The most preferred driver is recommended to be specified by GMT as considerations. For different needs, please choose the suitable driver based on real functional needs. The motorized stage performance might not meet specified on the catalogue.

<table>
<thead>
<tr>
<th>Motor type / Shaft type</th>
<th>Motor manufacturer</th>
<th>Motor model</th>
<th>Rated current</th>
<th>Step angle</th>
<th>Excitation maximum static torque</th>
<th>Rotor inertia (Kg*m²)</th>
<th>Driver Manufacturer (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-phase stepper motor/Double shaft</td>
<td>TAMAGAWA</td>
<td>TS3667N13E7</td>
<td>0.75A</td>
<td>0.72°</td>
<td>0.24 N-m</td>
<td>0.068x10^-4</td>
<td>GMT</td>
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<tr>
<td></td>
<td>TAMAGAWA</td>
<td>TS3667N11E3</td>
<td>1.4A</td>
<td></td>
<td>0.13 N-m</td>
<td>0.035x10^-4</td>
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<tr>
<td></td>
<td>SANYO</td>
<td>TS3641N12E3</td>
<td>1.2A</td>
<td>0.05 N-m</td>
<td>0.09 N-m</td>
<td>0.015 N-m</td>
<td>GMT</td>
</tr>
<tr>
<td></td>
<td>SANYO</td>
<td>TS3617N13E8</td>
<td>1.2A</td>
<td>0.32 N-m</td>
<td>0.16 N-m</td>
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<tr>
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<td>SANYO</td>
<td>TS3617N11E1</td>
<td>0.95A</td>
<td>0.008x10^-4</td>
<td>0.018x10^-4</td>
<td>0.025x10^-4</td>
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<tr>
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<td>SANYO</td>
<td>SH2285-5231</td>
<td>1.0A</td>
<td>0.37 N-m</td>
<td>0.2 N-m</td>
<td>0.01x10^-4</td>
<td>GMT</td>
</tr>
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<td>SANYO</td>
<td>SH2281-5231</td>
<td>1.0A</td>
<td>0.37 N-m</td>
<td>0.2 N-m</td>
<td>0.01x10^-4</td>
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</tr>
<tr>
<td></td>
<td>SANYO</td>
<td>SH2258-5231</td>
<td>1.0A</td>
<td>0.37 N-m</td>
<td>0.2 N-m</td>
<td>0.01x10^-4</td>
<td></td>
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<tr>
<td></td>
<td>SANYO</td>
<td>SH2258-5231</td>
<td>1.0A</td>
<td>0.37 N-m</td>
<td>0.2 N-m</td>
<td>0.01x10^-4</td>
<td></td>
</tr>
</tbody>
</table>

2-phase stepper motor of Japanese brand is alternative specification suggested for standard grade motorized stage optional reference only.

Testing equipment: laser interferometer, Zeiss coordinate measuring machine. In testing, fix the stage bottom board and move the stage workbench.

Positioning precision (unit: μm)
Within predetermined testing range, from the starting position, move and position in a specific direction and measure the difference between actual value and target value. Use the maximum difference as positioning precision.

Repeatability positioning precision (unit: 3μm)
Use laser interferometer or Zeiss coordinate measuring machine (CMM) to repeat measurement for seven times. With half of the obtained maximum error from the error based on one direction to any point stop, measure in the middle point of movement distance and in the directions of two ends and obtain the maximum difference as the repeatability positioning precision.

Missed step (lost stroke at reverse rotation) (unit: μm)
Within predetermined testing range, from the origin, make movement positioning for any point from positive direction command, measure actual movement value; make negative direction command (same pulse number) for movement positioning and measure actual movement value; make positive direction (same pulse number) command for movement positioning and measure actual movement value. Make positive direction and negation direction movement seven times and measure the individual actual movement values. The average will be the missed step.
Testing equipment: micrometer. In testing, fix stage and move stage workbench.

Parallelism (unit: μm)
Put the stage on granite workbench. Use micrometer or Zeiss coordinate measuring machine (CMM) for measurement. At the middle of stage work area, use the measured maximum difference as the parallelism.

Dynamic parallelism (unit: μm)
Put the stage on granite workbench. Set micrometer on the workbench and measure on granite. The measured maximum difference is the Dynamic parallelism.

Dynamic straightness (unit: μm)
Within predetermined testing range, from the starting position of stage, move in a specific direction and use standard gauge block as basis to measure the difference between actual value and target value for horizontal straightness and vertical straightness. Use the maximum difference as Dynamic straightness.
Testing equipment: laser interferometer, Zeiss coordinate measuring machine.

In testing, fix the stage bottom board and move the stage workbench.

Within predetermined testing range, from the starting position, move and position in a specific direction and measure the difference between actual value and target value. Use the maximum difference as positioning precision.

Use laser interferometer or Zeiss coordinate measuring machine (CMM) to repeat measurement for seven times. With half of the obtained maximum error from the error based on one direction to any point stop, measure in the middle point of movement distance and in the directions of two ends and obtain the maximum difference as the repeated positioning precision.

Within predetermined testing range, from the origin, make movement positioning for any point from positive direction command, measure actual movement value; make negative direction command (same pulse number) for movement positioning and measure actual movement value; make positive direction (same pulse number) command for movement positioning and measure actual movement value. Make positive direction and negation direction movement seven times and measure the individual actual movement values. The average will be the missed step.

Parallelism (unit: μm)
Put the stage on granite workbench. Use micrometer or Zeiss coordinate measuring machine (CMM) for measurement. At the middle of stage work area, use the measured maximum difference as the parallelism.

Dynamic parallelism (unit: μm)
Within predetermined testing range, from a stage starting position, move in a specific direction and measure the difference between actual value and target value. Use the maximum difference as Dynamic parallelism.
Dynamic vertical (unit: μm)

Put the stage on granite workbench. Set micrometer on the workbench and measure on the standard gauge block. The measured maximum difference is the Dynamic vertical.

Testing equipment: micrometer.
In testing, fix stage and move stage workbench.

Positioning precision (unit: ”)

Within predetermined testing range, from the starting position, move and position in a specific direction and measure the difference between actual value and target value. Use the maximum difference as positioning precision.

Repeated remove positioning precision (unit: ±”)  

According to baseline, set testing standard angle for movement. In clockwise (counterclockwise) direction, fix the angle for positioning and repeat seven measurements. In the same direction, use the half of the maximum difference from any stop point as Repeatability positioning precision value.

Missed step (lost stroke at reverse rotation) (unit: ”)

Select clockwise rotation for angle positioning and set the position x1. Continue counterclockwise rotation for angle positioning and set the position y1. Set arbitrary position for seven measurements. Measure in the middle of movement distance and in the direction of two ends. The obtained maximum is the missed step.

Missed step calculation:

$$\max \left( \frac{(x_1 + x_2 + x_3 + \ldots + x_7)}{7}, \frac{(y_1 + y_2 + y_3 + \ldots + y_7)}{7} \right)$$
within predetermined testing range, from a starting position, move in a specific
direction and measure and check if the distance from bench to circle center falls
within target value, which is the height of rotation center.

Within predetermined testing range, from a starting position, move in a specific
direction and measure and check if the actual circle center falls within target value, which is the rotation center deflection precision.

Testing equipment: altimeter, Zeiss coordinate measuring machine.
In testing, fix stage and move meter.

Testing equipment: altimeter, Zeiss coordinate measuring machine.
In testing, fix stage bottom board and move the stage workbench.

Testing equipment: allimeter, Zeiss coordinate measuring machine.
In testing, fix stage bottom board and move the stage workbench.

Testing equipment: allimeter, Zeiss coordinate measuring machine.
In testing, fix stage bottom board and move the stage workbench.

Within predetermined testing range, from a starting position, move in a specific
direction and measure and check if the actual circle center falls within target value, which is the rotation center deflection precision.

According to baseline, set standard angle position for movement plane and
fix and position rotation angle in clockwise (counterclockwise) direction. Measure the difference between actual value and target value in 360° rotation. The obtained maximum is the positioning precision.

Use any angle in clockwise (counterclockwise) direction as standard,
measure deviation for stop angle for seven times. With half of the obtained maximum error, in the middle of movement distance and the direction of two ends, obtain the maximum value as the Repeatability positioning precision.

Select clockwise rotation for angle positioning and set the position x1. Continue
counterclockwise rotation for angle positioning and set the position y1. Set arbitrary position for seven measurements. Measure in the middle of movement distance and in the direction of two ends. The obtained maximum is the missed step.

Missed step calculation:

$$\text{max} \left( \frac{x_1 + x_2 + \ldots + x_7}{7}, \frac{y_1 + y_2 + \ldots + y_7}{7} \right)$$
Testing equipment: micrometer.
In testing, fix stage and move meter.

Parallelism (unit: μm)
Put the stage on granite workbench. Use micrometer or Zeiss coordinate measuring machine for measurement. At the middle of stage work area, use the measured maximum difference as the parallelism.

Testing equipment: micrometer.
In testing, fix stage and move meter.

Dynamic parallelism (unit: μm)
Put the stage on granite workbench. Use micrometer on the stage workbench or Zeiss coordinate measuring machine for measurement. As the stage workbench makes one rotation, use the maximum measurement difference as the Dynamic parallelism.

Testing equipment: micrometer.
In testing, fix the stage bottom board and move the stage workbench.

Dynamic concentricity (unit: °)
Within predetermined testing range, from a starting position in the circumference, move in a specific direction and measure the maximum difference between actual value and target value as Dynamic concentricity.