Payload Adapters and Separation Systems
Adapters & Separation Systems for your successful mission

RUAG Space Payload Adapter Systems provide you with a complete solution for your mission. With our long experience in supporting the space industry we can provide a range of off-the-shelf products as well as tailor made solutions, all based on our high performance components.

Three decades of experience
RUAG Space is the world’s leading supplier of payload adapters and separation systems for commercial launch vehicles. RUAG has been developing and producing Payload Adapter Systems for more than three decades. A period during which we have accumulated vast experience, and supplied our products to an ever-growing number of satisfied users that today are market leaders.

Compatible with virtually any launcher/satellite combination
Modular adapters from RUAG Space enable fitting most satellites on the market to any launcher. RUAG Space is supplier to Ariane, Atlas, Delta, Land Launch, Proton, Sea Launch, Soyuz and Antares launchers.

We offer a broad spectrum of Payload Adapter Systems compatible with all commercial satellite buses used in the world today. Our services include support to our customer through all program phases up to the successful separation of the satellite in orbit. The Payload Adapters are tailored to customers’ needs and manufactured out of aluminum or carbon fiber composite technologies to impressive performance.

Low shock separation systems with outstanding flight record
RUAG Space separation systems keep satellites safely attached to their launchers during the tough journey to orbit and then with precision delivers the precious loads in orbit with the specified relative velocity, roll and spin.

RUAG offers standard systems and dedicated system for special applications like in-orbit separation of return-to-earth capsules. RUAG Space offers clamp-band as well as hard point separation systems. The RUAG low-shock clamp-band separation system is the industry standard for commercial payloads.

Our Payload Adapter Systems have an outstanding flight record. To date (October 2012) 490 in-orbit separations have been carried out with a success rate of 100%! This gives launch vehicle operators and satellite builders/operators confidence when planning for future missions together with us.

<table>
<thead>
<tr>
<th>Diameter (mm/Inch)</th>
<th>Ariane</th>
<th>Atlas</th>
<th>Delta</th>
<th>Sea Launch</th>
<th>Proton</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>937/37</td>
<td>101</td>
<td>13</td>
<td>4</td>
<td>7</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>1194/47</td>
<td>100</td>
<td>45</td>
<td>6</td>
<td>17</td>
<td>55</td>
<td>6</td>
</tr>
<tr>
<td>1666/66</td>
<td>36</td>
<td>30</td>
<td>6</td>
<td>3</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>2624/104</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2800/110</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-point nut (1663)</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>11</td>
<td>4</td>
<td>29</td>
</tr>
<tr>
<td>247</td>
<td>90</td>
<td>19</td>
<td>31</td>
<td>74</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>
Developed over 30 years, the RUAG Space product family to date includes a broad range of Separation Systems, spanning diameters of 14 to 103 inch / 360 mm to 2624 mm.

### RUAG Space Separation Systems

<table>
<thead>
<tr>
<th>Small system family</th>
<th>937 mm (37 inch) family</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 inch (15° and 15°)</td>
<td>937A (20° and 20°) @ 16 kN</td>
</tr>
<tr>
<td>17 inch (15° and 15°)</td>
<td>937B (15° and 15°) @ 25 kN</td>
</tr>
<tr>
<td>24 inch (15° and 15°)</td>
<td>937VS (20° and 15°) @ 20 kN</td>
</tr>
<tr>
<td>818S (15° and 15°) @ 24 kN</td>
<td>937VB (15° and 9°) @ 30 kN</td>
</tr>
<tr>
<td>937S (15° and 15°) @ 30-40 kN</td>
<td>937S (15° and 15°) @ 30-40 kN</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>1194 mm (47 inch) family</th>
<th>1666 mm (66 inch) family</th>
</tr>
</thead>
<tbody>
<tr>
<td>1194A (15° and 15°) @ 27 kN</td>
<td>1666A (15° and 15°) @ 30 kN</td>
</tr>
<tr>
<td>1194AX (15° and 15°) @ 40 kN</td>
<td>1666V (15° and 11°) @ 35 kN</td>
</tr>
<tr>
<td>1194V (15° and 9°) @ 30 kN</td>
<td>1666VX (15° and 11°) @ 32-38 kN</td>
</tr>
<tr>
<td>1194VX (15° and 9°) @ 35-40 kN</td>
<td>1666VSN (15° and 11°) @ 40 kN</td>
</tr>
<tr>
<td>1194VS (15° and 9°) @ 40-60 kN</td>
<td>1666MVS (15° and 11°) @ 40-60 N</td>
</tr>
<tr>
<td>1194VS (15° and 9°) @ 35-40 kN</td>
<td>16665 (11° and 11°) @ 45-60 kN</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2624 mm (103 inch) family</th>
</tr>
</thead>
<tbody>
<tr>
<td>2624 (9° and 9°) @ 45 kN</td>
</tr>
<tr>
<td>2624VS (9° and 15°) @ 40 kN</td>
</tr>
</tbody>
</table>

- **in production**
- **in development**
- **not active**
Compatibility with launchers and satellites around the world

Our Payload Adapter Systems can support a broad range of missions, from single launches of heavy spacecraft to missions with multiple, small-sized spacecraft. With our CBOD™ Separation System Release Mechanism we can provide the unique combination of high load capability and a low shock release.

High load capability

Spacecraft interfaces are our daily business

Low shock release
Payload Adapter System components:

Low Shock Separation Systems
- Clamp band or discrete point release systems
- Separation Spring Set

Aluminum/Composite Adapters
- Mission specific S/C adapter structures
- Launch vehicle adapter structures

Harness
- Separation System Harness
- S/C Harness
- Instrumentation Harness
- Umbilical Supports

Ground Support Equipment
- Installation GSE
- Handling Clamp Bands
- S/C Stands

Support Services
- RUAG Space Installation support during AIT
- RUAG Space support at fitcheck & launch

Satellite Dispensers

Dispensers for the European satellite navigation system Galileo
Based on the long experience of structures and systems for carrying and separating satellites, RUAG Space has developed and qualified the Dispenser for the European navigation system Galileo family of satellites.

The Dispenser – with a structural mass of less than 150 kg – carries and separates two 700 kg satellites into orbit. The system was flight proven with the successful maiden launch of a Soyuz ST-B from the European spaceport in French Guiana, in October 2011.
For a successful launch. We build reliable products.

RUAG Space products are chosen by today’s leading launch service providers. We have equipped every Ariane rocket with payload fairings since the very first launch in 1979, and our composite structures feature onboard American Atlas rockets. RUAG Space adapters and separation systems ensure there is a safe connection between satellite and rocket.

Payload Fairings and Launch Vehicle Structures
RUAG Space is the world’s leading supplier of composite technology payload fairings. Payload fairings are mounted at the tip of the launch vehicle to protect the satellites during the ascent and to make the shape of the rocket more aerodynamic.

RUAG Space produces the payload fairings for the European launch vehicles Ariane 5 and Vega and the American Atlas-V-500, and supplies the smaller Atlas-V-400 with the Interstage-Adapter ISA-400, a composite structure that connects the main stage and upper stage of the rocket. Our payload fairings have been used in over 220 rocket launches to date, and have never failed.

Payload Adapters and Separation Systems
RUAG Space is the world leader for payload adapters and separation systems used on commercial launch vehicles. Our separation systems ensure that satellite and rocket remain securely attached to one another during the tough journey into space, and then deliver the valuable payloads into orbit with precision. Our modular adapters mean that nearly all satellites can be fitted to almost every type of launcher.

RUAG Space equips Antares, Ariane, Atlas, Delta, Proton, Souyz and Zenit rockets. To achieve optimum performance, payload adapters are manufactured, as required, from aluminum or carbon fiber composites. Over 450 separations have been carried out in orbit using RUAG systems, with a 100 percent success rate.

Sounding Rocket Guidance
RUAG Space offers a range of products for sounding rocket guidance and for sounding rocket payload attitude control. RUAG systems are also currently used by NASA for their sounding rocket projects as well as on board ESA Maxus rockets.
RUAG Space is the leading supplier of products for the space industry in Europe. Experience, outstanding reliability, customer focus and a comprehensive, clearly structured product portfolio all make RUAG Space the partner of choice for manufacturers of satellites and launchers across the globe.

Our vision: Number one space product supplier
RUAG Space’s vision is to be the leading supplier of space products. We laid the foundations for realizing this vision as a partner in institutional European space programs from the very beginning. RUAG Space has played a part in all major European missions, where we have acquired know-how that benefits our customers all over the world today.

Our values: Collaboration, high performance, visionary thinking
Our corporate culture is based on the values of collaboration, high performance, visionary thinking. These values determine our actions and characterize our relationships with our customers and partners. For more than four decades RUAG Space has been an industrial partner to national and European space agencies. And we have been supplying our products to the manufacturers of satellites and launchers for just as long.
Outstanding product performance and consistency in meeting delivery deadlines are the yardsticks by which we measure success. And above all else we are focused on reliability, as there is no scope for failure in space.

At the heart of RUAG Space’s strategy is a clearly structured product portfolio, which we expand according to a definite plan. In expanding the portfolio, we place particular emphasis on space products that are attractive in growth markets outside the institutional European sphere.

The cornerstone of our success: Our employees
In Switzerland, Sweden and Austria, more than 1,100 employees of RUAG Space develop, manufacture and test products for satellites and launchers. Teamwork, trust and respect characterize the work environment at RUAG Space. Our employees work in close cooperation with customers and partners. The success of RUAG Space is based on the skills and commitment of our staff, on the accuracy and reliability of our mechanics, and on the creativity and know-how of our engineers.

RUAG Space: Part of an international technology group
RUAG Space is a dedicated division within RUAG, an international technology group for aerospace and defense. RUAG has its sites in Switzerland, Germany, Austria, Hungary, Sweden and the USA. RUAG employs 7,700 people worldwide.