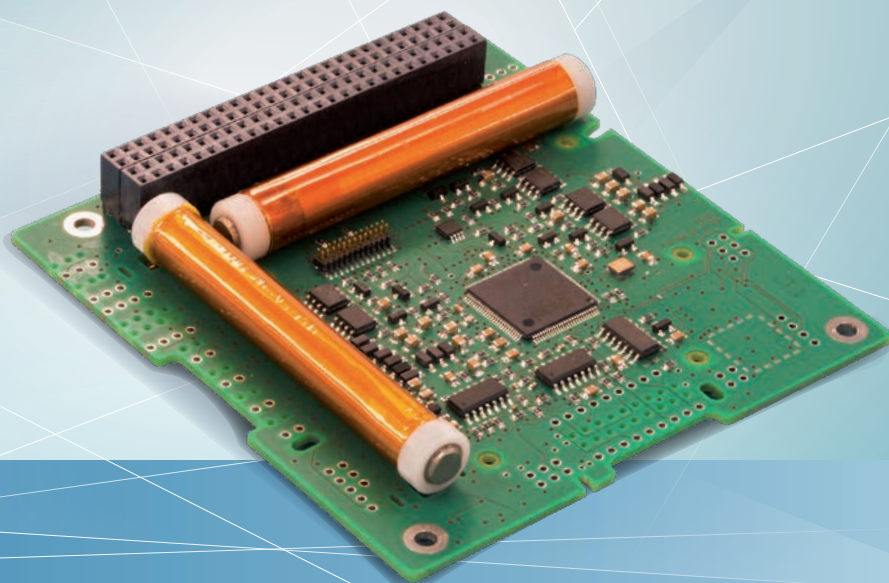
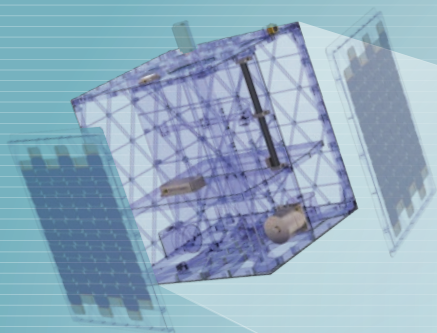


# CUBESAT ACS SOLUTION



## PERFORMANCE

	Magnetic Control	Adding Stellar Gyro and momentum wheel	Adding GPS Receiver
<b>FUNCTIONAL CHARACTERISTICS</b>			
Pointing knowledge (sunlit, 2 sigma)	2	2	1
Pointing knowledge (eclipse, 2 sigma)	2	2 (0.1 relative)	1 (0.1 relative)
Control accuracy (sunlit, 2 sigma)	10	3	1
Control accuracy (eclipse, 2 sigma)	20	3	1
Magnetic moment	>0.2	>0.2	>0.2
Position accuracy	-	-	<50m (2 sigma)
Velocity accuracy	-	-	<25cm/s (2 sigma)
Update rate	5Hz	5Hz	1Hz
<b>PHYSICAL CHARACTERISTICS</b>			
Dimensions	96 x 96 x 15mm	96 x 96 x 15mm	96 x 96 x 15mm
Mass	<200g	<200g	
Power	1.8W	2W	3W
<b>ENVIRONMENTAL CHARACTERISTICS</b>			
Thermal (operational)	-25°C to +50°C	-25°C to +50°C	-25°C to +50°C
Vibration (qualification)	14g rms	14g rms	14g rms
Radiation (TID)	10krad	10krad	10krad
<b>INTERFACES</b>			
Power supply	5V and 3.3V	5V and 3.3V	5V and 3.3V
Data	I2C	I2C	I2C and UART
Connector	PC104	PC104	PC104
Mechanical	PC104 format	PC104 format	PC104 format

# CUBESAT ACS SOLUTION



## FEATURES

- Single PC104 form factor
- Low power
- I2C and UART interfaces
- Can be populated to mission requirements

## APPLICATIONS

- High accuracy in eclipse
- Earth Observation missions
- Spin stabilised three axis control
- Simple magnetic control
- Acquiring stabilisation and orbital information

## QUALIFICATION

The CubeSat ACS Board flew on the TDS-1 in 2014 and has also been selected by a number of QB50 missions and other CubeSat clients.

## UTILITY

A CubeSat Attitude Control System (ACS) measures orbit position, absolute attitude, spacecraft rates and can also control the orientation of the satellite through either magnetic actuation or wheel based solutions.

The NewSpace ACS board is a single PC104 board (15mm height) that physically integrates three high accuracy sun sensors, a magnetometer, MEMS gyros, a stellar gyro and two magnetorquer rods. Additionally, external interfaces allow for a further three sun sensors, the Z-axis magnetorquer as well as momentum or reaction wheels.

The NewSpace ACS solution recommends combining the data from the MEMS gyros with a stellar gyro as this achieves precision

rate knowledge with no drift, allowing exceptional performance during eclipse periods at a fraction of the cost of a star mapper solution. The  $\pm 0.5$  degree accurate sun sensors and precision magnetometer provides an absolute pointing solution when sunlit. In eclipse, the attitude is propagated by the gyro combination, with the stellar gyro permitting a drift of typically less than 0.1 degree throughout the entirety of this orbit phase.

Furthermore, a GPS receiver can also be integrated to the NewSpace ACS board, with the addition of a mezzanine board, to allow orbit position knowledge. This increases the fidelity of the magnetometer by improving position knowledge compared to an orbit propagator. The NewSpace GPS is

independently controlled through a UART interface with all other functionality controlled via a single I2C interface.

Ultimately, the NewSpace ACS board can be supplied either partially populated, for example with sensors and actuators for simple magnetic stabilisation or safe mode control, or as a complete solution. Depending on the functionality required by the client, a fit for purpose board can be customised. Additionally, each of the NewSpace sensors and actuators as well as the GPS receiver are available individually to complement a client's existing suite of components. Individual datasheets for these products are available on request.