Company Overview

Italian Medium Enterprise with more than **200 high qualified employees** and **state-of-the-art facilities**

**Strong Heritage** in Design, Development, Production and Qualification of **Instruments, Electronics and Microelectronics Systems** compliant with high reliability standards.

Turn-key **Microsatellites based Solutions for Earth Observation and Science Applications and Services**, with the support of selected partners.

Quality Assurance Certifications: **EN 9100, ISO 14001, SA8000**

---

 Equipments
- Spacecraft Electrical Power
- Control Electronics for Complex Systems
- Spacecraft Data and Communications
- Electrical Ground Support Equipments

 Sub-Systems
- Small instruments
- Sensors and Detectors
- Electric Propulsion (HET, FEEP)
- AOCS

 Microelectronic Devices
- Rad tolerant Analog, Digital and Mixed-Signal ASICs
- Digital IP Cores for Complex FPGAs

 Systems
- Microsatellites
Plants and Facilities

- Headquarters in Modugno (BA) – *Design, Engineering and Production*
- Premises in Pisa – *Design and low volume production*
- 10000 m² new Headquarters under construction in Bari

- Qualified production line for space activities
- Large area class ISO 8 Clean Rooms
- Automatic Assembly Line
- Anechoic Chamber
- Mechanical Test Facilities
- Thermal Chamber
- X-Ray Machine
### Main Space Programs and Customers

<table>
<thead>
<tr>
<th>Program/Project</th>
<th>Image</th>
<th>Program/Project</th>
<th>Image</th>
<th>Program/Project</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSIS CSO</td>
<td>![Image]</td>
<td>EarthCARE</td>
<td>![Image]</td>
<td>COSMO 2nd Gen</td>
<td>![Image]</td>
</tr>
<tr>
<td>SENTINEL 1</td>
<td>![Image]</td>
<td>SWARM</td>
<td>![Image]</td>
<td>Curiosity</td>
<td>![Image]</td>
</tr>
<tr>
<td>SENTINEL 3</td>
<td>![Image]</td>
<td>ExoMars</td>
<td>![Image]</td>
<td>ASTRO-H</td>
<td>![Image]</td>
</tr>
<tr>
<td>AMS01/AMS02</td>
<td>![Image]</td>
<td>CALET</td>
<td>![Image]</td>
<td>INTEGRAL</td>
<td>![Image]</td>
</tr>
<tr>
<td>MUSIS CSO</td>
<td>![Image]</td>
<td>Orion MPCV</td>
<td>![Image]</td>
<td>PAMELA</td>
<td>![Image]</td>
</tr>
<tr>
<td>SENTINEL 1</td>
<td>![Image]</td>
<td>CALET</td>
<td>![Image]</td>
<td>ASTRO-H</td>
<td>![Image]</td>
</tr>
<tr>
<td>SENTINEL 3</td>
<td>![Image]</td>
<td>ExoMars</td>
<td>![Image]</td>
<td>INTEGRAL</td>
<td>![Image]</td>
</tr>
<tr>
<td>AMS01/AMS02</td>
<td>![Image]</td>
<td>CALET</td>
<td>![Image]</td>
<td>ASTRO-H</td>
<td>![Image]</td>
</tr>
</tbody>
</table>

**Extensive heritage in a wide range of solutions that have been delivered to the most important Space Players in Europe and all around the world.**

![Logos and Companies]
Space Electrical Power Overview

SITAEL designs and produces a very wide range of reliable, low noise and high efficiency space-born power supply systems. Power products include the following series: HV, LMV, and Specific Power Supplies.

SITAEL heritage and gained experience in power products includes units on several Earth Observation and Science missions on both manned and unmanned platforms.
Spacecraft Electrical Power

**HV series**
Up to 12 kV high efficiency high voltage DC/DC converters and linear regulators family

**LMV series**
From 2.6 up to 120 V space-borne high efficiency single and multi-outputs DC/DC Converters

**Specific Power Supplies**
With over 18 years experienced engineering staff, SITAEL is able to produce space-qualified power supply systems to meet any requirements coming from different satellite payloads and platform sub-systems

- **Optical Payloads (Detectors, Imagers, Spectrometers, APD, PMT, CCD)**
  - Spectrometer Telescope for Imaging X-rays (Solar Orbiter)
  - Soft Gamma-ray Detector, Hard X-ray Imager and Soft X-ray Spectrometer (ASTRO-H)
  - Avalanche Photo Diodes and Photo Multiplier Tubes (CALET)
  - Modular X- and Gamma-Ray Sensor (ASIM)
  - Canadian Electrical Field Instrument (SWARM)
  - JEM-X (INTEGRAL)

- **RF Payloads (SAR, SRAL)**
  - SAR TGU (Sentinel1)
  - SRAL-C Ku (Sentinel3)

- **Data Systems (PDHU, MMU)**
  - MMFU (EarthCARE)
  - PDHU (GAIA)
HV series

High Efficiency High Voltage DC/DC converters and Linear Regulators

- Up to 12 kV Outputs
- No Input Single Point Failure
- Latch-Up Protection Circuit
- ON/OFF Control
- Selectable Soft Start and Latch Delay
- SYNC Input and Thermal protection

### DC/DC Converters

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Input Range</th>
<th>Output Voltage</th>
<th>Output Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>S9031</td>
<td>+26V to +31V</td>
<td>-2500V</td>
<td>2.5mA</td>
</tr>
<tr>
<td>S9032</td>
<td>+26V to +31V</td>
<td>-900V</td>
<td>7mA</td>
</tr>
<tr>
<td>S9090</td>
<td>+4.75V to +5.25V</td>
<td>+2000V</td>
<td>30uA</td>
</tr>
<tr>
<td>S9097</td>
<td>+4.75V to +5.25V</td>
<td>+3000V</td>
<td>100uA</td>
</tr>
<tr>
<td>S9098</td>
<td>+4.75V to +5.25V</td>
<td>-3000V</td>
<td>100uA</td>
</tr>
<tr>
<td>S9099</td>
<td>+4.75V to +5.25V</td>
<td>+1250V</td>
<td>500uA</td>
</tr>
<tr>
<td>S9100</td>
<td>+10.8V to +13.2V</td>
<td>-1250V</td>
<td>500uA</td>
</tr>
<tr>
<td>S9102</td>
<td>+4.75V to +5.25V</td>
<td>+1250V</td>
<td>10uA</td>
</tr>
<tr>
<td>S9103</td>
<td>+4.75V to +5.25V</td>
<td>+600V</td>
<td>20uA</td>
</tr>
</tbody>
</table>

### Linear Regulators

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Input Range</th>
<th>Output Voltage</th>
<th>Output Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>S9033</td>
<td>0V to +2100V</td>
<td>+700V to +1800V</td>
<td></td>
</tr>
<tr>
<td>S9034</td>
<td>0V to -1000V</td>
<td>0V to -950V</td>
<td></td>
</tr>
<tr>
<td>S9035</td>
<td>0V to -2500V</td>
<td>-800V to -2200V</td>
<td></td>
</tr>
<tr>
<td>S9036</td>
<td>0V to +1000V</td>
<td>0V to +950V</td>
<td></td>
</tr>
</tbody>
</table>
**LMV series**

Space-born High Efficiency Single and Multi-Outputs DC/DC Converters

- Outputs from 2.6 up to 120 V
- No Input Single Point Failure
- Latch-Up Protection Circuit
- ON/OFF Control
- Selectable Soft Start and Latch Delay
- SYNC Input and Thermal protection

### Single Output

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Input Range</th>
<th>Output Voltage</th>
<th>Output Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>S9008</td>
<td>+22V to +32V</td>
<td>+17 V</td>
<td>100W</td>
</tr>
<tr>
<td>S9023*</td>
<td>+26V to +31V</td>
<td>+3.6 V</td>
<td>25W</td>
</tr>
<tr>
<td>S9024*</td>
<td>+26V to +31V</td>
<td>+5.6 V</td>
<td>25W</td>
</tr>
<tr>
<td>S9026</td>
<td>+26V to +31V</td>
<td>+12V</td>
<td></td>
</tr>
</tbody>
</table>

(*) Available also in DUAL configuration (two identical modules on a single board for redundancy)

### Multiple Output

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Input Range</th>
<th>Outputs</th>
<th>Output Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>S9022*</td>
<td>+26V to +31V</td>
<td>+5.6 V; -5.6V</td>
<td>14W</td>
</tr>
<tr>
<td>S9027*</td>
<td>+26V to +31V</td>
<td>+3.6V; -2.6V</td>
<td>10W</td>
</tr>
<tr>
<td>S9048Dual</td>
<td>+26V to +31V</td>
<td>+2.8V; -2.8V</td>
<td>12W</td>
</tr>
<tr>
<td>S9056Dual</td>
<td>+26V to +31V</td>
<td>+5V; +120V</td>
<td>6W</td>
</tr>
<tr>
<td>S9074Dual</td>
<td>+26V to +31V</td>
<td>+3.3V; +5.6V</td>
<td>25W</td>
</tr>
<tr>
<td>S9021*</td>
<td>+26V to +31V</td>
<td>+5.6V; +2.5V; -2.5V</td>
<td>15W</td>
</tr>
<tr>
<td>S9025*</td>
<td>+26V to +31V</td>
<td>+6V; -6V; +120V</td>
<td>3.5W</td>
</tr>
<tr>
<td>S9050 (CPPS)</td>
<td>+22V to +37V</td>
<td>+2.5V; +3.3V; +5V(6x); -5V(2x); +6V; +10V; +12V(2x); -12V; +15V(3x); -15V(3x); +28V(2x)</td>
<td>50W</td>
</tr>
</tbody>
</table>

(*) Available also in DUAL configuration (two identical modules on a single board for redundancy)
Customer: ESA

Function: Central Payload Power Supply for Compact Instrumentation

Features:
- 23 post regulated outputs divided into 10 Instruments groups with independent ground returns
- Output voltages from $\pm 2.5$ to $\pm 28$ V and current up to 1.5 A.
- Easily adaptable to other secondary supply voltage/current requirements
- Up to 80% efficiency
- 800mW consumption with Instruments OFF
- 22V to 37V Input Bus
- 50W nominal output power
- Load and cross regulation better than 1%
- 100kHz fixed frequency operation
- Low output noise
- Input EMI filter
- Input under-voltage protection
- Overload/short circuit protection
- Output over-voltage latching protection

Envisaged for all future ESA small satellite missions

820 cm$^3$ / 980g
### 120V/28V DC/DC Converter

**Customer:** SELEX ES, ASTRIUM DE, NASA

**Function:** 120V/28V DC/DC Converter Module of the Service Module PCDU of NASA Multi Purpose Crew Vehicle

**Features:**

- Controls the power flow from 120V Redundant Unregulated Bus to the 28V Regulated Bus inside PCDU
- Two DC/DC modules working in hot redundancy
- Each DC/DC module is composed by two identical sections of Step-down converters, completely independent (apart from the command-decoding interface)
- Two Input Power Bus Capacitors Banks (N+R)
- One Output Power Bus Capacitors Bank
- Max delivered power: 2kW
- 3+1 configuration: 1.5kW reduced power in case of single failure
Specific Power Supplies

With over 18 years experienced engineering staff, SITAEL is able to produce space-qualified power supply systems to meet any requirements coming from different satellite payloads and platform sub-systems, such as:

- Optical Payloads (Detectors, Imagers, Spectrometers, APD, PMT, CCD),
- RF Payloads (SAR, SRAL),
- Data Systems (PDHU, MMU),
- Electric Propulsion (Hall, FEEP).
HVPS for Soft Gamma-ray Detector, Hard X-ray Imager and Soft X-ray Spectrometer

Customer: JAXA, OHB, ESA

Function: High Voltage Power Supplies (HVPS) to be used in the Soft Gamma ray Detector (SGD), the Hard X-ray Imager (HXI) and the Soft X-ray Spectrometer (SXS) of the ASTRO-H satellites.

Features:
- Power Supply for Si/APD type (HXI, SGD)
  - +600 V / 20uA
- Power Supply for CdTe type (HXI, SGD)
  - +1250V / 10uA
- Power Supply for SXS/MXS (Modulated X-ray Source)
  - -11.3 KV / 50uA
- Common features:
  - Remotely programmable output voltage
  - Low ripple and high output voltage stability
  - Output voltage analog monitor
  - HV enable signal
HVPS for Avalanche Photo Diodes and Photo Multiplier Tubes

Customer: JAXA, IFAC-CNR, ASI

Function: HV Power Supply Systems for Avalanche Photo Diodes (APDs) and Photo Multiplier Tubes (PMTs) of the Calorimeter Electron Telescope (CALET) Experiment to be installed on ISS Japanese Experiment Module.

Features:

- 22 main + 22 redundant output channels for APDs
  - 0 to +1250 V/ 500 μA
- 80 main + 80 redundant linearly regulated independent output channels for PMTs
  - 0 to -900V / 150μA
- Common features:
  - Remotely programmable output voltage
  - Overcurrent protection on each channel
  - Low ripple and high output voltage stability
  - Output voltage analog monitor
  - HV enable signal

The copyright of this document is vested in SITAEL S.p.A.
Canadian EFI PSU

Customer: COM DEV, ESA
Function: Development and MAIT of EM, QM and FM for both Low and High Voltage Power Supply Units of SWARM CEFI

Features:
- 6 Low Voltage Outputs: +3.3V, ±5 V, ±15V, +30V
- 8 High Voltage Outputs: double +8KV, double –2.4KV
- double –100V, double AC (–100V ÷ +50V)
**JEM-X HVPS**

Customer: IAS, ESA

Function: HV Power supply systems for Microstrip Gas Chambers

**Features:**
- 6 kV @ 30 mA
- floating, programmable
- OvC and OvV protection

*In orbit since October 2002!*

JEM-X Detector

The copyright of this document is vested in SITAEIL S.p.A.
### Customer:
ASI, Selex Galileo

### Function:
Multi-Output Low Power supply for Focal Planes (CCD)

### Features:

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>24</td>
<td>28</td>
<td>50</td>
<td>V</td>
</tr>
<tr>
<td>Output Voltages</td>
<td>4.75</td>
<td>5</td>
<td>5.25</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>±14.5</td>
<td>±15</td>
<td>±15.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>±31</td>
<td>±33</td>
<td>±35</td>
<td></td>
</tr>
<tr>
<td>Output Power</td>
<td>2.6</td>
<td>3.4</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40</td>
<td>70</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Radiation Tolerance (TID)</td>
<td>100</td>
<td>krad(Si)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEL threshold</td>
<td>&gt; 75</td>
<td>MeV/mg/cm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation resistance</td>
<td>&gt; 10</td>
<td>MΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary/ground capacitance</td>
<td>6</td>
<td>20</td>
<td>nF</td>
<td></td>
</tr>
</tbody>
</table>

*Available at QM maturity*
Customer: Astrium UK, ESA

Function: DC/DC Converters for the SAR Transmit Gain Unit on board of ESA Sentinel 1 satellite

Features:
- 28V Input bus
- 6 voltage outputs for an ASIC monitor/control circuit and a RF Pulsed Power Amplifier.
- 42W maximum output power.
Customer: Thales Alenia Space

Function: DC/DC Converter for the SRAL-C Ku (SAR Radar and ALtimeter) Radio Frequency Unity (RFU) of ESA Sentinel 3 satellite

Features:
- 6 output voltages to the RFU
  - +5V, +6V and -6V regulated,
  - +6.2V, -40V and +30V not regulated
- Latching output overload protections
- Short circuit protections
- Input current monitor
- Temperature telemetry

GMES, EC-ESA joint initiative
Customer: Syderal, ESA

Function: Mass Memory and Formatting Unit (MMFU) Power Supply Boards (PSB) for the EarthCARE ESA Mission

Features:
- 5 output rails (+5V, +3.4V, +1.8V, -12.25V and +1.5V) for the Controller and Mass Memory Boards.
- Input in-rush current control
- Common mode and differential input noise filters
- Input under-voltage protection
- Input reverse polarity protection
- Over-load and output short-circuit protection
- Output filters
- Magnetic feedback
- Open Loop Gain Specs: PM > 60°; GM > 10dB
**Customer:** Syderal, ESA  
**Function:** Payload Data Handling Unit (PDHU) Power Supply Boards (PSB) for the GAIA ESA Mission

**Features:**
- 5 output rails (+5V, +3.3V, +2.5V, +1.8V and +1.5V) for the Controller Boards.
- 2 output voltages (+12V and +3.3V) for the Mass Memory Boards
- Common mode and differential input noise filters
- Input under-voltage protection
- Input reverse polarity protection
- Over-load and output short-circuit protection
- Output filters
- Magnetic feedback
- Open Loop Gain Specs: PM > 60°; GM > 10dB
LVPS for Avionic Applications

Customer: Prime Italian Defence Industry

Function: Low Voltage Power Supply for Avionic Applications

Features:
- Common mode and differential mode input noise filter
- Input spikes suppression
- Input under- and over- voltage protection
- Output over- and under- current protection
- Output over-voltage protection
- Fail and overheat status outputs
- Battle Short input
- Internal Thermal switch
- Integrated total elapsed-time recorder (ETR)
Thank you for your attention!

phone: +39 080 53 21 796
Fax: +39 080 53 55 048
e-mail: info.space@sitael.com

SITAEEL S.p.A.
S. P. 231, KM. 79.900 - 70026 Modugno (BA)
Via Livornese 1019 - 56122 Pisa (PI)
ITALY

www.sitael.com