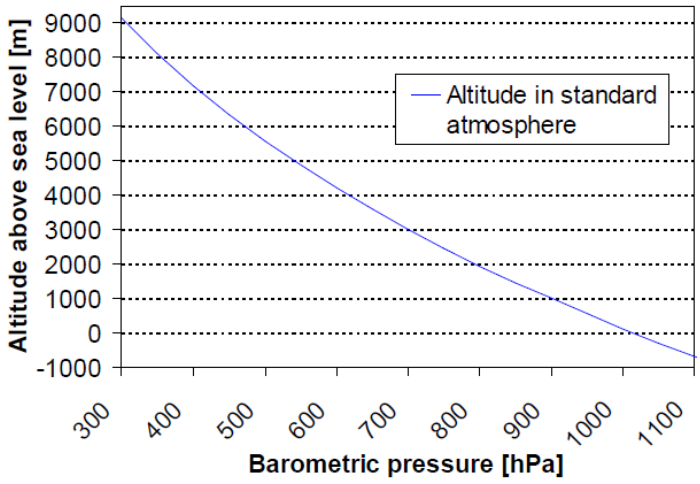
DATA FIELD	NO OF BYTE	DESCRIPTION
HEADER	4	0XFA,0xFF,0x32,0x32
X axis of acceleration	4	Type: float, Unit: m/s^2
Y axis of acceleration	4	Type: float, Unit: m/s^2
Z axis of acceleration	4	Type: float, Unit: m/s^2
X axis of angular speed	4	Type: float, Unit: rad/s
Y axis of angular speed	4	Type: float, Unit: rad/s
Z axis of angular speed	4	Type: float, Unit: rad/s
X axis of magnetic field	4	Type: float, Unit: gauss
Y axis of magnetic field	4	Type: float, Unit: gauss
Z axis of magnetic field	4	Type: float, Unit: gauss
Roll Angle	4	Type: float, Unit: deg.
Pitch Angle	4	Type: float, Unit: deg.
Yaw Angle	4	Type: float, Unit: deg.
Packet Number	2	MSB, followed by LSB. Incremented by 1 when data packet is sent out
Checksum	1	

Appendix 2：Calculation of Altitude based on barometric sensor

DynaCube DC30-GS provides a “vent” hole which connects the inside air to the outside. When this feature is needed, user should uninstall the sealed screw so the inside barometric sensor is able to measure the atmosphere pressure directly. When the pressure reading is obtained, user may use the following equation to calculate the equivalent elevation:

$$\text{Altitude} = 44330 \times \left(1 - \left(\frac{p}{p_0}\right)^{\frac{1}{5.255}}\right)$$

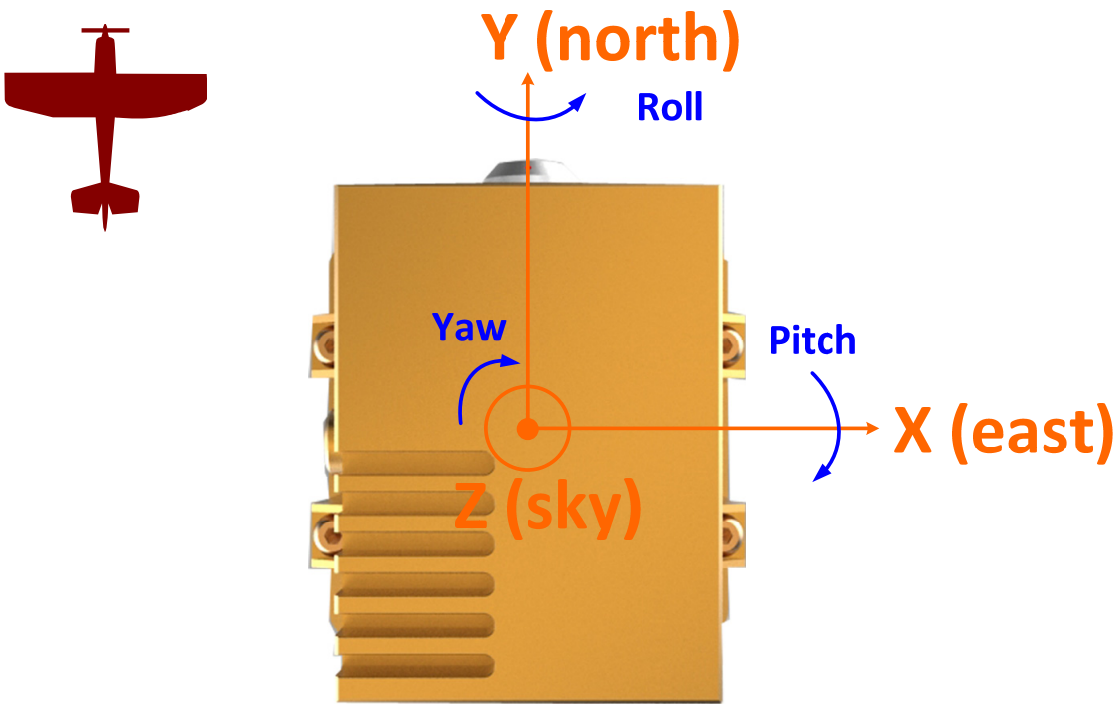
While p is the current pressure, in Pascal; p_0是the sea level atmosphere pressure, equals 101325 Pascal.



Appendix 3：Coordinate Definition

The coordinate system used in DynaCube, is compatible with MotionCore product series, which follows the common "EAST, WEST, SKY" convention. The detailed orientation is as follows, the direction which the arrow shows is positive:

- Pitch: positive around +X axis (i.e. head-up is positive)
- Roll: positive around +Y axis (i.e. tilt right is positive)
- Yaw: positive around - Z axis (i.e. clockwise turning, looking from the top is positive)



Top View

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