Kongsberg Defence &Aerospace -
Mechanism for rotating the Solar Arrays

The Norwegian Kongdberg Defence & Aerospace is responsible for the design and manufacturing of the two SADMs (Solar Array Drive Mechanism) and in addition for the SADE (Solar Array Drive Electronics) which is sub contracted as a whole to Alcatel Espacio in Spain. The main task for the SADM is to rotate the Solar Arrays and transfer the current from the Solar Arrays into the spacecraft. To transfer the current from the rotating Solar Arrays to the static pacecraft, a Twist Capsule is used which allows a +/-180 degrees rotation of the electrical wires. An optical encoder measures the angular position of the Solar Arrays and transmits the position to the SADE. The SADM is rotated by a stepper motor which is controlled from SADE.

The spacecraft.

Mars Express is not among the largest spacecraft. The bus dimensions are 1.5 x 1.8x 1.4 m and for power supply than have two solar arrays with a collected area at 11.42 m2. The tank volume for propellant is 540 l, and that is sufficient to bring the spacecraft to the planned orbit and for managing the orbiter the planned operation life.

Propulsion
The launcher provides most of the energy needed to propel Mars Express from Earth to Mars. The spacecraft's own engine, as have a force at 400 N, will only be uses over a thirty minutes period to reduce the speed of the spacecraft to 28800 km/h and with that bring the spacecraft in a elliptical orbit around Mars. Eight attitude thrusters attached to the corners of the spacecraft bus can each deliver 10 N will be used to stabile the spacecraft.

Electrical Power
Electrical power is provided by the spacecraft's solar panels, which deploy shortly after launch. When Mars is at its maximum distance from the sun, the solar panels will still be capable of delivering 650 W, which is more than enough to meet the mission's maximum requirement of 500 W. When the spacecraft's view of the Sun is obscured by Mars during the solar eclipse, four lithium batteries each delivering 67.5 Ah, previously charged up by the solar panels, will take over the power supply.

Communication.
The circular dish attached to one face of the spacecraft bus is a 1.6 m-diameter high gain antenna for receiving and transmitting radio signals when the spacecraft is a long way from Earth. When it is close to Earth, communication via a 40 cm-long low-gain antenna, which protrudes from the spacecraft bus.

Data storage.
As scientific data cannot be transmitted back to Earth as soon as it is collected, it will be stored on the spacecraft's computer until transmission is possible. The computer has 12 Gbits of solid-state mass memory.

Control.
The on-board computers will control all aspects of the spacecraft's functioning, including switching instruments on and off, assessing the spacecraft's orientation in space, and issuing commands to change it.

Navigation.
Three on-board computers will help Mars Express maintain a very precise pointing accuracy, which is essential if the spacecraft is to comminicate with a 34m dish on Earth up to 400 million km away. There are two star trackers, six laser gyros, and two coarse Sun sensors.

Thermal control.
The spacecraft must provide a benign environment for the instruments and on-board equipment. Two instruments, PFS and OMEGA, have infrared detectors that need to be kept at very low temperatures (about –180°C) The sensors on the camera (HRSC) also need to be kept cool, but the rest of 5the instruments and on-board equipment function best at room temperature at 10-20° C. The spacecraft will be encapsulated in thermal blankets made from gols.plated aluminium-tin alloy, to keep the interior at 10-20°C. The instruments that need to be kept cold will be thermally insulated from the warm interior of the spacecraft and attached to radiators that lose the heat to space, which is very cold, about –270°C.

