Motors for use in vacuum should not only withstand the vacuum (no bursting of air inclusions), they must not contaminate the vacuum either. Through many years of experience with special materials for use in Space, we have put a focus on materials with minimal molecular outgassing and high heat resistance. This is the prerequisite for a high vacuum quality and genuine measurement results in scientific and medical applications.

For exact positioning in vacuum, stepper motors are therefore particularly suitable because they can precisely position even without sensitive feedback providers. Therefore Phytron linear actuators can be used in particularly challenging environmental conditions (radiation, cryo-temperatures).

Since stepper motors do not generate jitter effects while holding a position, this technology is ideal for precisely aligning optical instruments, mirrors, antennas or samples e.g. in high-resolution microscopes, particle accelerators or molecular analysis devices.

Phytron LA linear actuators for cryo (UHVC1;UHVC2) and UHV (UHVS) are completely dry lubricated.

**LA Linear Actuator**

For Applications in Ultra-High-Vacuum and Cryogenic Environment

- 2-phase stepper motor
- Diameter 25 mm
- Linear speed 1.5 mm/s
- Linear stroke 13 mm
- Screw pitch 1 mm
- Positioning accuracy <0,01 mm
- Operating temperature
  - Cryo version: UHVC1: -196 to -50 °C
  - UHVC2: down to -269 °C (on demand)
  - UHV version (UHVS): -40 to +150 °C
- Rotatory encoder with switching cam
- Linear limit switches for stroke limitation
- Temperature evaluation with K-type
- Mounting position: any
- Lifetime (worst case) 100 000 strokes min.

**Options**

- VGPL precision planetary gear

**Cleanliness**

Phytron motors for use in ultra high vacuum (UHV) contain only materials that also meet the requirements of the ECSS (European Space regulations). Thus, each material has a maximum TML (Total Mass Loss) value < 1% and a maximum CVCM (Volatile Mass Losses) value < 0.1 %. You will receive your UHV motor, double-wrapped and vacuum sealed..
### Vacuum Classes

<table>
<thead>
<tr>
<th>Vacuum Class</th>
<th>Winding Temperature [°C]</th>
<th>Vacuum class [hPa]</th>
<th>Thermocouple</th>
<th>Radiation-resistant up to [J/kg]</th>
<th>Conditioning of the components</th>
<th>First outgassing at phytron</th>
<th>TML [%]</th>
<th>CVM [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>UHVS</td>
<td>-40...+150</td>
<td>10&lt;sup&gt;11&lt;/sup&gt;</td>
<td>K type</td>
<td>10&lt;sup&gt;a&lt;/sup&gt;</td>
<td>yes</td>
<td>yes</td>
<td>&lt;1</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UHVC1</td>
<td>-196...-50&lt;sup&gt;1&lt;/sup&gt;</td>
<td>10&lt;sup&gt;11&lt;/sup&gt;</td>
<td>K type</td>
<td>10&lt;sup&gt;a&lt;/sup&gt;</td>
<td>yes</td>
<td>2&lt;sup&gt;A&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>solid lubrication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UHVC2</td>
<td>-269...-50&lt;sup&gt;1&lt;/sup&gt;</td>
<td>10&lt;sup&gt;11&lt;/sup&gt;</td>
<td>K type</td>
<td>10&lt;sup&gt;a&lt;/sup&gt;</td>
<td>yes</td>
<td>2&lt;sup&gt;A&lt;/sup&gt;</td>
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<tr>
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<td>solid lubrication</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<sup>1</sup> Short-term tests at room temperature are possible  <sup>2</sup> First outgassing is optional

### Linear Actuator LA 25.200.x-y-z

![Linear Actuator LA 25.200.x-y-z](image)

### Dimensions / Electrical and Mechanical Characteristics

<table>
<thead>
<tr>
<th>LA Standard</th>
<th>Electrical Characteristics</th>
<th>Mechanical Characteristics</th>
<th>Dimensions in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>200-steps 4 lead parallel</td>
<td>Current/Phase</td>
<td>Resistance/Phase</td>
<td>Current/Phase</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>Ω</td>
<td>Vdc</td>
</tr>
<tr>
<td>25.200.1.2</td>
<td>1.2</td>
<td>1.1</td>
<td>0.475</td>
</tr>
</tbody>
</table>

<sup>1</sup> Tolerance ±0.02  <sup>2</sup> rated current: at UHVS: 1.2 A; at UHVC1 and UHVC2: 1.5 A
All values given above refer to room temperature and atmospheric pressure.
### Dimensions

<table>
<thead>
<tr>
<th>Gear</th>
<th>Stepper motor size</th>
<th>Gear stage</th>
<th>Force max. [N]</th>
<th>Speed max. [mm/s]</th>
<th>Frequency max. [Hz] (full step)</th>
<th>Dimensions in mm</th>
<th>Mass (motor and gear) [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>VGPL 22</td>
<td>25</td>
<td>5:1</td>
<td>30</td>
<td>0.3</td>
<td>300</td>
<td></td>
<td>0.320</td>
</tr>
</tbody>
</table>

**Linear Actuator LA 25.200.x-y-z Front View**

**Linear Actuator LA 25.200.x-y-z with Gear**
### Motor Connection

**4-lead bipolar control**

- **Windings parallel**
  - A: yellow
  - B: red
  - C: green
  - D: blue

**Stepper motor connection**

**Thermocouple connection**

**Wires length: 500 mm**

### Control Electronics for Vacuum Application: phyMOTION™

**Modular stepper motor controller for in-vacuum applications**

The phyMOTION™ controller is ideally equipped for the demands of in-vacuum projects. Beside the encoder evaluation (differential incremental encoder with quadrature signals, absolute encoder acc. to SSI standard, BiSS- and EnDat-encoder) a resolver and thermocouple evaluation of each axis is possible for monitoring of the driven motors. This functions can be integrated as optional submodules of each axis – in addition to the default limit switch evaluations of each axis. The better part of cabling effort is eliminated because the power stages are already integrated.

All illustrations, descriptions and technical specifications are subject to modifications; no responsibility is accepted for the accuracy of this information.

### Ordering Code

**The variable elements of the product are displayed in colour.**

<table>
<thead>
<tr>
<th>Options</th>
<th>LA 25 200 1,2 - GPLS - UHVS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
<td>25</td>
</tr>
<tr>
<td><strong>Gear</strong></td>
<td>GPL5 – GPL5 - GPL5 - GPL5 - Solaris X 5:1</td>
</tr>
<tr>
<td><strong>Vacuum class</strong></td>
<td>UHVS UHVC UHVC1 UHVC2</td>
</tr>
</tbody>
</table>

* Rated current: at UHVS: 1.2 A, at UHVC1 and UHVC2: 1.5 A