The PRO165LM is part of Aerotech’s second-generation PRO-LM stage series with many improvements and added features. Enhanced positioning specifications, improved stiffness, and competitive pricing make the PRO165LM stage the ideal choice for both medium and high-performance production applications. The design is similar to the PRO115LM series, providing additional load capacity and stiffness with larger bearings and a wider cross-section.

**Rugged Mechanical Construction**
A long-life recirculating linear guide bearing system and a low-friction sealing solution make the PRO165LM an attractive solution for industrial applications such as laser machining. The basic external construction of the PRO165LM design provides protection from debris while the side-seals prevent dirt and particulates from entering the stage. The curved hard-cover design provides a natural shape that prevents excessive debris from collecting on the stage.

**Precision Motion Performance**
The PRO165LM series stages are optimized with high-precision, noncontact linear encoders that are protected from debris by the stage sealing system. Precision recirculating linear bearings along with machining and assembly craftsmanship enable excellent geometric performance specifications.

Incremental and absolute encoders are available as standard options and enable minimum incremental motion down to 5 nm and sub-micrometer repeatability.

**Accurate Positioning with ThermoComp**
Temperature changes and thermal effects are some of the largest error sources in precision machines. All PRO series stages are available with Aerotech’s ThermoComp feature, an embedded temperature compensation unit that guarantees accurate positioning in variable temperature environments. Using this feature protects your process from real-world conditions, even in extreme industrial settings.

**Direct-Drive Linear Motor**
Aerotech’s high-power U-channel linear motors drive the PRO165LM. The ironless forcer coil provides high force with zero cogging for super-smooth velocity and position control. This ironless design is ideal for applications requiring outstanding contour accuracy and smooth velocity profiling. As with all Aerotech linear motor stages, the linear motor has zero backlash, no windup, zero friction, and excellent dynamic responsiveness.

**Design and Integration Flexibility**
The PRO165LM is designed with many standard features and options that make the design incredibly flexible and allow it to be easily tailored to a specific application. The PRO165LM is available in 10 different models with travels ranging from 100 mm to 1000 mm and speeds up to 2 m/s. Configurable cable management solutions are available for single and multi-axis systems as standard options.

Standard mounting holes for both English and metric optical tables are present in all travels. The tabletop is available with both English and metric mounting patterns and can be ordered with brush attachments to clear any debris that may collect on the stage hard cover. Tabletops with hole patterns that allow the direct attachment of several Aerotech rotary stages are also available.

The PRO165LM series is also available with cleanroom preparation and vacuum versions.
## PRO165LM Series SPECIFICATIONS

### Mechanical Specifications

<table>
<thead>
<tr>
<th>PRO165LM</th>
<th>100</th>
<th>150</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>400</th>
<th>500</th>
<th>600</th>
<th>800</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel</td>
<td>±4 µm</td>
<td>±6 µm</td>
<td>±8 µm</td>
<td>±9 µm</td>
<td>±10 µm</td>
<td>±12 µm</td>
<td>±14 µm</td>
<td>±15.5 µm</td>
<td>±17 µm</td>
<td>±18 µm</td>
</tr>
<tr>
<td>Accuracy(1)</td>
<td>±1 µm</td>
<td>±1 µm</td>
<td>±1.5 µm</td>
<td>±1.5 µm</td>
<td>±1.5 µm</td>
<td>±2 µm</td>
<td>±2 µm</td>
<td>±2 µm</td>
<td>±2 µm</td>
<td>±2 µm</td>
</tr>
<tr>
<td>Resolution (Min. Incremental Motion)</td>
<td>5 nm (-E1 Encoder), 10 nm (-E3 Encoder)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bidirectional Repeatability(2)</td>
<td>±0.4 µm</td>
<td>±0.4 µm</td>
<td>±0.5 µm</td>
<td>±0.5 µm</td>
<td>±0.5 µm</td>
<td>±0.5 µm</td>
<td>±0.5 µm</td>
<td>±0.5 µm</td>
<td>±0.5 µm</td>
<td></td>
</tr>
<tr>
<td>Vertical Straightness(3)</td>
<td>±2.5 µm</td>
<td>±3 µm</td>
<td>±4 µm</td>
<td>±5 µm</td>
<td>±6 µm</td>
<td>±8 µm</td>
<td>±9 µm</td>
<td>±10 µm</td>
<td>±12 µm</td>
<td>±14 µm</td>
</tr>
<tr>
<td>Pitch</td>
<td>29 μrad (6 arc sec)</td>
<td>29 μrad (6 arc sec)</td>
<td>40 μrad (8.2 arc sec)</td>
<td>46 μrad (9.5 arc sec)</td>
<td>58 μrad (12 arc sec)</td>
<td>70 μrad (14.4 arc sec)</td>
<td>80 μrad (16.5 arc sec)</td>
<td>90 μrad (18.6 arc sec)</td>
<td>100 μrad (20.6 arc sec)</td>
<td>120 μrad (24.7 arc sec)</td>
</tr>
<tr>
<td>Roll</td>
<td>29 μrad (6 arc sec)</td>
<td>29 μrad (6 arc sec)</td>
<td>40 μrad (8.2 arc sec)</td>
<td>46 μrad (9.5 arc sec)</td>
<td>58 μrad (12 arc sec)</td>
<td>70 μrad (14.4 arc sec)</td>
<td>80 μrad (16.5 arc sec)</td>
<td>90 μrad (18.6 arc sec)</td>
<td>100 μrad (20.6 arc sec)</td>
<td>120 μrad (24.7 arc sec)</td>
</tr>
<tr>
<td>Yaw</td>
<td>29 μrad (6 arc sec)</td>
<td>29 μrad (6 arc sec)</td>
<td>40 μrad (8.2 arc sec)</td>
<td>46 μrad (9.5 arc sec)</td>
<td>58 μrad (12 arc sec)</td>
<td>70 μrad (14.4 arc sec)</td>
<td>80 μrad (16.5 arc sec)</td>
<td>90 μrad (18.6 arc sec)</td>
<td>100 μrad (20.6 arc sec)</td>
<td>120 μrad (24.7 arc sec)</td>
</tr>
<tr>
<td>Maximum Speed(2)</td>
<td>2 m/s</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Maximum Acceleration(2)</td>
<td>3 g</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load Capacity(3)</td>
<td>Horizontal</td>
<td>45 kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moving Mass</td>
<td>2.6 kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage Mass</td>
<td>8.2 kg</td>
<td>9.1 kg</td>
<td>9.9 kg</td>
<td>10.7 kg</td>
<td>11.6 kg</td>
<td>13.3 kg</td>
<td>14.9 kg</td>
<td>16.6 kg</td>
<td>20.0 kg</td>
<td>23.3 kg</td>
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<tr>
<td>Material</td>
<td>Anodized Aluminum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MTBF (Mean Time Between Failure)</td>
<td>20,000 Hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Certified with -PL1 option.
2. Requires the selection of an appropriate amplifier with sufficient voltage and current.
3. Axis-orientation for on-axis loading is listed.
4. Specifications are for single-axis systems measured 25 mm above the tabletop. Performance of multi-axis systems is payload and workpoint dependent. Contact factory for multi-axis applications.

### Electrical Specifications

| Drive System | Brushless Linear Servomotor |
| Feedback | Noncontact Encoder |
| Incremental – 1 Vpp and TTL (0.1 µm) Output |
| Absolute – EnDat 2.2 |
| Maximum Bus Voltage | 340 VDC |
| Limit Switches | 5 V, Normally-Closed |
| Home Switch | Near Center |

### Recommended Controller

<table>
<thead>
<tr>
<th>Multi-Axis</th>
<th>A3200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ndrive HLe/Ndrive CP/Ndrive HPe/Npax</td>
</tr>
<tr>
<td>Ensemble</td>
<td>Ensemble HLe/Ensemble CP/Ensemble HPe</td>
</tr>
<tr>
<td>Single Axis</td>
<td>Soloist</td>
</tr>
<tr>
<td></td>
<td>Soloist CP/Soloist HPe</td>
</tr>
</tbody>
</table>
Cantilevered load capability of the PRO165LM.

Measurement data showing successful compensation of thermal related positioning errors at several temperatures using the ThermoComp feature. Results are typical of stage performance with and without ThermoComp.
PRO165LM Series Accessory Tabletop DIMENSIONS

DIMENSIONS: MILLIMETERS

- TT3 MOUNTS THE FOLLOWING
  ADRS  ADRT  AGR
  -100  75
  -150  -150  100°

*SIDE MOUNT NOT AVAILABLE

8X M5x0.8  Ø 8.3
28X M6x1.0  Ø 7.0
8X 5.8 THRU ALL
16X 5.8 THRU ALL

www.aerotech.com
PRO165LM Series Cable Management (-CMS0) DIMENSIONS

PRO115LM/PRO165LM -CMS0

PRO190LM -CMS0

PRO225LM/PRO280LM/PRO560LM -CMS0

MOTOR/ENCODER FEEDBACK

MOTOR POWER

CONNECTOR INTERFACE

6 MM AIR LINE CONNECTION FORCER COOLING

DIMENSIONS: MILLIMETERS
**PRO165LM Series ORDERING INFORMATION**

### Travel (Required)

- **-0100**: 100 mm travel stage
- **-0150**: 150 mm travel stage
- **-0200**: 200 mm travel stage
- **-0250**: 250 mm travel stage
- **-0300**: 300 mm travel stage
- **-0400**: 400 mm travel stage
- **-0500**: 500 mm travel stage
- **-0600**: 600 mm travel stage
- **-0800**: 800 mm travel stage
- **-1000**: 1000 mm travel stage

### Mounting Orientation (Required)

- **Normal mounting orientation**
- **-MT1**: Side-mounted or vertical orientation
- **-MT2**: Inverted mounting orientation

### Tabletop (Required)

- **-TT1**: Tabletop with metric dimension mounting
- **-TT2**: Tabletop with English dimension mounting
- **-TT3**: Accessory tabletop with mounting for select rotary stages
- **-TT4**: Tabletop with metric dimension mounting and wiper brushes
- **-TT5**: Tabletop with English dimension mounting and wiper brushes
- **-TT6**: Accessory tabletop with mounting for select rotary stages and wipers

**NOTE**: -TT1 or -TT4 tabletop option required for lower axis of XY.

### Feedback (Required)

- **-E1**: Incremental linear encoder, 1 Vpp
- **-E2**: Incremental linear encoder, 0.1 µm digital TTL output
- **-E3**: Absolute linear encoder, EnDat 2.2

### Cable Management (Required)

- **-CMS0**: No external CMS, motor/feedback connector bracket on carriage
- **-CMS1**: External CMS for single axis
- **-CMS2**: External CMS for lower-axis of two-axis PRO (XY) assembly
- **-CMS3**: External CMS for lower-axis of two-axis (XZ or XT) assembly
- **-CMS4**: External CMS for upper-axis of two-axis PRO (XY) assembly
- **-CMS5**: External CMS for upper-axis of two-axis (YZ or YT) assembly
- **-CMS6**: External CMS for lower-axis of three-axis (XYZ or XYT) assembly
- **-CMS7**: External CMS for lower-axis of three-axis (XZT) assembly

### Lifting Hardware (Optional)

- **-LF**: Lifting hardware

**NOTE**: Lifting option only available on travels 400 mm and greater. Lifting should never be ordered on the upper-axis of an XY set (only order on lower-axis).

### ThermoComp (Optional)

- **-TCMP**: ThermoComp integrated thermal compensation, single or lower axis

**NOTE**: An A3200 controller must be used with the -TCMP option

### Metrology (Required)

- **-PL0**: No metrology performance plots
- **-PL1**: Metrology, uncalibrated with performance plots
- **-PL2**: Metrology, calibrated (HALAR) with performance plots
Integration (Required)

Aerotech offers both standard and custom integration services to help you get your system fully operational as quickly as possible. The following standard integration options are available for this system. Please consult Aerotech if you are unsure what level of integration is required, or if you desire custom integration support with your system.

<table>
<thead>
<tr>
<th>-TAS</th>
<th>Integration - Test as system</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Testing, integration, and documentation of a group of components as a complete system that will be used together (ex: drive, controller, and stage). This includes parameter file generation, system tuning, and documentation of the system configuration.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>-TAC</th>
<th>Integration - Test as components</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Testing and integration of individual items as discrete components that ship together. This is typically used for spare parts, replacement parts, or items that will not be used together. These components may or may not be part of a larger system.</td>
</tr>
</tbody>
</table>

Accessories (to be ordered as a separate line item)

- ALIGN-NPA  Non-precision XY assembly
- ALIGN-NPAZ Non-precision XZ or YZ assembly
- ALIGN-PA10  XY assembly; 10 arc sec orthogonality. Alignment to within 7 microns orthogonality for short travel stages.
- ALIGN-PA10Z XZ or YZ assembly with L-bracket; 10 arc second orthogonality. Alignment to within 10 microns orthogonality for short travel stages.
- ALIGN-PA5  XY assembly; 5 arc sec orthogonality. Alignment to within 3 microns orthogonality for short travel stages.
- ALIGN-PASZ XZ or YZ assembly with L-bracket; 5 arc second orthogonality. Alignment to within 5 microns orthogonality for short travel stages.