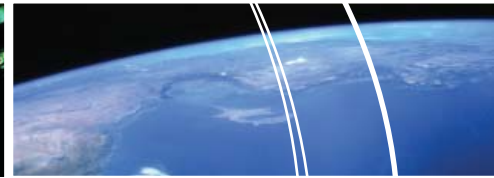
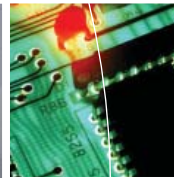
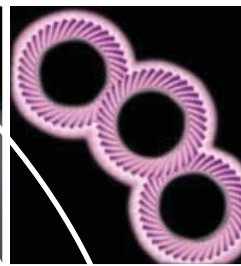
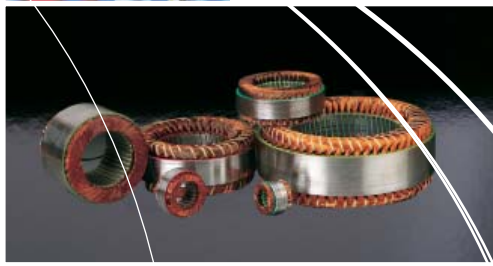
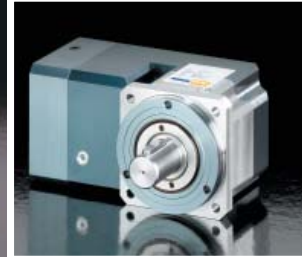
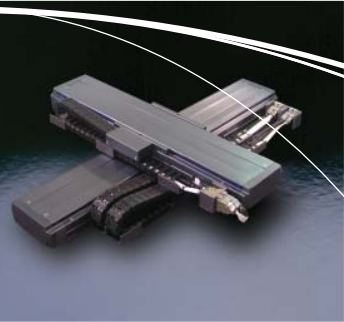


Parker
BAYSIDE[®]



PRECISION PRODUCTS for the Motion Control Industry

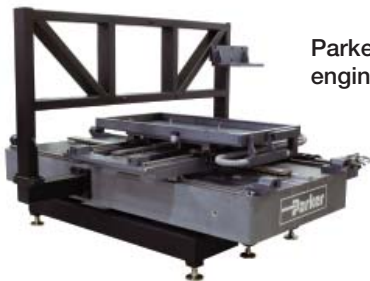


Parker Hannifin Corporation

A Fortune 300 company with annual sales exceeding \$9 billion and more than 400,000 customers in 46 countries, Parker Hannifin is the world's leading supplier of innovative motion control components and system solutions serving the industrial, mobile, and aerospace markets. We are the only manufacturer offering customers a choice of electromechanical, hydraulic, pneumatic, or computer-controlled motion systems.

Total System Solutions

Parker's team of highly qualified application engineers, product development engineers, and system specialists can turn pneumatic, structural, and electromechanical products into an integrated system solution. Moreover, our Selectable Levels of Integration™ allows you to choose the appropriate system, subsystem, or component to meet your specific need.



Parker offers complete engineered systems.

First in Delivery, Distribution, and Support

In today's competitive, fast-moving economy, what good is an application that isn't ready on time? This is especially true when compressed design cycles make the quick delivery of critical components essential. With factories strategically located on five continents, Parker offers an unrivaled delivery record, getting solutions out our door and onto your floor faster than ever.

Parker also has the industry's largest global distribution network, with more than 8,600 distributors worldwide. Each of these locations maintains ample product inventory to keep your downtime to a minimum. And many distributors have in-house design capabilities to support your system and subsystem requirements.

Throughout the design process, Parker's factory-trained electro-mechanical engineers work hand in hand with you and day or night at 1-800-C-Parker. Our operators will connect you with a live, on-call representative who will identify replacement parts or services for all motion technologies.



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Parker world headquarters in Cleveland



Training

Parker's best-in-class technology training includes hands-on classes, Web-based instruction, and comprehensive texts for employees, distributors, and customers. Parker also provides computer-based training, PowerPoint presentations, exams, drafting and simulation software, and trainer stands.

parkermotion.com

Our award-winning Web site is your single source for

- Product information
- Downloadable catalogs
- Motion-sizing software
- 3D design files
- Training materials
- Product-configuration software
- RFQ capabilities



24/7 Emergency Breakdown Support

The Parker product information center is available any time of the day or night at 1-800-C-Parker. Our operators will connect you with a live, on-call representative who will identify replacement parts or services for all motion technologies.

A SOLUTION FOR EVERY AXIS



As someone looking for a motion control solution, you know there are countless manufacturers out there promising to solve your challenge. So what makes Parker Bayside so special? As part of Parker Hannifin's Electromechanical Automation Division, Parker Bayside is backed by the expertise, drive for innovation and high-quality products and systems of an \$9 billion global presence in the motion control industry.

With a solution for every axis, Parker Bayside is a world-class manufacturer of electronic and mechanical motion control products, including linear and rotary positioning systems, servo motors and drives, gearheads and gearmotors. Our passion for excellence and focus on new technologies give you an unsurpassed level of commitment that means your automation objectives are solved quickly and efficiently. And to ensure your application is operating at 100%, we give you the support of our experienced team of technical professionals, 24/7.

Parker's Electromechanical Automation Division brings together leading brands in industrial and high-tech automation, including not only Bayside, but Acroloop, Compumotor, CTC, Custom Servo Motor and Trilogy. Designed for easy configuration to make a complete motion system — from miniature precision for life sciences to overhead gantries for the factory floor — these best-of-breed individual components are available separately, so you can build a motion system from the ground up, or as a complete motion system to make integration simple, fast and easy. For more details, please visit us at parkeremotion.com.

Thank you for your interest in Parker Bayside. We look forward to putting you in motion!



PARKER BAYSIDE

DELIVERING HIGHLY ENGINEERED ELECTROMECHANICAL SYSTEMS
AND COMPONENTS THAT IMPROVE PRECISION, INCREASE PRODUCTIVITY,
AND CREATE VALUE FOR CUSTOMERS.

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Product Line Overview

Linear, Vertical & Rotary Positioning Stages

Linear, Vertical & Rotary Stages

| Product Series | Feature | Width (mm) | Travel (mm) | Length (mm) | Max. Load (kg) | Actuation | Accuracy | Repeatability |
|----------------------|--|----------------------|--------------|--------------|----------------|---|--------------------|----------------------|
| LM | Long Travel Precision | 100 to 250 (3 sizes) | 200 to 1,400 | 565 to 1,765 | 650 | Ball Screw | ±60µm to ±8µm | ±15µm to ±5µm |
| | Long Travel Precision | 100 to 250 (3 sizes) | 200 to 2,000 | 503 to 2,388 | 650 | Linear Motor | ±20µm to ±3µm | ±15µm to ±2µm |
| Micro | Low Profile High Precision | 50 to 150 (4 sizes) | 25 to 200 | 164 to 538 | 652 | Ball or Lead Screw | ±23µm to ±8µm | ±10µm to ±5µm |
| Ultra | Side Driven Open or Solid Frame | 200 to 600 (4 sizes) | 100 to 500 | 256 to 768 | 2,187 | Ball Screw, Lead Screw, or Linear Motor | ±10µm to ±3µm | ±5µm to ±3µm |
| | Ultra High Precision | | | | | | ±10µm to ±1µm | ±5µm to ±0.5µm |
| Z Wedge ¹ | True Vertical Motion | 100 to 200 (3 sizes) | 10 to 25 | 210 to 265 | 20 | Ball Screw | ±7µm to ±5µm | ±2µm |
| ZP200 | 25 mm vertical Travel | 200 | 25 | 200 | 75 | Ball Screw | | |
| Rotary | Rotary Motion Ultra Precision | 100 to 200 (3 sizes) | 360° | 130 to 230 | 250 | Direct Drive | ±24 to ±12 arc sec | ±8.2 to ±4.1 arc sec |
| | Rotary Motion Precision High Load, High Torque | 100 to 300 (4 sizes) | 360° | 55 to 108 | 1000 | Worm Gear | 2 arc min | 0.2 arc min |
| 200 RT | Rotary Motion Precision Low Profile | 100 to 300 (5 sizes) | 360° | 46 TO 76.2 | 90 | Worm Drive | 2 arc min | 0.2 arc min |

Crossed Roller & Ball Bearing Linear Slides

| Product Series | Feature (mm) | Width (mm) | Travel (kg) | Max. Load | Material |
|----------------|-------------------------|---------------------------------|-------------------|-----------|-----------------------|
| SE | Extended Travel | 50 to 150 (4 sizes) | 25 to 400 | 980 | Aluminum or Cast Iron |
| SP | Limited Travel | 50 to 150 (4 sizes) | 25 to 150 | 395 | Aluminum or Cast Iron |
| SC & SK | Crank & Knob Lead Screw | 50 to 150 (4 sizes) | 25 to 100 | 395 | Aluminum or Cast Iron |
| SW | Double "V" Low Profile | 38 to 100 (3 sizes) | 25 to 225 | 871 | Aluminum only |
| 3500 | Miniature ball bearing | 0.59 to 1.06 (inches) (4 sizes) | 0.5 to 4 (inches) | 30 | Aluminum |
| 3900 & 4000 | Square profile | 1.25 to 5 (inches) (8 sizes) | 12.5 mm - 3 | 95 | Aluminum |
| 4900 | Heavy duty | 5 to 6 (inches) (3 sizes) | 2 to 12 inches | 140 | Aluminum |

Crossed Roller Bearing Sets

| Product Series | Feature | Roller Diameter (mm) | Length (mm) | Maximum Load (kg) |
|----------------|----------------|----------------------|-------------|-------------------|
| RC | Crossed Roller | 3 and 6 | 20 to 700 | 2,180 |

Manual Positioners

| Product Series | Feature (mm) | Width (mm) | Travel (kg) | Max. Load | Material |
|--------------------|-----------------------------|------------------------------|---------------------|-----------|----------|
| Drive Mechanisms | Micrometers, digital | — | — | — | Aluminum |
| Subminiature Stage | Subminiature stages | 11.2 mm | .125 to 0.5 | 12 | Aluminum |
| 3900 Drive | Square profile | 1.25 to 5 (inches) (8 sizes) | 12.5 mm -3 | 95 | Aluminum |
| 4000 Drive | Heavy duty slides | 5 to 6 (2 sizes) | 2 to 12 (inches) | 140 | Aluminum |
| 2500 | Tangent arm | 1.75 & 2.62 (2 sizes) | 360 with 10 degrees | 10 | Aluminum |
| 10000/20000 | low profile worm gear drive | 4.75 inches | 360 degrees | 50 | Aluminum |
| 30000 | Heavy load worm gear drives | 5 to 10 (inches) (8 sizes) | 360 degrees | 200 | Aluminum |

Multi-Axis System 3U Integrated Chassis

| Product Series | Number of Axes | Controller | Amplifier Type | Power /Axis | Input Voltage |
|----------------|----------------|------------|----------------|----------------|----------------|
| 3U | 1 to 4 | 5 Brands | Linear & PWM | 144 to 4,800 W | 115 to 230 Vac |

(1) Consult factory

Frameless Motors & Gearmotors

Servo Motors

| Product Series | Frame Size | Windings (Vdc) | Length (mm) | Continuous Torque T_C (Nm) | Maximum Speed (RPM) | Feedback |
|----------------|--------------|----------------|-------------|------------------------------|---------------------|----------|
| Frameless | 32 to 254 mm | 12 to 600 | 20 to 100 | 0.044 to 58.0 | 30,000 | N/A |

Gearmotors

| Product Series | Configuration | Frame Sizes | Cont. Torque (Nm) | Ratios | Backlash (arc minutes) | Gear Teeth | IP Rating | Windings | Feedback |
|-------------------------------|---------------|-------------------------------|-------------------|------------------------------------|------------------------|----------------------|-----------|--------------------|---------------------|
| GM | In-Line | 60 to 142 mm NEMA 23 to 56 | 3 to 60 | 5, 7, 10 (3 ratios) | < 10 | Helical Planetary | IP 65 | 160 Vdc 360 Vdc | Encoder Resolver |
| DX Servo Wheel | In-Line | 152 & 203 mm Wheel | 26 to 48 | 20 to 36 (4 ratios) | N/A | Planetary | N/A | 24 Vdc 48 Vdc | Encoder |
| GM 50 Pancake Gearmotor | In-Line | 120.65 | 2.0 to 19.8 | 10.51 42.47 100.65 152.51 | < 30 | Spur | IP65 | 12 VDC 24 vdc | Hall Sensor |

Gearheads

Gearheads

| Product Series | Gear Teeth | Configuration | Frame Sizes | Cont. Torque (Nm) | Ratios | Backlash (arc minutes) | IP Rating |
|-----------------|-------------------------------------|-----------------------------|--|-------------------|-------------------------|------------------------|-----------|
| PS | Helical Planetary | In-Line | 60 to 300 mm (8 sizes) | 5 to 4,181 | 3 to 100 (12 ratios) | < 3 | IP 65 |
| PX | Helical Planetary | In-Line | 60 to 142 mm NEMA 23 to 56 (3 sizes) | 18 to 158 | 3 to 100 (11 ratios) | < 8 | IP 65 |
| PV | Planetary | In-Line | 40 to 90 mm (3 sizes) | 3.5 to 71 | 3 to 100 (16 ratios) | <10 | IP64 |
| RS | Helical Planetary / Spiral Bevel | Right Angle | 60 to 300 mm (7 sizes) | 11 to 4,181 | 5 to 100 (9 ratios) | < 4 | IP 65 |
| RX | Helical Planetary / Spur Bevel | Right Angle | 60 to 115 mm NEMA 23 to 42 (3 sizes) | 7 to 45 | 5 to 100 (9 ratios) | < 14 | IP 65 |
| RT | Spiral Bevel / Helical | Right Angle Thru Bore | 90 to 220 mm (5 sizes) | 34 to 565 | 3 to 30 (5 ratios) | < 4 | IP 65 |
| RD | Spiral Bevel / Helical | Right Angle Double Shaft | 90 to 220 mm (5 sizes) | 23 to 565 | 1 to 30 (7 ratios) | < 4 | IP 65 |
| RB | Spiral Bevel | Right Angle | 90 to 220 mm (5 sizes) | 23 to 565 | 1 to 3 (3 ratios) | < 4 | IP 65 |
| NE | Spur | In-Line | NEMA 23 to 42 (3 sizes) | 50 to 350 | 3 to 100 (9 ratios) | < 10 | IP54 |
| NR ¹ | Bevel / Spur | Right Angle | NEMA 23 to 42 (3 sizes) | 50 to 350 | 1 to 100 (10 ratios) | < 15 | IP54 |

(1) Consult factory

Resources & Capabilities

● A Commitment to Excellence

Parker Bayside's Engineered Solutions Group is comprised of a uniquely qualified team of application, design and manufacturing engineers who are committed to provide Parker Bayside's customers with innovative, reliable and cost-effective positioning system solutions for their manufacturing processes.



● Ideal Infrastructure

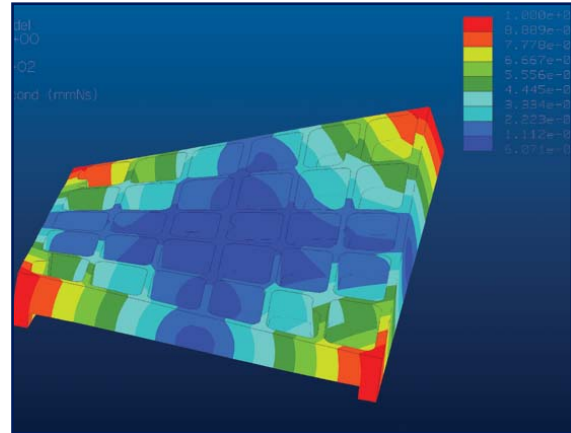
Parker Bayside's Engineered Solutions Group is supported by an effective, broad-based, corporate infrastructure. From one location, Parker Bayside designs and manufactures a wide range of motion control products, including linear positioning slides and stages, rails, motors, drives, controllers, gearheads and gearmotors. This capability provides an ideal infrastructure for cost-effective engineered solutions since they can be designed, built and integrated at one location into a single robust system.



Electronic Chassis

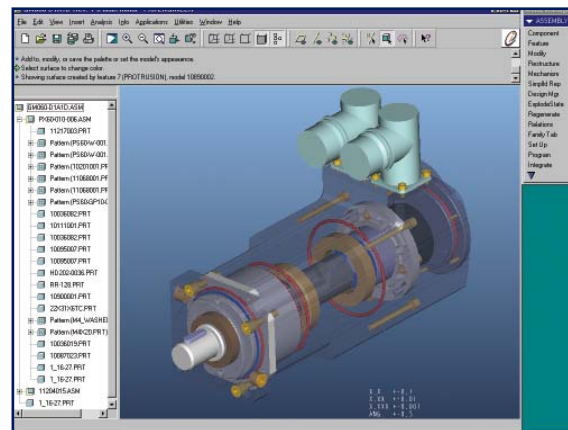
● Professional Capabilities

Parker Bayside's Systems Solution Group strives to become your dependable motion control positioning solution provider, and play a strategic role in achieving your new system development objectives. We follow your needs from the very early stages of conceptual ideas,



"FEA" Simulation

through a rigorous definition of system requirements, which in many cases we assist in developing. As partners, we may conduct various feasibility testing for verification of new ideas to meet challenging environmental conditions such as high vacuum, low magnetic field, tight space, high temperature and ground vibrations. These tests are conducted to assist us in providing you with our best possible recommended solution.



Pro / ENGINEER CAD Platform

● Strategic Partnership

Parker Bayside's Engineered Solutions Group has one main objective: to take your manufacturing process needs from concept to successful completion. Through an open channel of communication and joint planning, Parker Bayside's engineers will develop a cost-effective solution that meets or exceeds your expectations. Parker Bayside is looking forward to establishing a long-term strategic relationship with your company and project development team.

Parker Bayside's Six Step Project Process

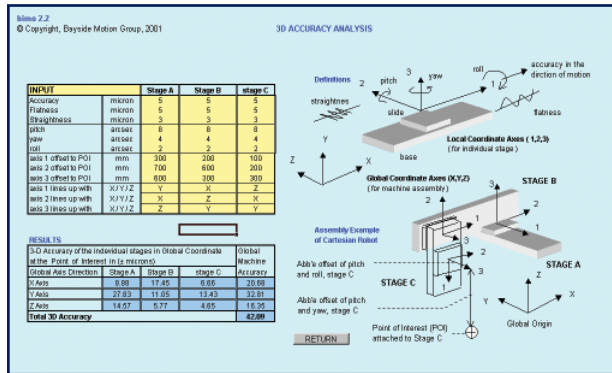
1 Understanding the Need

Whether your project is related to building semiconductor wafer processing machines or high-precision general manufacturing equipment, Parker Bayside's first objective is to understand your engineering needs.

Our industry specialists review your positioning specifications for completeness, clarity, consistency and feasibility, as well as the value that each required specification has toward the desired manufacturing process.

2 System Analysis

Once an engineered system and its requirements have been reviewed and defined, Parker Bayside's engineering team uses a proprietary software (BIMO) to gain a better qualitative understanding of the proposed system value as well as a quantitative understanding of optimal component sizing.



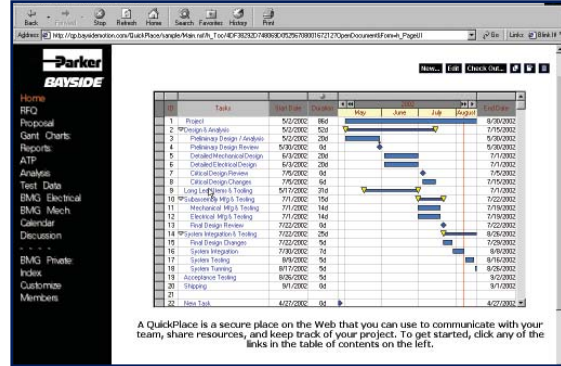
BIMO Analysis Tool

3 Solution Proposal

Equipped with an in-depth understanding of the need and a proposed solution, our system application engineers prepare a detailed document that highlights the requirements, cost effectiveness of various solution options, recommended configuration, selected components, price quotation, and delivery schedule.

4 Project Management

Each engineered system is assigned and led by a project manager who is responsible for ensuring that the project's process is begun and completed in a smooth, orderly and precise manner. To ensure accurate, up-to-date communication, the Project Manager utilizes a secured, web-based communication tool (QuickPlace) to keep all involved parties apprised of the project progress and details. The detail kept in the QuickPlace includes: Project Members, RFQ, Proposal, ATP, Gantt Charts, Tasks, Reports, System Analysis, Test results, Electrical Engineering, Mechanical Engineering and Discussion History.



View of QuickPlace

5 Acceptance Test

The Acceptance Test Procedure (ATP) is a mutually agreed upon document, which outlines the procedures, tools and methods used to verify that all project performances meet desired specifications. The acceptance test procedure is prepared well in advance to allow for the customer representatives to review it prior to their presence in this stage of the project.

6 After Sales Support

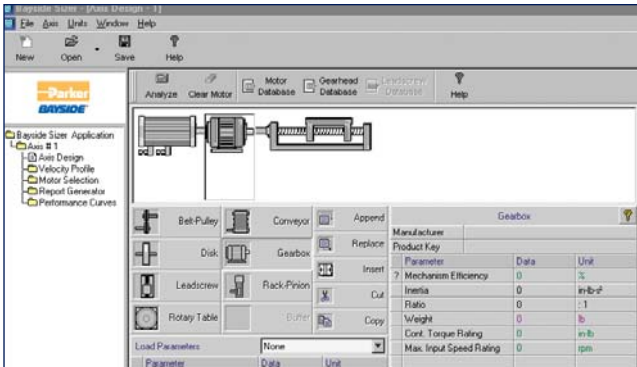
When the engineered system has been accepted by the customer, a Parker Bayside engineer is assigned to follow up the delivery at the customer's site. The engineer inspects the machine and powers it up. Training is also provided to the customer on site to assure proper readiness to start operation and maintain the machine.

Throughout the life cycle of the machine, Parker Bayside continuously monitors the status of the project and provides quick support when needed.



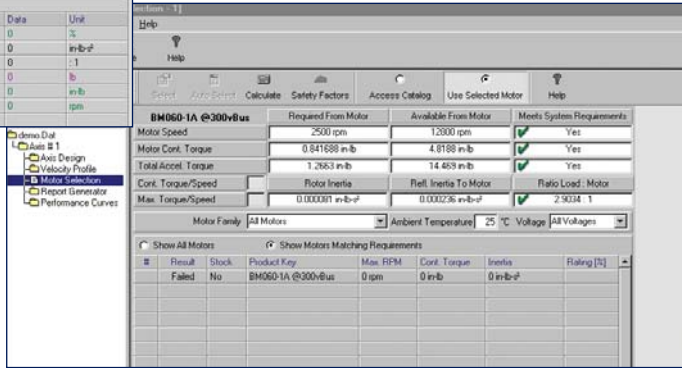
Acceptance Testing

Motion Workbench



Axis Design

Selection of components and entry of parameters to build an axis. The selection component will appear on screen as a graphical symbol.



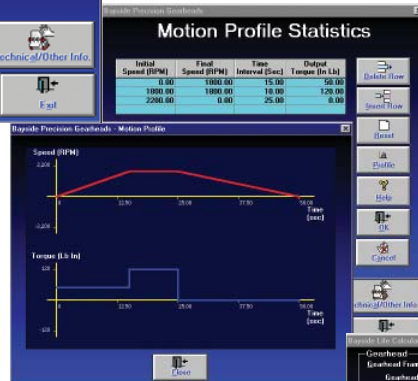
Motor Selection

Selects motor that meets system requirements and generates report with performance curve.

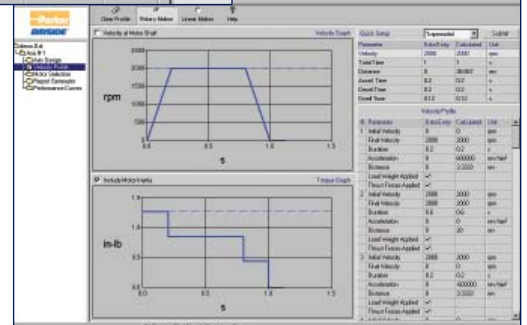
Life Estimator



Entry of application data for speed, torque, duty cycle loads and shock.

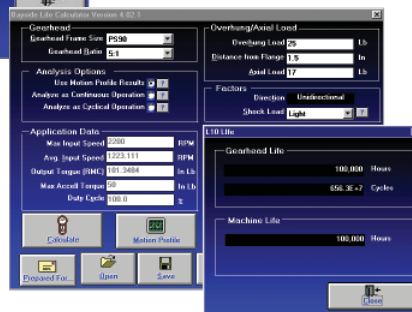


Profile - Entry of data for a specific velocity profile for each selections of accel, decel and dwell. It is also shown graphically.



Velocity Profile

Entry of data for a specific velocity profile. As data is entered for accel, decel and dwell, the profile is graphically shown.



L10 Life - Creates detailed application report and gearhead life.

BIMO

(Parker Bayside Integrated Motion Optimizer)

bimo 2.2
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SETTLING TIME ANALYSIS

system requirements

| | | |
|--------------------------------|-----|-------|
| system position bandwidth | hz | 30 |
| system damping coefficient | - | 0.1 |
| structural damping coefficient | - | 0.06 |
| moving mass | kg | 10 |
| resistance force during cv | N | 20 |
| resistance force during ramp | N | 20 |
| smoothness of motion during cv | %CV | 0.01 |
| position accuracy during dwell | mm | 0.001 |

chart scale factors

| | | |
|--------------------------|------|-----|
| motor force scale factor | N | 0.1 |
| position scale factor | mm | 1 |
| velocity scale factor | mm/s | 1 |

settling time and distance

| | | |
|-----------------------------|-----|----------|
| settling time during cv | sec | 0.2868 |
| settling distance during cv | mm | 428.6815 |
| settling time during dwell | sec | 0.2868 |

integration stability

| | | |
|----------------------------------|-----|---------|
| actual integration time interval | sec | 0.00013 |
| max recommended time interval | sec | 0.00067 |

estimated machine requirements

| | | |
|-----------------------------|------|---------|
| resonance magnification | db | 18.42 |
| machine stiffness | N/mm | 3344.01 |
| estimated natural frequency | hz | 92.08 |

(assume 60 db/dec at resonance)

motor requirements

| | | |
|------------------|---|--------|
| continuous force | N | 63.61 |
| peak force | N | 248.55 |
| duty cycle | | 0.07 |

RETURN

The dynamics and settling analysis assists in selecting the required motor forces needed to drive the stage in a motion profile, which is determined at the kinematic analysis phase.

bimo 2.2
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MOTOR / AMPLIFIER SIZING

force requirements

| | | |
|------------------------|---|--------|
| motor continuous force | N | 63.61 |
| motor peak force | N | 248.55 |

(note: without coil mass and attraction)

input company / motor selection

| | |
|--------------|--------------|
| company | TRILEGY |
| select model | IL-12-030-A4 |

motor specifications

| | | | |
|-----------------------------|---------|--------------|--------------|
| company / motor model | TRILEGY | IL-12-030-A4 | IL-06-075-A1 |
| continuous force | N | 76 | 10 |
| peak force (1 sec) | N | 240 | 30 |
| force constant (3 phases) | N/Arms | 8 | 10 |
| back emf constant (ptn/rms) | V/msec | 4 | 5 |
| resistance @ 25C (ptn) | Ohm | 0.4 | 0.5 |
| electrical time constant | msec | 0.21 | 0.25 |
| slider mass | kgm | 0.42 | 0.5 |
| magnet pitch | mm | 18 | 20 |
| magnetic attraction | N | 0 | 0 |
| thermal resistance | °C/Watt | 0.80 | 0.8 |
| power loss (ptn / 125C) | Watt | 131 | 150 |
| maximum coil temperature | °C | 130 | 130 |

motor temperature

| | | |
|----------------------------------|---|-------|
| coil temperature (above ambient) | C | 76.11 |
|----------------------------------|---|-------|

safety margins

| | | |
|------------------|---|-------|
| continuous force | % | 19.48 |
| peak force | % | -3.44 |
| coil temperature | % | 41.45 |

amplifier requirements

| | | |
|--------------------|------|-------|
| continuous current | Arms | 7.57 |
| peak current | Arms | 29.59 |
| DC bus voltage | V | 40.78 |

company: TRILEGY initial velocity: 1500 mm/sec
crash velocity: 54.01226 mm/sec
energy to absorbed: 0.014587 joule

motor: IL-12-030-A4

RETURN

The linear motor and amplifier analysis selects the motor that meets the force requirements obtained from the dynamic analysis.

The 3-dimensional accuracy analysis determines the effects of sensor stages parameters, assembly configuration and Abbe offsets on the overall accuracy of the machine.

bimo 2.2
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3D ACCURACY ANALYSIS

| INPUT | | Stage A | Stage B | Stage C |
|----------------------|--------|---------|---------|---------|
| Accuracy | micron | 5 | 5 | 5 |
| Flatness | micron | 5 | 5 | 5 |
| Straightness | micron | 3 | 3 | 3 |
| pitch | arcsec | 8 | 8 | 8 |
| yaw | arcsec | 4 | 4 | 4 |
| roll | arcsec | 2 | 2 | 2 |
| axis 1 offset to POI | mm | 300 | 200 | 100 |
| axis 2 offset to POI | mm | 700 | 600 | 200 |
| axis 3 offset to POI | mm | 600 | 300 | 300 |
| axis 1 lines up with | X/Y/Z | Y | X | Z |
| axis 2 lines up with | X/Y/Z | X | Z | X |
| axis 3 lines up with | X/Y/Z | Z | Y | Y |

RESULTS

| 3-D Accuracy of the individual stages in Global Coordinate at the Point of Interest in (z microns) | Global Machine Accuracy | | | |
|--|-------------------------|---------|---------|--------------|
| Global Axis Direction | Stage A | Stage B | Stage C | Accuracy |
| X Axis | 8.88 | 17.45 | 6.66 | 20.88 |
| Y Axis | 27.83 | 11.05 | 13.43 | 32.81 |
| Z Axis | 14.57 | 5.77 | 4.65 | 18.35 |
| Total 3D Accuracy | | | | 42.09 |

Assembly Example of Cartesian Robot

Abb'e offset of pitch and roll, stage C

Abb'e offset of pitch and yaw, stage C

Point of Interest (POI) attached to Stage C

RETURN

This software tools are made available as an aid to the selection of gearheads, motors and stages. These values are merely an estimate and we cannot accept the responsibility for their interpretation.