NetMotion, Inc.

www.netmotion.com

Specialty Components and Supply for Equipment Manufacturers in

Pharmaceutical

Laboratory

Vision/ Optics

Biotechnology

Biomedical

Bioscience

Semiconductor

Instrumentation

Chemical/ Food Processing

Fiber Optics

Robotics

Industrial

COMPETITVE PRICING!

NET MOTION

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NetMotion at a Glance

Also visit us on-line at
www.netmotion.com

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NetMotion, Inc. was established in December 1995 to create a distinct market identity in the industrial control industry for its line of motion control products. In 1998, the company expanded its product line to capital equipment components, becoming a value-added resource to equipment manufacturers and owners in any industry.

As industries continue in technological advancements and new designs, issues such as quality, contamination and efficiency have become important concerns. Therefore, component distributors must also meet and maintain the same criteria to cater to the industries. Understanding the need, NetMotion has positioned itself to be the preferred resource for these important components. In our selection of products, we do extensive market research to understand the market demands of the product and choose only the highest quality components. Our goal is to help equipment manufacturers and owners of various industries to eliminate steps in component sourcing and find the best product selections at one resource...NetMotion.

NetMotion Offers Solutions in

Pages 3~15

Pages 16~24

Pages 25~30

Pages 28~29

Pages 31~38

Pages 39~46

Look for these symbols throughout the catalog:

New Items

Application Notes

More Info On-Line

Technical Advisor

Service & Support

MOTION CONTROL

NetMotion has over 20 years of experience selling motion control components. Over the years we have expanded our product line to provide better solutions for our customer's needs. Our technical sales staff are always available to assist you with your design problems. We pride ourselves in our committment to serving you better. Don't hesitate to contact us should you have questions regarding your projects. We would be delighted to lend a hand!

Motion Control Applications & Advisory

Stepper Motors Selection Procedure

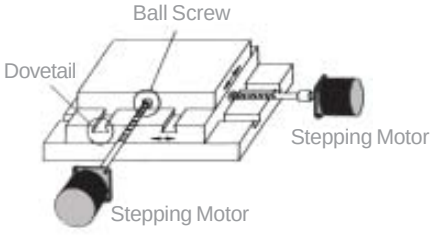
1. Determining the drive mechanism component Determine the mechanism and required specifications	First, determine certain features of the design, such as mechanism, rough dimensions, distance moved, and positioning period.
2. Calculate the required resolution Find the step angle resolution for the motor	From the required resolution, determine whether a motor only is to be used or whether a geared motor is to be used.
3. Determine the operating pattern Determine the operating pattern that fulfills the required specifications	Find the acceleration (deceleration) period and operating pulse speed in order to calculate the acceleration torque.
4. Calculate the required torque Calculate load torque Calculate acceleration torque Calculate required torque	Calculate the load torque and acceleration torque and find the required torque demanded by the motor.
5. Select motor Make a provisional selection of a motor based on required torque. Determine the motor to be used from the speed-torque characteristics.	Select a motor whose speed-torque characteristics satisfy the requirement.
6. Check the selected motor Confirm the acceleration/deceleration rate and inertia ratio.	Check the acceleration/deceleration rate and inertia ratio in order to determine the suitability of the selection

● **Selection Complete**

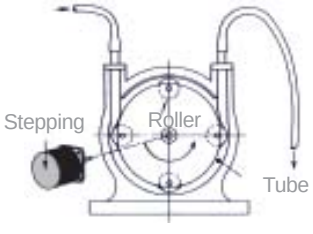
* If you have trouble selecting the right motor, please contact NetMotion for further assistance **sales@netmotion.com** or call **1-800-790-7837**

Samples Stepper Motor Applications

X-Y Table



Constant Flow Pump



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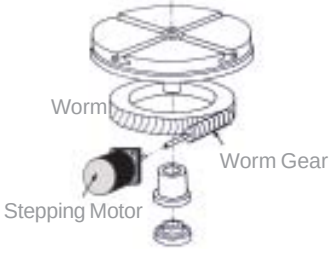

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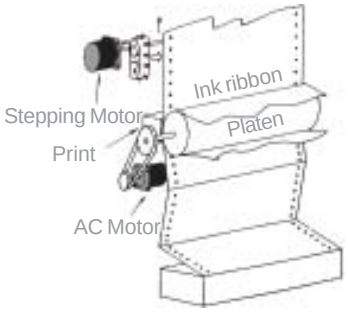
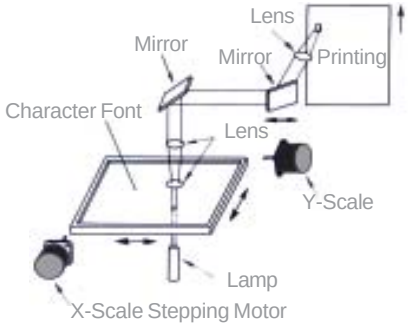
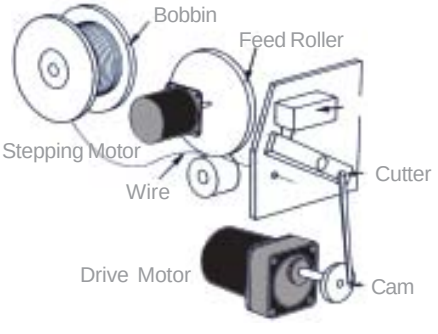


Photo Typesetting



Wire Cutter



Servo -vs- Stepper

Stepper motors are permanent magnet motors that 'Step' one increment each time the computer gives its control electronics one pulse. They don't require position feed back if run within their limits. When stopped they inherently hold their position. Servo motors are standard DC or Brushless motors with an encoder feedback loop. The computer reads the position of the motor and controls the power applied to the motor.

Stepper motors generally are just as accurate as servos and are simpler and more reliable and maintenance free in harsh dusty applications. The Servomotor's encoder is susceptible to dirt and vibration causing problems. Servo's are faster moving point to point and are better at accelerating very heavy machinery, but their higher maintenance should be a factor in deciding which to go with. Our stepper motor system can be just as fast or faster than many servo systems because of the control software's algorithms.

Many companies that sell servo controls try to run steppers down. They don't know how good a properly made stepper motor system can be! Our stepper systems never loose steps and can run for days with perfect repeatability.
A Servo system with dust on the encoder will loose steps!

Characteristics of Servo and Stepper Motors

Motion Characteristics	Servo Motors	Stepper Motors
High Torque, Low Speed	Can be considered if cost/complexity is not an issue.	Continuous duty aplicattions requiring high torque and low speed.
High Torque and High Speed (>2000 rpm)	Continuous duty applications requiring high torque and high speed. A DC servomotor can deliver greater continuous shaft power at high speeds compared to steppers. High speed up to 12000 rpm is possible. AC servo- motors can handle higher current surges compared to DC Servos. You can get lot stronger AC servo compared to either DC servo or DC stepper.	If speeds are less than 2000 rpm stepper may be economical. Stepper becomes bulky at higher torque.
Short, Rapid Repetitive Moves	Use servo if you need high dynamic requirements.	Stepper will offer more economic solution when requirements are more modest.
Positioning Applications	Servo can handle effectively when load is mostly inertia instead of friction. The ability to overdrive servomotor in intermittent duty allows a smaller motor to be used. If positioning is critical in micron level use servo.	Use Stepper motor if torque is lower than 500 oz-in, less 2000 rpm, low to medium acceleration rates.
Applications in Hazardous Environments.	Use Brushless servo motor.	Use step motor.
Low Speed, High Smoothness	Use DC servo.	Use microstepping.
Control Method	Closed loop.	Preferred to be used in open loop applications.

Examples of Servo Motor Applications

A.

B.

C.

A. Forming Machine

B. Servo-Press Machine

C. Microarray Staining Machine

AC Brushless Servo System

AC Servo Motors

- Fast Response
- Compact
- High Torque
- 30W ~ 1kW
- Ultra Compact Servo Motors
- Washdown
- CE & TUV Marked

SANYO DENKI

Amplifier PV Model

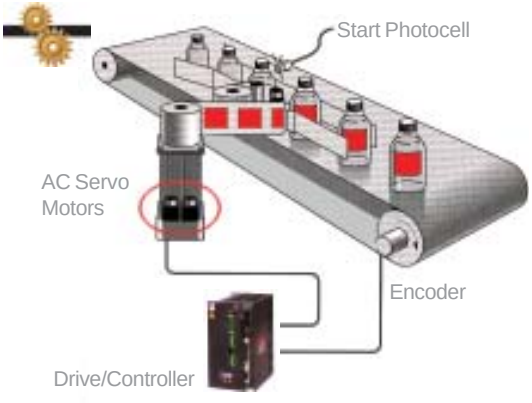
- Device Net
- Multi-Function
- Position, Speed, Torque Control

Amplifier PY Model

- Output 30W ~ 1.5kW
- Easy Connection
- Position, Speed, Torque Control
- Dynamic Brake Function
- Electronic Gear Function

Labelling Machine

Application Type: Following
Motion: Linear



Application Description:
Bottles on a conveyor run through a labelling mechanism that applies a label to the bottle. The spacing of the bottles on the conveyor is not regulated and the conveyor can slow down, speed up, or stop at any time.

Machine Requirements:

- Accurately apply labels to bottles in motion
- Allow for variable conveyor speed
- Allow for inconsistent distance between bottles
- Pull label web through dispenser

Motion Control Requirement:

- Synchronization to conveyor axis
- Electronic gearbox function
- Registration control
- Open-loop stepper if possible
- High torque to overcome high friction
- High resolution

Application Solution:
A motion controller that can accept input from an encoder mounted to the conveyor and reference all of the speeds and distances of the label roll to the encoder is required for this application. A servo system is also required to provide the torque and speed to overcome the friction of the dispensing head and the inertia of the large roll of labels. A photosensor connected to a programmable input on the controller monitors the bottles' positions on the conveyor . The controller commands the label motor to accelerate to line speed by the time the first edge of the label contacts the bottle. The label motor moves at line speed until the complete label is applied, and then decelerates to a stop and waits for the next bottle.

Servo Motor Selection

The choice of motor and drive as well as mechanical transducer is a very important step in servo system design, because non-optimal selection leads to poor system performance and increased installation and maintenance costs. It is still an important process to obtain correct specifications and safety margins. Below are 3 simple steps in selecting the right servo system for you.

1. Load Analysis
In order to select a motor of an appropriate size, speed and torque requirements have to be known first. Servo motors should have just enough speed, peak torque and rms torque capabilities, along with optimal gearing arrangement, to meet the load requirement as well as the cost objective. Equally important is selecting the type and size of the drive and power supply to meet the system requirements. Unfortunately, there is no simple straightforward procedure in servo system component selection. Nevertheless, a basic principle of analyzing the load and selecting a motor is presented here. It is assumed that the type of motor (brushed DC, PM synchronous motor, etc.) is already chosen. For more information, please contact NetMotion's motor specialist at 800-790-7837 pr sales@netmotion.com.

2. Selection of a Motor and Drive
Now, on the torque-speed curve of the selected motor, one can map calculated peak and rms torques can determine if the motor is suitable. If not, one can select a different size motor or the same motor with different winding for repeated procedure. Since motor performance is affected by the drive, it is best to work with system torque-speed curve. If system curve is not available, one may use motor curve to select the motor first, and then select a drive. When selecting a drive, it should be able to supply enough current and voltage to the motor to meet both peak and rms torque requirements. As a minimum, drive should supply peak and rms currents desired for the system.

3. Selection of Other System Components
The power supply in a servo system fundamentally delivers DC power to a servo amplifier. Depending on the specific servo amplifier chosen, the power supply may be internal to the drive, for which no selection process is required, or external, thus requiring selection decisions. In addition to the basic power sizing requirement, typical DC supplies for servo amplifiers include shunt regeneration circuitry which dissipates regenerative energy from the load when the motor is decelerated rapidly.

The power output rating of a power supply must exceed or equal to the combined average power of all servo drives operating simultaneously. The average power of an individual servo drive is based on the power calculation of rms torque and speed. Taking into account motor and drive losses, as a general rule, for permanent magnet servos (DC brush or brushless), 1 kW of input power is needed for every 750 watts (approximately 1 HP) of output power. In addition, power supplies often supply the logic power for the servo amplifier. The voltage ratings and ampacity of this power supply must also be appropriate for the amplifiers being supplied.
(*If you have any more questions and would like to discuss with us, please contact us at 800-790-7837 or sales@netmotion.com)

DC Brushless Servo System

DC Servo Motors

- Low DC Motor Inertia
- Maximum Torque
- Minimum Torque Ripples
- Low Electrical & Time Constant
- CE & TUV Marked

Amplifier PB Model

- Low Cost Servo
- Accepts Pulse & Direction
- Device Net
- RS 485
- High Resolution
- CE, UL, & TUV Marked
- Multi-Function
- Speed 0~4500 rpm

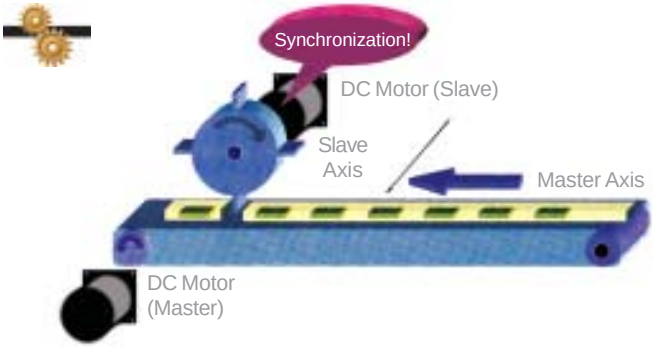
SANYO DENKI

Features of our DC Servo Motors:

1. Clears all European Safety Standards (CE-Marked).
2. Space-Saving! Has no protrusion for a brush holder.
3. A rich variety of models. Nine Models Available from 23 to 500W.
4. Excellent Rotation Performance. Small torque ripples and smooth rotation.
5. Compatible Design. Compatible with Other DC Servo Motors.

Servo Motor Selection

In distributed, multi-axis applications that require electronic gearing and cam profiles, synchronus, high-speed updates of position command are essential. NetMotion offers systems which will ensure complete synchronization between the controllers and all slaves at a high communication rate. Our product offers a set of drivetrain objects that can be used to electronically link axes together in geared or mapped relationships.



What's a permanent magnet DC motor?

The basic structure of a DC motor consists of the stator and a rotor. The *stator* is the stationary outside part of a motor. The *rotor* is the inner part which rotates. There are magnets in the rotor section with magnets or winding with a north polarization and maganets or winding with a south polariztion. Polarities attract making two maganets of the opposite poles come together.

The stator of a permanent magnet DC motor is composed of two or more permanent magnet pole pieces. The rotor is composed of windings which are connected to a mechanical commutator. In this case the rotor has three pole pairs. The opposite polarities of the energized winding and the stator magnet attract and the rotor will rotate until it is aligned with the stator. Just as the rotor reaches alignment, the brushes move across the commutator contacts and energize the next winding.

Standard Applicable Motors

Supported Amplifier Part Number	Motor Part Number	Maximum Stall Torque [N·m] (oz-in)	Rotor Inertia [X10^{-4}Kg m^2]	Weight [Kg] (lb.)	Bearable Thrust Load[N] (lbf)	Bearable Radial Load[N] (lbf)
PB1D001P100	PBM282D□*60	0.044 (6.23)	0.008	0.16 (0.35)	9.8 (2.203)	33 (7.42)
PB1D002P100	PBM423D□*60	0.39 (55.23)	0.056	0.35 (0.77)	9.8 (2.203)	49 (11.02)
	PBM503D□*60	0.57 (80.72)	0.12	0.59 (1.30)	14.7 (3.30)	96 (21.58)
PB1D003P100	PBM565D□*60	1.05 (148.69)	0.36	1.05 (2.32)	14.7 (3.30)	167 (37.54)
	PBM603D□*60	1.3 (184.09)	0.4	0.85 (1.87)	14.7 (3.30)	167 (37.54)

DC Motors For all Types of Applications

Features

- DC Motor with Spur Gear
- DC Motor with WormGear
- DC Motor - No Gearing
- Multi-function, Various Torque
- Applicable for all types of applications

Please Select From The following Applications:

DC Motors for Medical Applications - Linear Drives & Medical Technologies

Application	Model	Type & Gear Ratio	Description/ Note
Patient Lift	SWMK 403.347	DC Motor with Spur Gear 50:1	Actuates roller with ribbon. Park position (plastic deformation), selflocking function, 9V alkaline battery for emergency drive
Hospital Bed Adjustment	GMPG 404.515	DC Motor No Gearing	Linear actuator for hospital bed adjustment. Move different section of the bed. UL approved thermo switch with manual reset
Bath Lift	SWMK SW2K	DC Motor with Worm Gear 69:1	Actuates lead screw. Enclosure class of system. Current draw of motor
Toilet Lift	GMK 404	DC Motor with Worm Gear 210:1	Lifts seat synchronised. General machine construction, Laboratory appliances, medical appliances
Position Systems / Mammography	SWMK SW2K	**Please contact us	Used in all kinds of adjustments
Mattress Adjustment	GMK 404	**Please contact us	Mattress adjuster - moves different sections of the mattress
Wheel Chair Lift	GMK 404.753 SW2L 404.385 SW2L 404.386	DC Motor No Gearing DC Motor with Worm Gear 103:4	Actuates pneumatic pump of the lifting mechanism. Furniture / bed adjustment, lifts wheel chair
Foldable/ Portable Wheel Chair	SWMK 403.855	DC Motor with Worm Gear 69:1	Foldable, portable wheel chair that automatically lifts seat.
Telescopic Lifting Column	SWMK 403.559	DC Motor with Worm Gear 53:2	Actuates spindle.
Stair Lift	SW2L 4	**Please contact us	Actuates pinion on rack

DC Motors for Catering - AgriculturalApplications

Application	Model	Type & Gear Ratio	Description/ Note
Espresso Coffee Machine	GMPG 404.156/ 404.157 SWMK 403.559	DC Motor with Worm Gear 56:4 for model 404.157	Espresso Cafe Machine, Motor GMPG grinds beans, SWMK presses powder
Butter Portioning Machine	SW 7	DC Motor with Worm Gear	General machine construction, automatic machines, agricultural technology
Slicing Machine for Portioning Cold Cuts	SWMK 402.600	DC Motor with Worm Gear 55:1	Motor actuates the sled, worm wheel out of resin bond fabrics
Battery Driven Filter System for Cleaning Oil in Deep Fryers	GMK 404.752	DC Motor- No Gearing	Actuates pump
Mayonnaise, Ketchup Dispensers	GMPG 404.303	DC Motor with Worm Gear 62:1	Actuates pump for sauce dispense

More DC Motor Applications

DC Motors for Smart Building Concepts

Application	Model	Type & Gear Ratio	Description/ Note
Curtain & Blind Opener for Hospitals & Office	GMPI 404.636	DC Motor with Spur Gear 20:1	General machine construction, linear drives
Window Shading System for Conference Rooms	GMPG 404.748 GMPG 404.763	DC Motor with Worm Gear 210:1/ 62:1	General machine construction, automatic machines, agricultural technology. Actuates roller, noise reduction
Room Divider with Electric Adjustable Door	GMRG 404.593	DC Motor with Worm Gear 40:1	Actuates Door
Garage Door Opener	SWMK 403.033, SW2K	DC Motor with Worm Gear 78:1	Residential or collective door openers. Noise reduction, actuates chain worm. belt, selflocking function, Hall-IC, ref point device
Wing Gate Opener	GMPG 404.764	DC Motor with Worm Gear 210:1	Actuates worm, smart mechanic dis-/engagement
Sliding Wing Gate Opener / Parking Gate Opener	SWMV 402.826	DC Motor with Worm Gear 59:1	Actuates rack of the sliding gate / gear box of wing gate. Additional gearing, battery driven (cellular cells) stand-alone system, resin bond fabrics
Greenhouse / Skylight Window Opener	SWMP 403.280	DC Motor with Worm Gear 85:1	Greenhouse window actuator, Actuates spindles to open and close windows
Shop Door Opener	SW2K 403.930	DC Motor with Worm Gear 70:4	Door opener for shops, supermarkets, etc. Actuates sliding doors. Benefit: long duty cycle, voltage 3V, axial loads (timing belt)
Swimming Pool Cover	GMK 404.382	**Please Contact Us	Swimming pool cover, actuates pool tarpaulin

DC Motors for Distribution Applications

Application	Model	Type & Gear Ratio	Description/ Note
Mobile Stretch Machine - Packaging	SW2K 404.156 SW2K 404.258	DC Motor with Worm Gear 70:4	403.931 Used to move swinding arm (backdriving needed for manual operation); 403.258 used to adjust height of the stretch film roller (Hall encoder needed for positioning)
Logistical Inventory System (Inventory Sorting System)	SW2K 403.712	DC Motor with Worm Gear 83:2	Logistical invenotry systems: actuates warehouse goods dropping into box
Drug Dispensing Systems for Pharmacies	GMAG 403.821	DC Motor - No Gearing 83:2	Drug dispensing systems for pharmacies (motor actuates transport belt)
Unit Production System for Clothing Industry - Chain Drive Actuation	SWMV 403.362	DC Motor with Worm Gear 59:1	Unit production system for clothing industry, actuates chain drive for lifting clothes after sewing operations. Note: Worm wheel made out of resin bond fabrics in order to avoid plastic deformation of teeth.
Bottle Return, Can Scrap Machine	SWMP / GMPG4	DC Motor - No Gearing	Actuates belt for chest transfer
Airtube Systems - Shunt Actuation	SWMK 402.614	DC Motor with Worm Gear	Actuates Shunt
Mailing Systems	GMAG 402.781 SW2K 403.854	DC Motor with Worm Gear	GMAG 402.781: Machine for professional mailing (printing, folding, inserting, stamping) Motor wets envelopes SW2K 403.854: Machine for professional mailing
Valve Application	GMPG 404.334	DC Motor with Worm Gear	Electric valve, actuates valve

DC Motors for Office and Copy Machine Applications

Application	Model	Type & Gear Ratio	Description/ Note
Paper Feed Unit for Copy Machines	GMPG 404.390	DC Motor with Worm Gear 72:1	Glass fiber reinforced worm wheel with hexagon joint. Paper feed unit for copy machine. Motor actuates paper tray
Book/ Booklet Makers	GMPG 404.30 2/303/304/306/329	DC Motor with Worm Gear Various Gear Ratio	Booklet folding, greasing, thermo-binding
Paper Finisher Unit for Copy Machine	GMAG 404.694	DC Motor with Worm Gear 72:1	Glass fiber reinforced worm wheel with hexagon joint, 40mm armature stack. Actuates finisher
Paper Laminating Machines	SWMK 402.743 GMPG 404.156	DC Motor with Worm Gear 69:1 / 62:1	Actuates Roller
Wire Binding Machine	GMP 404.711	DC Motor with Worm Gear	Actuates roller to wind the wire into the paper
Offset Plate Developing Machine	GMPG 40	DC Motor / Ratio 6	Actuates transport rollers
Cutting Machine for Endless Perforated Papers	SWMP	DC Motor with Worm Gear	Cuts paper
Film Developing and Photo Printing Machines	SW2K 403.931	DC Motor with Worm Gear 70:1	Transports film at constant speed through photographic developer, battery driven to make sure film does not get spoiled if power if turned off.

Stepper Motors (2, 3, and 5 phase)

Features:

- 2, 3 & 5-phase
- General and Specialty Motors
- Size 8 through 42
- High Performance
- High Resolution
- High Torque
- Resonance -Free Operation
- Custom Designs Available

Donovan Micro-Tek

LIN ENGINEERING

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15°, 7.5° Miniature Motors

- Designed with Quality and Precision
- High Holding Torque
- High Start Up Speed

Specialty / Slim-Line Motors

- 0.36° ~ 1.8°
- Ultra Thin
- Compact
- Low Inertia / Light Weight
- High Speed Applications
- Custom Designs Available

Standard & High Torque 2-Phase Motors

- High Performance, High Resolution
- High Torque
- Resonance-free Operation
- Custom Designs Available

2, 3 & 5-phase Stepper Motors

- Full/Half Step/ Microstepping Drivers
- High Resolution
- High Torque
- Smooth Operation
- CE Marked Stepper Motors

Stepper Motors & Drivers Selection Chart

2PH Stepping Motors

Frame Size (mm)	Torque Range (oz-in)	Step Angle
11	9 ~ 16	1.8°
14	5 ~ 8	1.8°
17	4 ~ 85	0.9° ~ 1.8°
23*	28 ~ 188	0.45°, 0.9°, 1.8°
34*	180 ~ 920	1.8°
42*	1062 ~ 2690	1.8°

*** CE marked stepper motor and and drivers available**
Ask for stepper motor and drivers set. Call 800-790-7837

5PH Stepping Motors

Frame Size (mm)	Torque Range (oz-in)	Step Angle
28	3 ~ 7	0.72°
39	10 ~ 23	0.36°
42	18 ~ 31	0.36°, 0.72°
50	31 ~ 55	0.72°
60	91 ~ 262	0.72°
86	290 ~ 869	0.72°
106	1500 ~ 4700	0.72°

Ask for stepper motor and drivers set. Call 800-790-7837

How to Choose a Stepper Motor? (A Brief Overview)

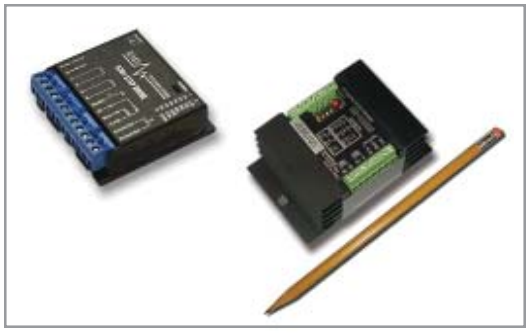
Stepper motors come in all sizes and resolutions. Most stepper motors have highe resolution. Some stepper motors rotate 7.5°per step, others rotate as little as 0.9°per step. Some stepper motors are strong enough to control X-Y tables, others only need to move the head of a CD-player.

In general, stepper motors of smaller sizes (1 inch diameter and about 0.75 inch thickness) have larger step sizes and less torque, while larger ones (1.5 inch cubed or so) have finer step sizes and more torque. While it is not an absolute guideline, motors that consume about 1W to 3W are “about right” in terms of torque and power.

The decision between a larger, fine step and high torque motor and a smaller, large step and low torque one is up to you. A smaller and lighter motor makes the overall size smaller and the overall mass lighter. However, due to the lack of torque and resolution, you need to gear down the drive axle of a smaller motor.

A larger, high resolution and high torque stepper motor can be directly attached to a drive wheel. This approach simplifies the mechanical design, but it adds more mass and increases the overall size. Most other school use these high torque and high resolution stepper motors.

Stepper Motor Drivers



Features:

- Ultra-Compact
- High Quality
- Active Midrange Stabilization
- High Voltage Input
- Thermal Protection
- Selectable: Full, Half, Microstep
- Selectable Clock Input
- Selectable Current Setting
- 100mA~12amp

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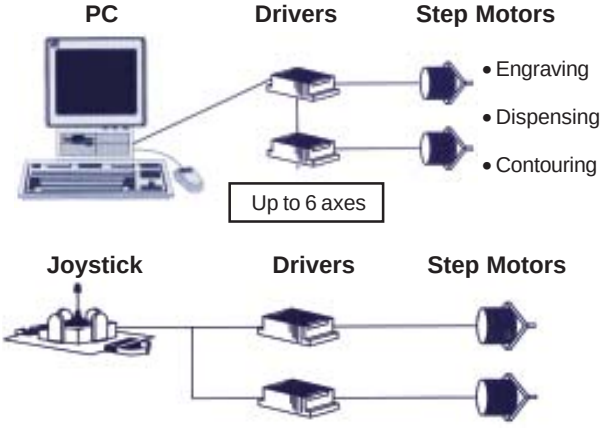
PLC, Joystick, Multiaxis, Open or Closed Loop

Examples:



- X-Y Stage for Inspection Equipment
- Measurement Equipment

Drivers and Motors Selection Chart

2PH Step Motor Drivers

Model	Max. Current Rating	Remark
RD021M8 CMTD5015 R208 RDA051 PMMMDXXXX RD122	1.5	Full & Microstep
RD023MS R701 R710 DA051 PMMBAXXXX RD123 RD126 RD323MS	2 ~ 6	Full & Microstep
RD02CMSH	3 ~ 12	Full & Microstep

*** We can provide AC or DC drivers.**
Please call for more information 800-790-7837 or 510-440-8040 x 216

5PH Step Motor Drivers

Model	Max. Current Rating	Remark
RD053N RD053MS RD153 PMMBAXXXX	0.75 ~ 6.0A	Full & Microstep

*** We have drivers with built-in oscillators and analog input for speed control. We also have drivers with AC inputs for high speed applications. Please call for more information 800-790-7837 or 510-440-8040 x 216**

Unipolar -vs- Bipolar Drivers

Unipolar

The name unipolar is derived from the fact that current flow is limited to one direction. As such, the switch set of a unipolar drive is fairly simple and inexpensive. The drawback to using a unipolar drive however, is it's limited capability to energize all the windings at any one time. As a result, the number of amp turns (torque) is reduced by nearly 40% compared to other driver technologies. Unipolar drivers are good for applications that operate at relatively low step rates.

Bipolar Chopper

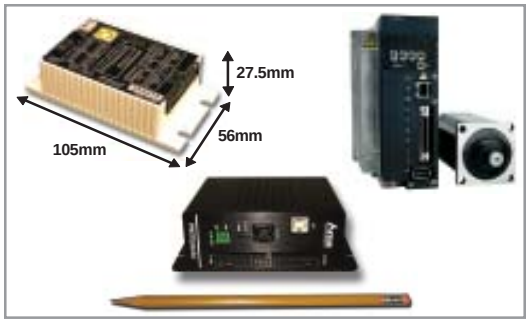
Bipolar chopper drivers are by far the most widely used drivers for industrial applications. Although they are typically more expensive to design, they offer high performance and high efficiency. Bipolar chopper drivers use an extra set of switching transistors to eliminate the need for two power sources. Additionally, these drivers use a four transistor bridge with recirculating diodes and a sense resistor that maintains a feedback voltage proportional to the motor current. Motor windings, using a bipolar chopper driver, are energized to the full supply level by turning on one set (top and bottom) of the switching transistors. The sense resistor monitors the linear rise in current until the required level is reached. At this point the top switch opens and the current in the motor coil is maintained via the bottom switch and the diode. Current "decay" (lose over time) occurs until a preset position is reached and the process starts over. This "chopping" effect of the supply is what maintains the correct current voltage to the motor at all times.

How to Select a Stepper Motor Driver

A stepper motor driver provides precisely controllable speed and positioning. The motor spins at precise increments with each control pulse, easily converting digital information to exact incremental rotation without the need for feedback devices such as tachometers or encoders. Because the system is open loop, the problems of feedback loop phase shift and resultant instability common with servo drives, are eliminated.

Load characteristics, performance requirements, and mechanical design, including coupling techniques, must be thoroughly considered before the designer can effectively select the most suitable motor and driver combination for an application. For more information, please visit our web site at:

Stepper and Servo Motor Controllers



Features:

- 4 Axes/Axis Controller Available
- Compact Designs
- Open & Close-Loop
- Programmable Speed
- Programmable Counter
- Programmable Timer
- High Speed Counting
- S-Curve Acceleration Control
- Stand-Alone Available
- Circular/ Linear Interpolation

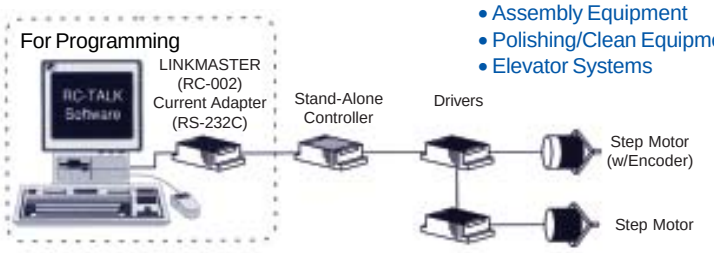
Arcus TECHNOLOGY

RORZE

SANYO DENKI

Example of Stand-Alone Open or Closed Loop Control for:

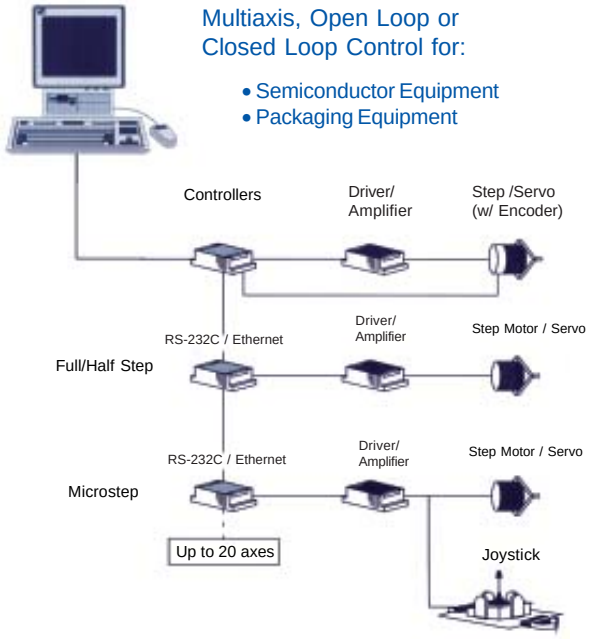
- Assembly Equipment
- Polishing/Clean Equipment
- Elevator Systems

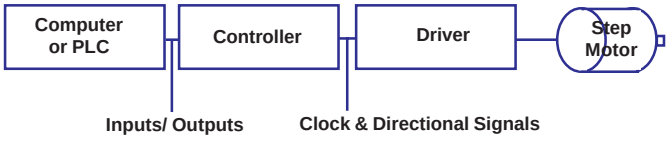


LinkMaster RC-002 is used in a NetMotion control system to convert the computer's RS-232C signal to current loop type for the I/O Master counter/ controllers.

Multiaxis, Open Loop or Closed Loop Control for:

- Semiconductor Equipment
- Packaging Equipment





LinkMaster RC-002 is used in a NetMotion control system to convert the computer's RS-232C signal to current loop type for the I/O Master counter/ controllers.

What is a Stepper Motor Controller?

Amount, speed, and direction of rotation of a step motor are determined by appropriate configurations of digital control devices. Major types of digital control devices are: Motor Drivers, Control Links, and Controllers. These devices are employed as shown on the right.

The Driver accepts clock pulses and direction signals and translates these signals into appropriate phase currents in the motor. The Indexer creates the clock pulses and direction signals. The computer or PLC (programmable logic controller) sends commands to the indexer. For more information, visit our site at: **www.netmotion.com**

Multi-Axis Control

Many motion applications have more than one motor to control. In such cases a multi-axis control system is available. A PC Bus step motor controller card for example, may have up to four indexers mounted on it; each one connected to a separate driver and motor. In a serial communication mode, up to 32 axes can be controlled from a single communication port and/or I/O channel.

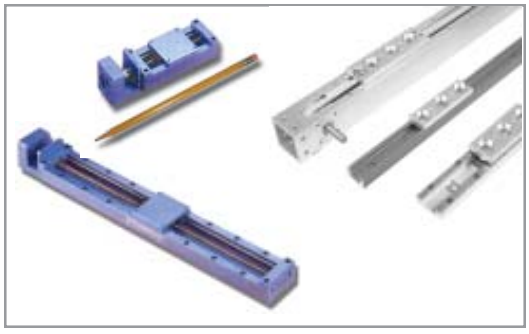
Some applications require a high degree of synchronization, such as circular or linear interpolation. Here, it may be necessary to coordinate the movement with a central processor. NetMotion provides a variety of single board or modular level controllers for these types of operations.

Controller Selection Overview

For more information, please contact us at 1-800-790-7837

Controller Model	Type / Feature
RC203	Single Axis Stepper Indexer
RC207	I/O Master Programmable Indexer
RC234	2 Axes Open/ Closed Loop Programmable Controller Circular & Linear Interpolation
Proteus-SA	4 Axes, Closed/Open Loop Visual Basic & LAb View Driver Circular & Linear Interpolation USB, Ethernet Interface Multitasking
Sanyo Denki	Single Axis Servo Controller Programmable
Simple Step	Step Motor + Driver +Controller pak for 17 frame step motor
Silverpak	Step Motor + Driver pak for 17 frame step motor

Linear Actuators / Slides



Features:

- Antifriction Operation and Low Noise
- Low installed Cost / Easy Installation
- Good Corrosion Resistance
- Smooth Running
- High Speed Capacity
- Unlimited Travel Lengths
- High Load Capacity
- High Temperature
- Cleanroom Compatible
- Compact Design
- Impervious to Contamination

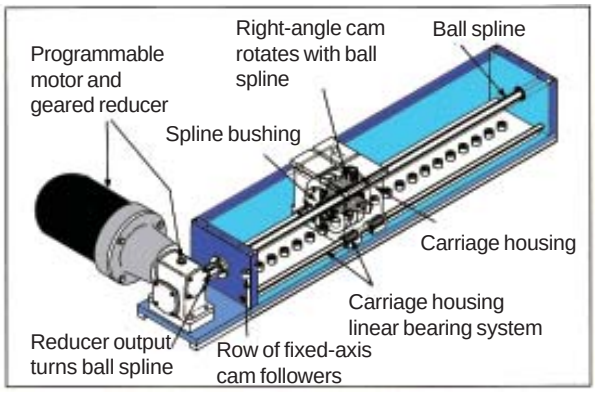
Actuators

The major components of linear motion systems can be categorized as: Actuators, Support systems (bearings), Control Systems and Components

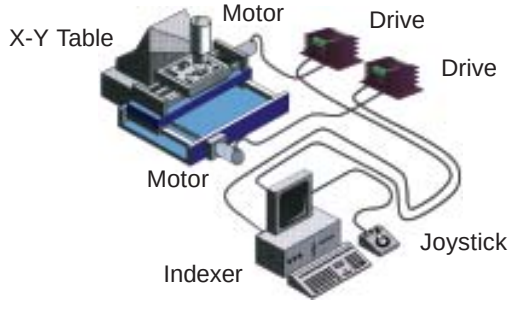
Common linear actuation devices for single axis motion included, but are not limited to:

- Various complex linkages such as a walking beam or slider crank mechanism.
- Gear rack and pinion set.
- Plate or disc-cam drive with fixed-axis follower.
- Cylindrical-cam drive with fixed-axis follower.
- Chain, belt, or cable drive in the linear part of its path, with or without special attachments.
- Plastic drive tape.
- Sliding-action leadscrew (usually acme screw), with nut.
- Ball-bearing leadscrew (ball-screw) with nut. The balls recirculate into and out of the load zone.

Example of a Cam-and-Screw Mechanism



Example: Circuit Board Scanning
X-Y Point to Point / Motion: Linear



Principle of an Efficient Linear Acutator

To get a highly efficient linear actuator with holding force, a requirement to be fulfilled is to act with a minimum of energy consumption and to work with a high efficiency of energy transformation all the time. This efficiency is split into several types of operation: A) the motion of the actuator has to be carried out with a high efficiency of energy transformationinto mechanical energy; B) the actuator has to hold the position without consumption of energy because the efficiency is zero if energy is needed to hold the position; and C) the efficiency of mechanical energy transformation from the actuator to the effective element has to be high.

Several energy conversion steps are possible. The number of steps has to be as small as possible, because every step causes waste of energy and reduces efficiency. Therefore, only one conversion step would be optimal. Source energy can be every kind of energy which could be converted into mechanical one. The uncontrolled source energy is electrical energy, and the final is mechanical. The last conversion step may be from mechanical to mechanical energy, for example from the potential energy of a spring to kinetic energy of the flap moving to its new position. Hence, the best actuator principle is to be selected. Different principles are already in use in the field of technology. The table below gives a summary of their efficiencies:

Actuator principle	Efficiency
Electrochemical Actuators	1.2 %
Shape memory alloys	5%
Piezoelectric effect (including voltage transformation)	39%
Electrodynamic effect	40%
Polarized electrical magnet (magnetomechanic conversion)	70%

Summary:
To get a highly efficient linear actuator with holding force, several actuator principles were evaluated. The most effective is the reluctance principle in the polarised version. The most efficient magnetic circuit is a magnetic bridge circuit. The structure of the magnetic circuit in a relay is more effective than in a stepping motor if both have the same air gap width. The stepping motor offers good chances of obtaining an efficient actuator device if air gap is thin. For more information, please contact sales@netmotion.com.

Application Description: X-Ray Scanning equipment used in the quality control of printed circuit boards and water chips.

System is an automated PC-based system that efficiently increases throughput and eliminates operator error. The host computer will interact with the motion control card using a "C" language program. The operator can manually override the system using a joystick.

Machine Requirements:
- 2-Axis analog Joystick
- Travel Limits
- Joystick button
- Encoder Feedback on both axes

Display Requirements:
- X and Y position coordinates
  Operator Adjustable Parameters:
- Dimensions of sample under test
- (0,0) position - starting point

Motion Control Requirement:
- Motors with accurate and automated positioning

- Manual Joystick Control
- Continuous display of X & Y axis position
- User-friendly operations

Ultra Compact Sensors

Compact Photomicrosensor, Photoelectric, Proximity Sensor, and Miniature Enclosed Switch

Features:

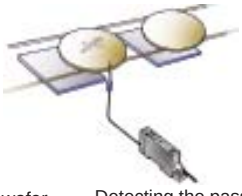
- Compact, thin models ensure ease of use
- Photomicrosensor model with built-in amplifier
- Optical fiber, self-contained, vane type photoelectric sensors
- Inductive type proximity sensor
- Subminiature enclosed switch
- Economical general-purpose enclosed switch
- Many models available

NEW YAMATAKE OMRON

Photoelectric Sensor Applications

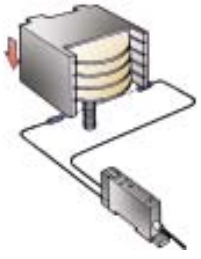
Detecting the leadwires of resistors

Detecting the wafers in drying furnace



Detecting the presence/ absence of seal rubber pieces of electrolytic capacitors

Positioning the wafer cases

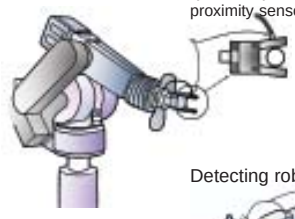


Detecting the passing of PCBs in a reflow furnace

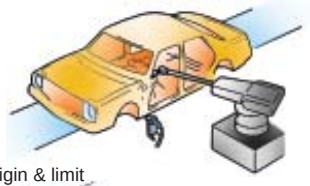
Proximity Sensor Applications

Checking robot hand gripping

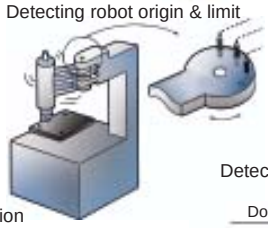
Very small cylindrical proximity sensor



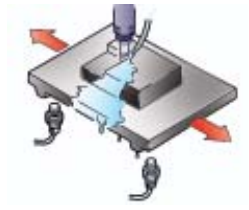
Welding Line



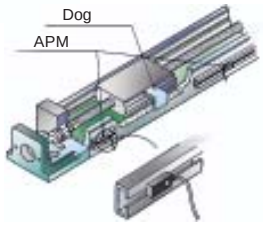
Detecting robot origin & limit



Machine dog detection



Detecting the position

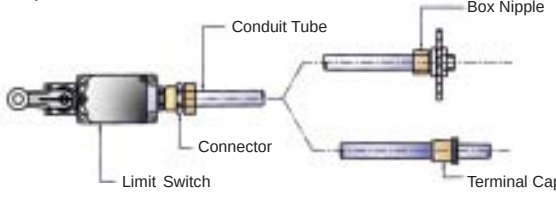


Sensors Advisory - Types of Sensors

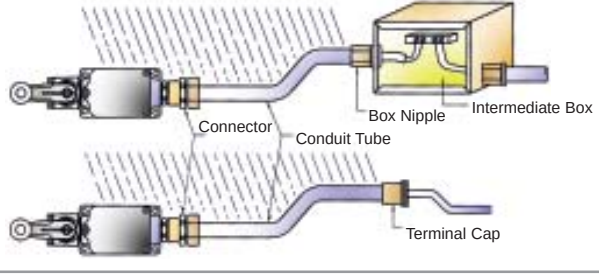
Snap action switch	• Low cost • Simple to Use • Contact bounce creates false signals • Rated IP60 to IP67 to match environment • Mechanical parts wearout • Requires physical contact • Wide range of actuators • Slow speed of operation
Limit switch	• Contact bounce creates false signals • Simple of Use • Rugged, rated IP65 or better for dusty, humid environments • Mechanical parts wearout • Requires physical contact • Wide range of actuators • Slow speed of operation
Small proximity Sensor	• Reliable digital output • Short sensing distance • Easy to install • Rugged, IP60 to IP67 to match environment • Requires metal to actuate sensor • Inductive or capacitive sensing
Photomicrosensor	• Fast, reliable digital output • Slight chance of interference from ambient light • Installs easily • No parts to wear out • Rated IP50 for clean, dry environments • Cost-effective • Slot, through-beam, diffuse, fiber-optic
Small Photoelectric Sensor	• Fast, reliable digital output • More expensive than a photomicrosensor solution • Wide range of capabilities, including fine-tuning controls • Through-beam, diffuse, retroreflective, fiber-optic

Limit Switch Applications

The connector is connected to the limit switch, and is attached to the intermediate box by means of the box nipple, ensuring sealability from the switch up to the intermediate box.



The connector is connected to the limit switch, flexible piping is provided only at locations subject to splashing by cutting fluid and chips , and the end of the conduit tube is capped by terminal cap and is open.



Uninterruptible Power Supplies

Low Capacity, True On-Line Continuous Clean Sine Waves Uninterruptedly At Times of Power Failure

SANUPS Series Systems

1~5 kVA (0.7 ~ 3.5 kW)

- Improved reliability by redundant parallel operation
- DIN-rail mountable or free-standing
- Supplying more stable and reliable power
- Reducing cost of at least 6%
- Easy to install and maintain
- Expandable power that is cost-effective and power saving

SANUPS-ASD-UL Series Systems

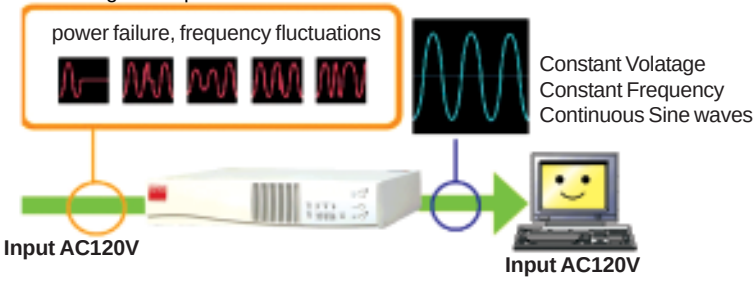
3.5 ~ 14kVA (2.8 ~ 11.2kW)

- Improved reliability by redundant parallel operation
- Extendable system design
- Small and lightweight
- Easy to install and maintain
- Network connecting ability

SANYO DENKI

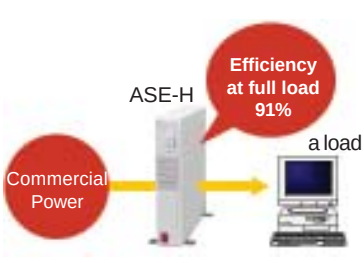
Supplying more stable & reliable power

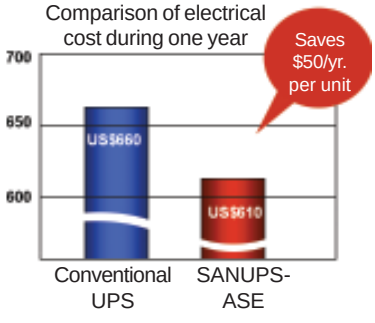
- Achieving a high reliability with parallel redundant operation.
- N+1 operation prepares for an unexpected unit trouble and improves inverter power supply
- Supplying complete sine wave uninterruptedly at the time of power failure
- Eliminating error operation of the load due to a wave disorder



Reducing Power consumption cost by at least 6%

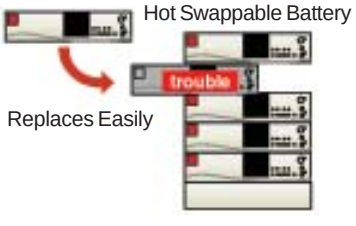
- Achieving 91% power conversion efficiency
- Contributing to protecting our natural environment

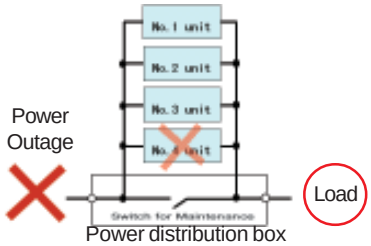




Easy to install and maintain

- Hot swappable batteries are easy to install
- Batteries may be replaced without halting the system operation
- Battery is located in the front of the unit
- Inverter unit can be changed without stopping system operation





UPS Advisory

AREAS WHERE UPS IS BEING USED

AVIONICS INDUSTRY, MILITARY
General Avionics
A.T.ESystems

HI-TECH-ELECTRONICS INDUSTRY & (OEM)
Communication Equipment
Graphic Systems
Medical Diagnostic Imaging Systems
Medical Monitoring Systems
P.C. B Designer and Production
Power Control Systems
Semiconductors
Telecommunication
TV Manufacturers

LABORATORIES
Agriculture Research Institute
Analytical Equipment Distributors
Chemical Industry
Food Industry
Pharmaceutical Industry & Research
Research Institute - Biotechnology
Uuniversities - Biology & Chemistry Labs

MEDICAL- HOSPITALS - CLINICS
Biotech Lab
Blood Bank
Cardiology Dept.
Gastro Antology Laboratory
Hematology Laboratory
Immunology
Intensive Care
Medical Research Labs
Neurobiology Laboratory
Pathology Laboratory
Pulmonary Function Dept.
Open Heart Surgery Room

FLUID HANDLING

Need more info?
Just give us a call!
1-800-790-7837

NetMotion provides a wide range of fluid handling components for your business needs. Products include those used to transfer gases, liquids, or granular materials, NetMotrion's wide range of applications includes chemical lines, pharmaceuticals, food and beverage, pump feed and discharge, water and fluid lines, laboratory use, biomedical appliance components, air and gas lines, and more. For more information, please contact our fluid handling specialist at 800-790-7837.

Fluid Handling Applications & Advisory

Applications for PFA, PTFE, PEEK Material

Adhesives, Beverage, Chemical Plants, Corrosives, Cryogenics, Deionized Water Transfer , Food Transfer , Lighting Covers , Laboratory , Medical , Paint Spray , Pure Water Systems , Sight Glass , Solvents , Water Sampling , Wire Insulation

Tensile Strength Values & Calculations:

PTFE: 2,500 psi
FEP: 3,000 psi
PFA: 4,000 psi
ETFE: 6,500 psi
PEEK: 13,000 psi

$$P = \frac{T(X^2 - Y^2)}{Y^2(X - Y^2)}$$

P= Burst Pressure
$x = \frac{OD}{2}$
$Y = \frac{ID}{2}$
P= Tensile Strength

The above equation is theoretical. It does not factor steam pressure, altitude, etc., and it is calculated at ambient room temperature. The Burst pressure result is meant as a guideline in design, not a definitive number.

Physical Properties

	PTFE	FEP	PFA	PEEK
Hardness Durometer Shore (D)	50-65	55	60	85-86
Tensile Strength, psi	3000-5000	3500	3500	14,065~14,500
Elongation at Break, %	200-400	300	300	20-60
Brittle Temperature	<-400°F	<-400°F	<-500°F	<-644°F
Max. Continuous Op. Temp.	500°F	400°F	500°F	500°F

**Values listed are typical and are meant only as a guide to aid in design. Field testing should be performed to find the actual values for the application.

Air/Gas Monitoring Sample Applications:

- Airborne Molecular Contamination (AMC) Monitoring
- Gas Monitoring
- Indoor Air Quality (IAQ) Monitors
- Air Pollution Control Technologies

PTFE, PFA and FEP are thermoplastic polymers that have some or all of their hydrogen replaced with fluorine. It is the fluorine that gives them some of the most unique properties of any plastic materials.

PTFE (polytetrafluoroethylene) is has the lowest coefficient of friction of any known material. It is also the most inert to chemical contact. Its excellent mechanical properties are maintained at low temperatures as well as at elevated temperatures (-459 to +550F). The drawback of PTFE in semiconductor and high-purity fluid handling is that it has greater porosity than PFA, making it more susceptible to particle and fluid entrapment.

PFA (perfluroalkoxy) has many of the same properties of PTFE, but has lower levels of metallic and organic extractables. It also has a smoother surface texture than PTFE. It is these properties that makes it used widely in semiconductor and pharmaceutical processing applications. And it has greater translucene when compared to PTFE.

FEP (fluorinated ethylene propylene) also has many of the same properties of PTFE, but has lower gas permeability than PTFE or PFA. Gases and vapors permeate at a rate that is considerably lower than other plastics. It also has a higher tensile strength, so is sometimes used in handling high-pressure fluid transfer applications. However, it does not have the thermal stability of PTFE. Its temperature limit is also about 100-degrees lower than that of PTFE.

All about Vespel®

Vespel® is a high performance polyimide material which is formed from resin manufactured only by DuPont. Polyimide materials are characterized by a ring-shaped molecular structure containing Nitrogen.

Vespel® is one of the highest performing engineering plastics currently available. Vespel® will not melt and can operate continuously from cryogenic temperatures to 550°F (288°C), with excursions to 900°F (482°C). Vespel® parts consistently exhibit superior performance in a variety of applications requiring low wear and long life in severe environments.

Vespel® Features

- Excellent temperature resistance
- High wear resistance (especially SP-21)
- Dimensionally stable
- Resistant to radiation
- Extremely low outgassing
- Relatively easy to machine

Vespel® Applications

Rotary seal rings , Thrust washers and discs , Bushings , Flanged bearings , Plungers , Printer wire guides , Spline couplings , Wear strips , Valve seats , Thermal and electrical insulators , Wafer clamping, polishing and grinding rings , Wafer guides & carriers , Vacuum pads , Die pickup collets

Vespel® Grades

SP-1

The unfilled base resin grade. SP-1 provides maximum physical strength, elongation, and toughness as well as the best electrical and thermal insulation values. Typical applications include spacers, high-temp fixtures, valve seats, balls, gaskets, insulators, and seals.

SP-21

SP-21 has 15% graphite by weight added to the base resin for increased wear resistance and reduced friction in applications such as bearings, thrust washers, bushings, seal rings, slide blocks and other wear applications. It has the highest mechanical properties of the graphite filled grades.

SP-211

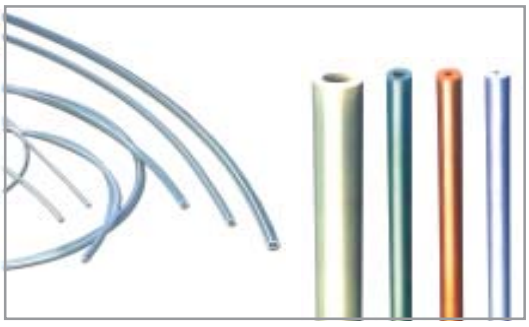
This grade has 10% Teflon PTFE and 15% graphite by weight added to the base resin for the lowest coefficient of friction over a wide range of operating conditions. It also has excellent wear resistance up to 300°F (149°C). Typical applications include sliding or linear bearings as well as many wear and friction uses listed above.

SP-3

SP-3 is 15% moly-filled (molybdenum disulfide solid lubricant) for wear and friction resistance in vacuum and other moisture-free environments where graphite actually becomes abrasive. Typical applications include seals, bushings, bearings, gears, and other wear surfaces in outer space, ultra-high vacuum or dry gas applications.

Precision Polymer Tubing

PFA, PFA-HG, PTFE, FEP, PEEK Tubing



Features of PFA, PTFE, and FEP:

- Chemical Inert; Low Permeability
- Lowest Coefficient of Friction of Any Solid Material
- Widest Service Temperature pf Any Plastic Tubing (-275°F to 500°F)
- Excellent Electrical and Weatherability Properties; Non-Flammable
- Made Without Plasticizer Which Can Leach Into Critical Streams
- Ultra-High-Purity Grades Available for the Semiconductor Industry

NICHIAS Corporation

Zeus Industrial Products, Inc.

PTFE, PFA AND PEEK TUBING IMPROVE PURITY IN CRITICAL PROCESSES

In the transfer of corrosive and ultra-pure liquids, PTFE, PFA and PEEK tubing have become the tubing materials of choice. Chemical, pharmaceutical and semiconductor processors cannot risk the use of materials that could contribute impurities into process fluids.

In chemical processing systems, PTFE tubing is used throughout because of its inertness to almost all chemicals including nitric, sulfuric and phosphoric acids, even at high temperatures and high concentrations.

In pharmaceutical processing systems, PTFE and PFA are FDA-approved materials offering inertness and high-purity properties.

Solvents, acids, photoresist and ultra-pure water are essential in the production of microelectronic devices. Even trace amounts of non-volatile or ionic extractables measured in parts-per-billion can create unacceptable yield levels in semiconductor processing. PFA (perfluoroalkoxyalkane) tubing has emerged as the tubing material of choice in the semiconductor processing field because of its excellent chemical resistance and extremely low extractables. For the most demanding cleanliness applications, PFA-HG is gaining wide acceptance.

Where a rigid plastic fluid transfer tube is needed, more and more designers are specifying PEEK (polyetherether ketone) in their systems. For example, PEEK tubing is now replacing PFA tubing in the pumping of reagent and chemicals from storage bottles. Because they are rigid and can reach the bottom of the bottle or tank, the processor is assured that they are using the entire chemical available to them.

PEEK™ Tubing Available!

PEEK polymer, a ***polyetheretherketone*** **resin**, is the material of choice for various applications due to their outstanding combination of physical properties. Contact us for more information!

Fluoropolymer Tubing Advisory

PFA tubing is widely used in the semiconductor, laboratory, environmental and pharmaceutical industries where ultrapure chemicals (including water) require precise quality control. Other areas of utilization are automotive, electrical and appliance markets.

PFA tubing can be used in general chemical application activities such as delivery of natural gas and mineral oils, toxic gas monitoring and paint, varnish or adhesive delivery lines.

Almost totally inert, Fluoropolymer can be used with virtually all industrial solvents, chemicals, and corrosive materials, even at elevated temperatures. It does, however, react with fluorine, molten sodium hydroxide, and molten alkali metals.

Fluoropolymer Tubing can be steam or chemically sterilized in-line with any industrial cleaner, solvent, or sterilizing method.

Fluoropolymer's non-stick property allows transport of viscous, sticky materials without line clogging. It also offers outstanding aging resistance.

Fluoropolymer's outstanding thermal properties offer continuous use from cryogenic temperatures up to 500°F. It is also non-aging, so brittleness is eliminated.

PTFE's translucent white color will vary naturally from lot to lot, however, the quality and physical properties do not change. FEP & PFA are clear and can be heat sealed and heat bonded.

Custom sizes, colors, and permanent color striping, repetitive cutting, etching, and longer-than-listed lengths are also available.


Bendable


Coiled


Fabricated


Pliable


PTFE

More About Coiled Tubing

Coiled tubing is exactly what it sounds like: a continuous string of tubing, rolled onto a spool. It is made from rolling strip material into a tubular form and resistance welding along its length. Upon its manufacturing, the tubing is rolled onto large spools with core diameters ranging from 8 – 12 feet. The strip material is joined together using carefully controlled bias welding processes, such that the final string has no visible butt welds. Strings as long as 26,000 feet have been fabricated.

Fatigue: As coiled tubing is deployed into and out of a well, it is wrapped and un-wrapped over its spool, and over a tubing guide arch, commonly referred to as a "gooseneck." The bending and straightening action imposed on coiled tubing is extremely severe. Cyclic bending strains can be as great as 2-3%. Coupled with internal pressure, this can result in fatigue lives less than 100 cycles.

Diametral Growth & Wall Thinning: In addition to fatigue, another important characteristic of coiled tubing is its tendency to increase in diameter as it is cycled with internal pressure. In test fixtures, diameters have been observed to increase as much as 30%, a phenomenon sometimes referred to as "ballooning."

Fluoroplastic Tube Fittings

Compression-Type Fittings (30-Series)

· Easy assembly taper swaging system
· Compact design
· Maximum working temperature : 100°C (212°F)
· Maximum working pressure: 125psi (9kg/cm^2)

Flare-Type Fittings (60-Series)

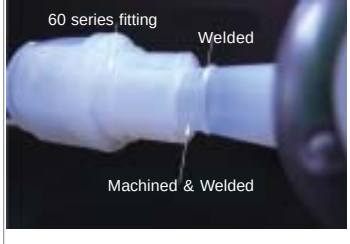
· Added holding reliability
· Minimal dead volume
· Maximum working temperature: 100°C (212°F)
· Maximum working pressure: 175 psi (12kg/cm^2)

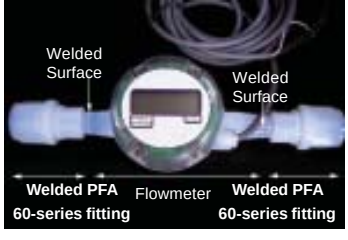
Reinforced High-Temperature, High-Pressure Fittings (20-Series)

· Inner support ring for higher holding force
· Ideal for repeated use
· Maximum working temperature : 200°C (392°F)
· Maximum working pressure: 175psi (12kg/cm^2)

High Performance, Temperature Flare Fittings (11-Series)

· Gripper welded directly on the flared tube
· Superior holding strength & smooth liquid flow
· Maximum working temperature: 200°C (392°F)
· Maximum working pressure:155psi (11kg/cm^2)





Advantages of Fluoroplastic Tube fittings

FLOWELL fluoroplastic tube fittings offer reliable sealing and excellent holding strength at tubing interconnections handling high-purity fluids and corrosive or caustic chemicals. Applications include the handling of processing chemicals and DI wafer in semiconductor processing equipment, high-purity fluids in analytical systems in biotechnology and other research areas, as well as medical devices, chemical processing and food processing.

Features:

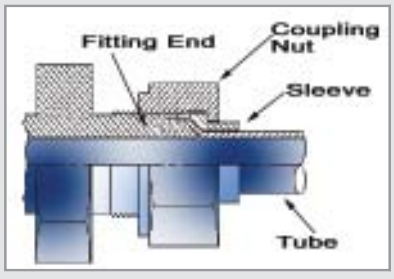
- High purity PFA & PTFE.
- Excellent holding strength.
- High sealing reliability.
- Minimal fluid entrapment and turbulence.
- For 1/8" to 1inch (3 to 25mm) tube sizes.
- Temperature 0° ~ 200°C (32° to 392°F)

Flared & Flareless Fittings

Flared and flareless fittings are two common types of separable fluid fitting designs which have been in use for many years. Flared fittings are the older of two. See figure below:

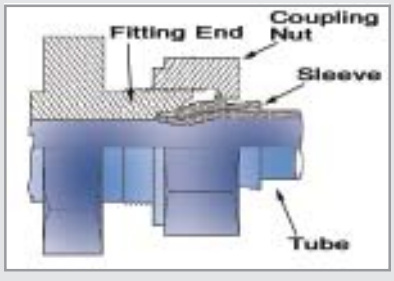
Flared Fittings

With flared connections the tube end is flared outward and is sandwiched between matching male and female tapers of the fitting end and the sleeve.The flared tube is drawn up tight against the fitting end with a coupling nut which bears against the sleeve which in turn bears against the back side of the tube flare.



Flareless Fittings

Flareless fittings were developed because of the problems associated with tube flaring and the performance limitations of flared connections. There are several flareless designs in existence. In the US, the military flareless design has widespread usage, particularly in aerospace applications. Flareless fittings, as the name implies, do not require flaring of the tube. Flareless connections instead employ a different type of sleeve, permanently attached to the end of the tube, and a different fitting end. A coupling nut is used to draw the sleeve up tight against the fitting end.



Ultimate Cycone Flowmeters

For Di Water, High Temperature Solvent, Aggressive Chemical, and Cooling Water

Features:

- High accuracy and reliability independent of fluid temperature changes and pressure fluctuation.
- High purity, low particle.
- Wide flow range (0.3~300 l/m), up to 135°C, dual turbine.
- Below 1% reading of full flow range, ±0.1% repeatability guaranteed.

Flowmeter for DI Water
(Part#: SCTF-PF)
- Uses no particle generating materials
- Extremely high electric resistivity materials
- Superior resistance to chemicals

Flowmeter for CC Level DI Water (Part#: SCTPF-PF)
- Uses no particle generating materials
- Extremely high electric resistivity materials
- Superior resistance to chemicals

Flowmeter for Solvent, High Temp.
(Part#s: SCTF-SL/ SCTSF-S6)
- High resistance to acids and alkalis
- High durability under high pressure and temp.
- Corrosion resistance and easy to assemble

Flowmeter for Chemical
(Part#: SCTF-PE)
- High resistance to acids and alkalis
- Excellent resistance to pressure fluctuation of fluids with abrasive material
- Superior accuracy against temperature fluctuations

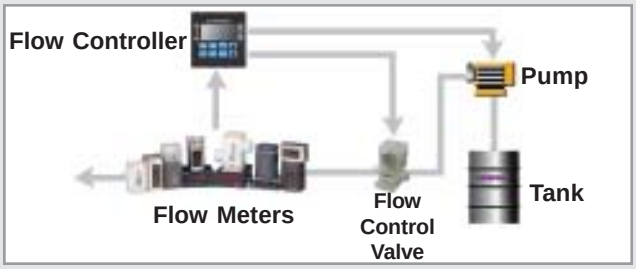
Flowmeter for Cooling Water
(Part#s: SCTF-AL/ SCTF-PC)
- High performance at low cost
- Applicable to extreme low temperature fluids
- Easy operation and light weight

Totalizer
Momentary flow indicator
(Part#s: SCTF-DI1/ SCTF-DI2)

Instant Display
Instantaneous Flow Quantity Indicator
(Part#s: SCTF-DL1/ SCTF-DL2)

Definition of Turbine Flowmeter:

Many designs exist for turbine flowmeters. As fluid flows through the meter, a turbine rotates at a speed that is proportional to the flowrate. Signal generators, usually located within the rotor itself, provide magnetic pulses that are electronically sensed through a pickup coil and calibrated to read flow units. In some designs, an integral display may show both the flowrate and the total flow since power-up. Turbine meters are available for both gas and liquid flow.



Typical Flowmeter Applications:

Flowmeters are well suited for a wide variety of liquid and gas applications, including the following:

- Measuring water and gas flow in plants or labs
- Monitoring chemical lines
- Purging instrument air lines (i.e., lines that use a valved meter)
- Monitoring filtration loading
- Monitoring flow in material-blending applications (i.e., lines that use a valved meter)
- Monitoring hydraulic oils (although this may require special calibration)
- Monitor makeup water for food & beverage plants
- Metering natural-gas consumption
- Monitoring such fluids as syrups, oils, suspensions and pharmaceuticals

Estimating Liquefied Compressed Gases: An Exception

A liquefied compressed gas can be defined as a gas, when compressed in a cylinder (container), that becomes liquid at ordinary temperatures. Liquefied gases have boiling points that range from –130°F to 30°F (–90°C to –1°C). At 70°F (21°C), the cylinder contains liquid and gas. Cylinder pressure, or the "vapor pressure" of the gas, is directly affected by ambient temperature. Increases or decreases in the temperature will cause the vapor pressure to increase or decrease, respectively.

For example, at 70°F (21°C), a cylinder of hydrogen chloride has a vapor pressure of 613 psig. At 30°F (11.1°C), that same cylinder would have a pressure of 335 psig. Since both cylinders would contain the same amount of product (by weight), the amount of product in a cylinder cannot be determined by a pressure reading. With liquefied compressed gases, cylinder content can only be determined by product weight.

Contamination- Free Pressure Sensor

All-PFA Wetted Parts for Ultra-High Purity and Aggressive Fluids

Features: **TEM - TECH LAB Co., Ltd.**

- Single-piece PFA internal fluid cavity
- O-ring isolated from fluid contact
- Measures differential pressures to 150 psig
- Accuracy and reliability to ±1% FS (LHR)
- 1/4, 3/8 and 1/2-inch tube or flare fitting connection
- 4-20mA, 0-5v, 0-10v or 1-5v output signal
- Integrated leak detector

High-purity pressure sensors use PFA fittings and non-metallic diaphragms for DI water and chemical handling applications. *The PFA fluoropolymer is compatible with virtually all fluids, and produces minimal particulate and minimal ion elution. Many other "high-purity" pressure sensors use o-rings and diaphragms of materials that can add particulate and ionic extractables into the system.*

The TEM-TECH SE3200 and SE3300 pressure sensors are all-PFA wetted, seal-less pressure sensors. Being constructed from a single piece of high-purity PFA, they eliminate fluid contact with the o-ring and eliminate any potential leak path that could allow outside contaminants into the pure fluid.

APPLICATIONS

The TEM-TECH pressure sensors are used wherever there is a requirement for accurate pressure measurements, chemical compatibility and virtually no particle and ionic contamination.

Wafer cleaning systems use fluids such as hydrofluoric, hydrochloric, ammonia hydroxide, ultra-pure water and hydrogen peroxide. Not all are compatible with all pressure sensors because of ion contamination.

In **wafer processing** and **cleaning tools**, the process fluid supply pressure is monitored to assure that an adequate fluid supply is being delivered to the tool.

In **CMP (chemical mechanical polishing)**, monitoring system pressure can determine if a filter is clogged or flowing efficiently.

In **chemical storage**, the hydrostatic head pressure can be measured to determine the volume of liquid present.

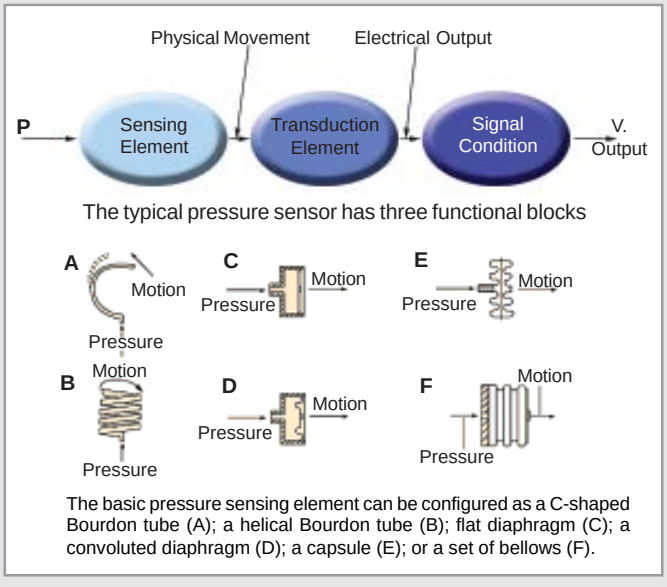
What are Pressure Sensors?

Pressure Sensing

Pressure is sensed by mechanical elements such as plates, shells, and tubes that are designed and constructed to deflect when pressure is applied. This is the basic mechanism converting pressure to physical movement. Next, this movement must be transduced to obtain an electrical or other output.

Sensing Elements

The main types of sensing elements are Bourdon tubes, diaphragms, capsules, and bellows . The Bourdon tube is a sealed tube that deflects in response to applied pressure. All except diaphragms provide a fairly large displacement that is useful in mechanical gauges and for electrical sensors that require a significant movement.



The typical pressure sensor has three functional blocks

The basic pressure sensing element can be configured as a C-shaped Bourdon tube (A); a helical Bourdon tube (B); flat diaphragm (C); a convoluted diaphragm (D); a capsule (E); or a set of bellows (F).

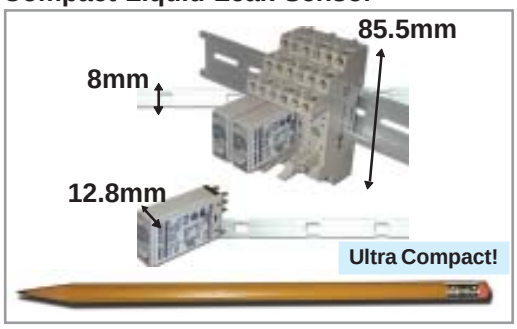
How Do Pressure Sensors Work?

The Pressure Sensor can be used to monitor pressure changes in experiments. It can also be used to monitor reaction rates as a gas is produced in a chemical reaction. Vapor pressure of various liquids and solutions can be monitored to show the relationship between vapor pressure and absolute temperature. Pressure Sensor can also be used to monitor changes in the partial pressure of oxygen or carbon dioxide gases in an enclosed atmosphere.

Figure on the left illustrates one example of how the pressure sensor is set up. Many pressure sensors are set up for absolute pressure measurement, so one side of the membrane is a vacuum. The sensor produces an output voltage which varies in a linear way with absolute pressure. It includes special circuitry to minimize errors caused by changes in temperature.

Liquid Leak Sensors

Compact Liquid Leak Sensor



Description	Part No.
OMRON Liquid Spill Sensor	F0316PE10
Sensing Band, 1-meter	F0316PE1
Sensing Band, 2-meter	F0316PE2
Sensing Band, 5-meter	F0316PE5
Sensing Band, 25-meter	F0316PE25
Terminal Block	F0320
Band Stickers w/Adhesive	F0326PE
Sensor Amplifier	K7LAT50
DIN Rail Socket	P2RF08E

Features:

- Monitors resistance between two sensing bands
- Detects leakage of water to chemical liquids with low conductivity
- Low-voltage AC signal to the sensing band to prevent electrical corrosion
- Polypropylene sensing band may be cleaned and reused after leak detection

OMRON YAMATAKE

Specifications:

Ambient Temperature	Operating:	-10ºC to 55ºC
	Storage:	-25ºC to 65ºC
	(with no icing or condensation)	
Ambient Humidity	Operating:	45% to 85%
	Storage:	25% to 85%
	(with no icing or condensation)	
Insulation Resistance	10MW at 100VDC between case and current-carrying parts	
Dielectric Strength	1,000 VAC at 50/60 Hz for 1 min between case and current carrying parts	
Power Consumption	1VA max.	
Response Time	Operate: 800ms max.	
	Release: 800ms max.	
Weight	Approx. 14g.	

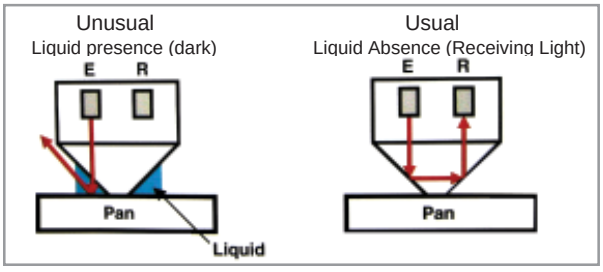
Self-contained Optical Leak Sensor

*Product displayed larger than actual size

Features:

- Sealed, Chemically Resistant Materials - 13mm circular sensor pancake lays on bottom and detects liquid leak or spill by refraction light principle (see illustration on this page).
- Body is Teflon® PFA material with IP67 sealing and the mounting bracket assembly is CPVC.
- 2 meters of PFA covers the sensing end of the electrical cable.
- Quick detection minimizes environmental impact and messy cleanup -Typically, 1ml of liquid contact with the optical focal point will trigger the signal change.
- Fail Safe Design - Output current is conducted in normal dry conditions and will turn off in the presence of liquid.
- The sensor can be used with any pan material color.
- UL508 and CE approve
- PNP and NPN output versions are available.
- Condition Indication Using Easy-to-View LED's - Green LED indicates normal dry condition and proper operation, orange LED indicates when liquid is detected or operation is stopped.
- Low Initial and Operational Cost - The HPQ-D series is priced very aggressively and will require little maintenance unlike other prevailing technologies.

Operational Principle



The **HPQ-D leak detection sensor** family is the first of its kind to be constructed entirely of sealed, Teflon® PFA material and be configured in a self-contained package smaller than a quarter. It does not require a fiberoptic amplifier to be used since there is a useable NPN or PNP transistor output with each sensor. Typically, only 1ml of liquid in contact with the optical focal point will change the sensor's output. This enables early detection of caustic chemical spills and can be used to shut down the tool immediately, which minimizes the environmental impact.

Easily viewable green LED signifies normal operation and an orange LED turns on when liquid is detected and output is shut off. The bracket assembly is made of CPVC material and has an over/under patented style that assures solid retention once locked down and the ability to remove the sensor for maintenance or output checking.

The underside of bracket is flat and has perforated mounting holes so you can mount with hardware or adhesive.

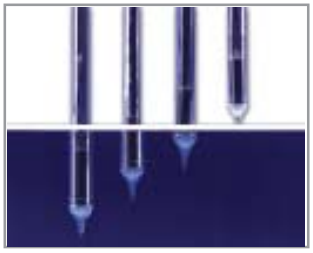
A large gain signal difference between no liquid and liquid detection ensures low probability of false detection. The fail safe design provides a normally closed output that turns off when liquid is detected.

Easily detacheable for cleaning

Wet Process Products & Applications

Fiberoptic Leak Detection (Inherently Safe)

Pipe Mounted, Fiber Cable Type Liquid Sensor (Inherently Safe)



Teflon Probes for Tank Level Detection

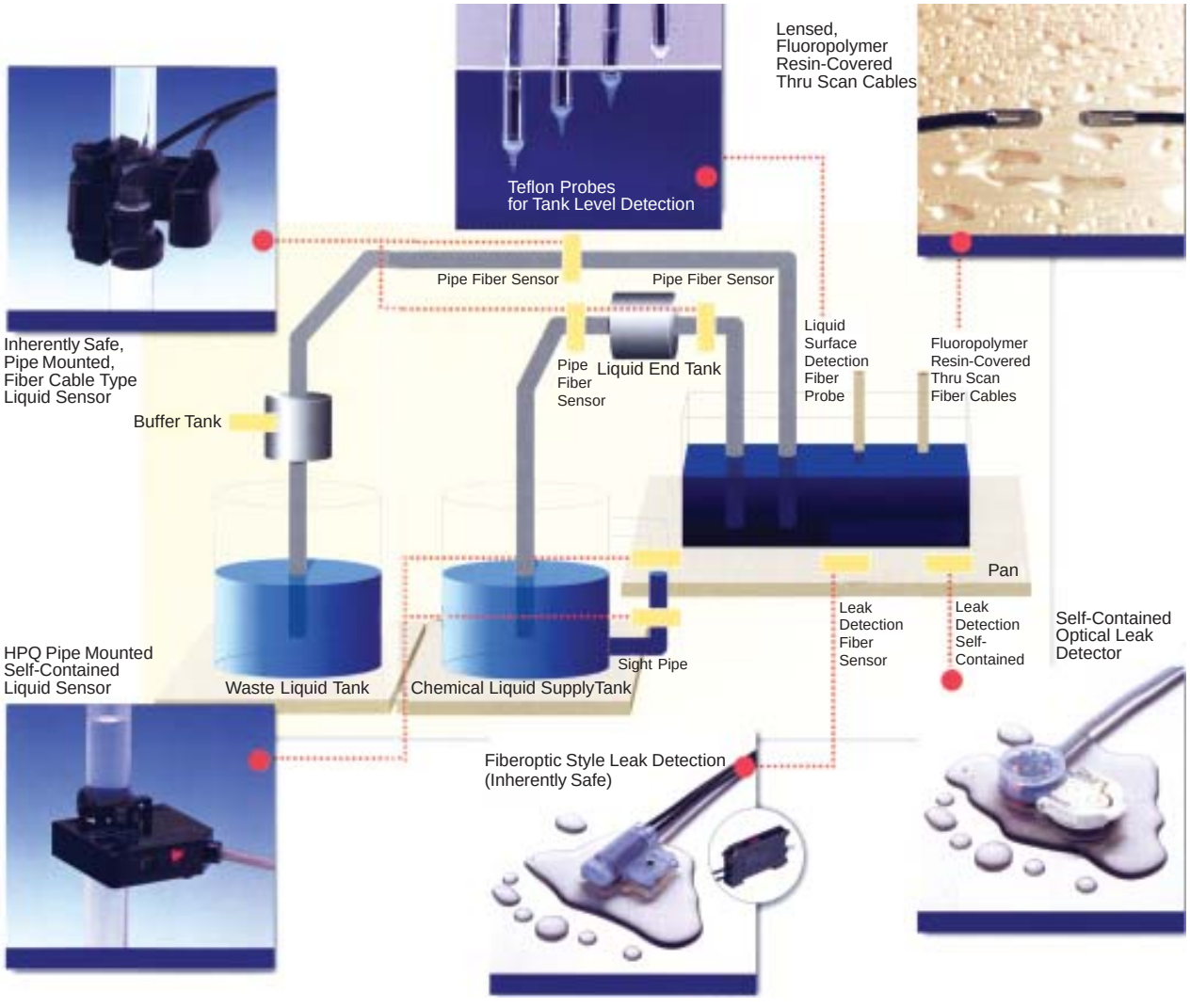
HPQ Pipe Mounted, Self-Contained Liquid Sensor

Illustrated Sensor Applications

NEW YAMATAKE

The illustration on this page shows a typical chemical supply arrangement used in many industries. Yamatake has developed many different types of wet process sensing products that are tailored to specific application needs. The illustration shows the type of sensor that is typically used at each point in the chemical management process.

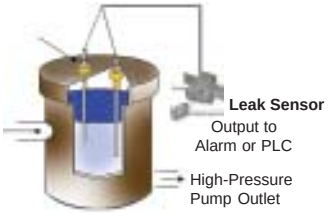
There are many unique features and capabilities for each type of sensor. Please feel free to contact NetMotion if you have any questions regarding any particular sensor or application requirements.



Leak Sensor Advisory & Applications

Leak Sensor Applications

Coolant Tank

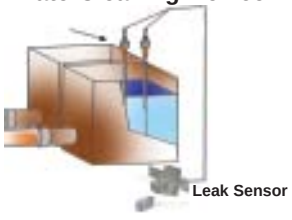


Application: To detect water contamination in the coolant tank in the chiller device (To detect leakage from heat exchanger).

Reason for Detection: To prevent changing the properties of or causing deterioration of the coolant.
To prevent corrosion of the tank pipes.

Advantages: Sometimes the contaminant is pure water, so it is necessary to be able to consistently detect liquid with a higher resistance.
To cope with space-saving for panel mounting.

Metal Plate Cleaning Device

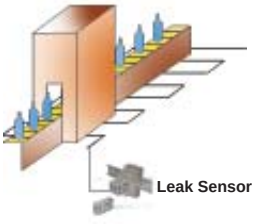


Application: To detect the pure water level in the cleaning tank during the plating tank cleaning

Reason for Detection: To prevent product defects caused by too much or too little cleaning fluid resulting in inadequate cleaning and to prevent damage or short-circuiting of the cleaning device.

Advantages: To consistently detect the pure water used for cleaning.

Beverage Production Equipment



Application: To detect leakage and spillage in and outside devices that fill soda and alcohol containers.

Reason for Detection: To prevent damage and short-circuiting of equipment and to prevent product defects.

Advantages: To cope with the space-saving for panel mounting. As part of the beverage leakage prevention program.

Point Liquid and Polymer Strip Discriminating Sensors

Liquid type sensors use solid state electronics, which measure a particular physical property or properties of liquid that contacts the detection element. An example is capacitance change sensors, where liquid contacting the detection element acts as the dielectric in a capacitor. Air liquid present at sensor, hydrocarbon-based liquids, and water each have distinctly different dielectric constants. A capacitance change sensor can detect this and respond differently when dry, or when exposed to water or hydrocarbons. Different responses from the sensor are interpreted by the control panel, which activates the appropriate alarm.

In contrast to point liquid discriminating sensors, polymer strip sensors use two detection elements combined in one housing to discriminate between product and water. The first detection element is a float switch or ultrasonic detector that will activate a "low liquid level" alarm when in contact with any liquid. It is located near the bottom of the sensor, and generally has a quick response time. The second detection element is a hydrocarbon-sensing cable or strip that will activate a "product" alarm when exposed to hydrocarbon-based product. It will not respond to water. The cable or strip typically runs from the bottom to the top of the sensor, and response times vary between approximately 5 minutes and 20 minutes in unleaded fuel (may be 12 hours or more in diesel fuel). It is only by combining the float or ultrasonic liquid sensing element with the hydrocarbon-sensingelement (cable or strip) that the polymer strip type sensor is able to discriminate between product and water.

Boiling Pint & Density

	Oxygen		Nitrogen		Argon	
Pressure psig	Sat.Liquid Densitylb/ft3	BoilingPoint°F	Sat.Liquid Densitylb/ft3	BoilingPoint°F	Sat.Liquid Densitylb/ft3	BoilingPoint°F
0	71.2	-297	50.5	-321	87.7	-303
10	69.6	-288	48.9	-312	85.4	-293
20	68.5	-281	47.8	-306	83.7	-286
40	66.6	-271	46.2	-297	81.2	-276
60	65.2	-263	45.0	-290	79.2	-269
80	63.9	-257	43.9	-284	77.6	-262
100	62.8	-251	42.9	-279	76.1	-257
120	61.8	-247	42.0	-275	74.8	-252
140	60.9	-242	41.5	-273	74.2	-248
160	60.0	-238	40.3	-268	72.4	-244
180	59.1	-235	39.5	-264	71.3	-240
200	58.3	-232	38.7	-261	70.3	-237
220	57.5	-228	38.0	-259	69.2	-234
240	56.7	-226	37.2	-256	68.3	-231

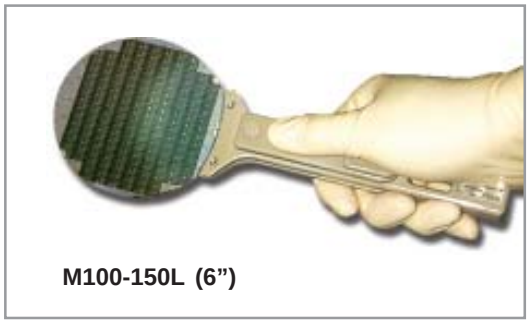
WAFER & PRECISION PARTS HANDLING

Let us know what you need and we will make it happen for you!

NetMotion has a large selection of fine quality wafer & precision parts handling tools. We offer versatile tweezers and durable wands with lockable lever to safely secure your precious wafers and delicate substrates. We also offers vacuum wands for wafers and vacuum pumps. Large selection of wand tips made from various materials are also available to choose from.

Manual Wands & Tweezers

Manual Tweezers for Semiconductor Wafer, Mask and Square-Substrate Handling



M100-150L (6")

Features:

- **Unique patent pending design** ensures handling of delicate semiconductor wafer and mask securely without excessive force
- The surfaces of a wafer/mask are made of non-metallic material and **won't scratch** like the conventional metal tweezers.
- Area that contacts wafer/mask surfaces is optically-polished to **reduce surface particle** counts.

M100-100 (4")

M100-200L (8")

M100-300L (12")
(with lockable lever)

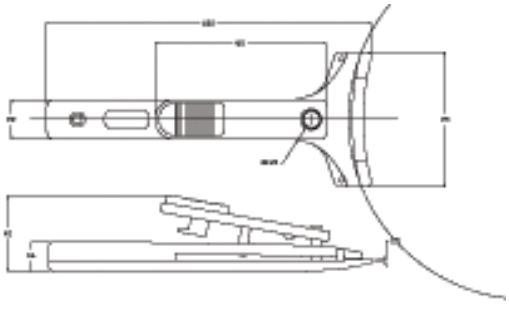
Mask and Square Substrate Handling Tool

- Handles 4" x 4" and 6" x 6" square Alumna substrate and lithography mask substrates
- Lockable mechanism adds security
- Optically polished to reduce surface paticles
- Withstand up to 130°C
- Low particle emission and chemical compatibility

Item Description & Part Number
Please call for quantity discount! 800-790-7837

Description	Part Number
ESD PEEK Manual Wand for 4"	E100-100
ESD PEEK Manual Wand for 5"	E100-125
ESD PEEK Manual Wand for 6"	E100-150
ESD PEEK Manual Wand for 8"	E100-200
PEEK Manual Wand for 4"	M100-100
PEEK Manual Wand for 5"	M100-125
PEEK Manual Wand for 6"	M100-150
Lockable PEEK Manual Wand 6"	M100-150L
PEEK Manual Wand for 8"	M100-200
Lockable PEEK Manual Wand 8"	M100-200L
Lockable PEEK Manual Wand 12"	M100-300L
PPS Manual Wand for 4"	M110-100
PPS Manual Wand for 5"	M110-125
PPS Manual Wand for 6"	M110-150
PPS Manual Wand for 8"	M110-200
Vespel + SUS Wand for 6" & 8"	M800-200N
Vespel + SUS Wand for 6" & 8" (scoop)	M800-200S
PEEK Wand for Masks 4x4"	M100-4x4L
PEEK Wand for Masks 6x6"	M100-6x6L

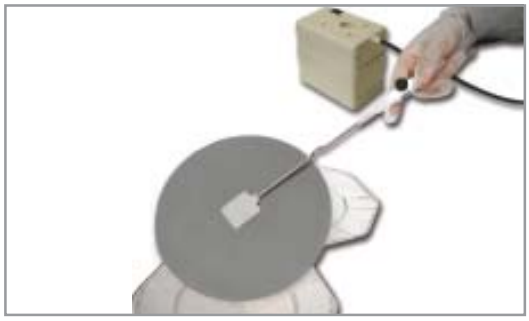
Best Wands for your Wafers & Masks!



Our unique patent-pending wand with lockable lever is safe, durable and convenient to use. NetMotion offers wands for high temperature and/or ESD Safe applications. Good for 4" through 12" wafers and 4"x4" and 6"x6" masks/ square substrates.

Vacuum Wands for Wafers

Vacuum Wands for Wafers. Comes with a wide selection of material and attachments.



Features:

- Our unique valve ensures reliable suction and release of a semiconductor wafer.
- The well polished inner wall of the valve minimizes particle generation.
- The optically polished wafer tip provides excellent adhesion to a wafer.
- The wand body can be easily detached from the tubing.

Tip Part# 90-CP (Conductive-PEEK)

Tip Part# 05-3F (PCTFE)

Tip Part# 92-CP (Conductive-PEEK)

F-Series Wand with PEEK™ Wafer Tip

C-Series Wand with Conductive PEEK Wafer Tip

Vacuum Wand Parts & Accessories

1. 2. 3. 4. 5. 6. 7.

1. Wand Body
2. Wand Tips
3. Wand Stand (Desk or Wall Mount)
4. Vacuum Pump with HEPA filter
5. Portable Leak Detector
6. ESD Safe Grounding Cable
7. ESD Safe Tubing

For more information on wand tips, visit us on line: www.netmotion.com and for parts/ accessories, please refer to page 38. Call for quantity discounts 1-800-790-7837!

Item Description & Part Number

Description	Connection/Tubing*	Joint Type	Part Number
ESD Safe Vacuum Wand Body	With 100/106*	Ball Swivel	C001-X
ESD Safe Vacuum Wand Body		Fixed	C001-Y
ESD Safe Vacuum Wand Body	With 100/106*	Ball Swivel	C002-X
ESD Safe Vacuum Wand Body		Fixed	C002-Y
ESD Safe Vacuum Wand Body	With 100/106*	Ball Swivel	C003-X
ESD Safe Vacuum Wand Body		Fixed	C003-Y
ESD Safe Vacuum Wand Body	(For Die Handling)	n/a	C001
ESD Safe Vacuum Wand Body	(For Die Handling)	n/a	C002
ESD Safe Vacuum Wand Body	(For Die Handling)	n/a	C003
Teflon Vacuum Wand Body (Chemical Resistant)	(For Die Handling)	n/a	F001
Teflon Vacuum Wand Body (Chemical Resistant)	(For Die Handling)	n/a	F002
Teflon Vacuum Wand Body (Chemical Resistant)	(For Die Handling)	n/a	F003
Teflon Vacuum Wand Body (Chemical Resistant)	(For Die Handling)	n/a	F007
Teflon Vacuum Wand Body (Chemical Resistant)	Connect to 100/105/106*	Ball Swivel	F001-X
Teflon Vacuum Wand Body (Chemical Resistant)		Fixed	F001-Y
Teflon Vacuum Wand Body (Chemical Resistant)	With 100/105/106*	Ball Swivel	F002-X
Teflon Vacuum Wand Body (Chemical Resistant)		Fixed	F002-Y
Teflon Vacuum Wand Body (Chemical Resistant)	With 110/111*	Collect Chuck	F002-Z
Teflon Vacuum Wand Body (Chemical Resistant)		Ball Swivel	F003-X
Teflon Vacuum Wand Body (Chemical Resistant)		Fixed	F003-Y
Teflon Vacuum Wand Body (Chemical Resistant)	With 110/111*	Collect Chuck	F003-Z

Vacuum Wands for Precision Parts Handling

Vacuum Wands and Tips for Small Parts Handling

Features:

- ESD Safe Wand Available
- Interchangeable Tips
- Won't Scratch like Metal Tweezers
- Picks Up All Shapes and Sizes

We have a wide selection of high quality vacuum wands and attachments/ tips available to choose from.

Nozzle: PCTFE, PEEK, Vespel, conductive PEEK, conductive nylon, stainless steel

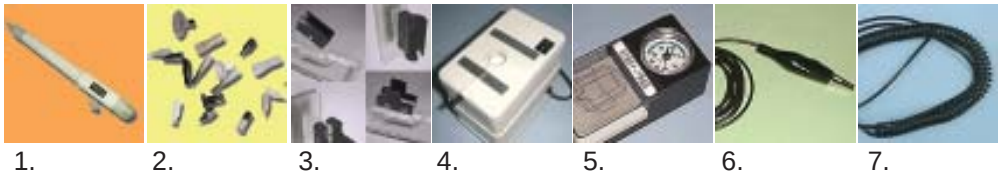
Cup: Silicone rubber, viton rubber, conductive silicon rubber, Teflon

Slit-Tip: PCTFE, conductive nylon

Description	Width of the Tips (mm.)	Tips Part Number
PCTFE Nozzle	X = 0.3, 0.5, 0.7, 1.0, 1.2, 1.5, 2.0, 2.5, 3.0	21-X
PCTFE Nozzle	X = 0.1, 0.2	22-X
PEEK Nozzle	X = 0.3, 0.5, 0.7, 1.0, 1.2, 1.5, 2.0, 2.5, 3.0	23-X
Vespel Nozzle	X = 0.3, 0.5, 0.7, 1.0, 1.2, 1.5, 2.0, 2.5, 3.0	24-X
Conductive PEEK Nozzle	X = 0.1, 0.2	25-X
Conductive PEEK Nozzle	X = 0.3, 0.5, 0.7, 1.0, 1.2, 1.5, 2.0, 2.5, 3.0	26-X
Conductive Nylon Nozzle	X = 0.3, 0.5, 0.7, 1.0, 1.2, 1.5, 2.0, 2.5, 3.0	27-X
Stainless Steel Nozzle	X = 0.3, 0.5, 0.7, 1.0, 1.2, 1.5, 2.0, 2.5, 3.0	31-X
Silicone Rubber Cup	X = 2.5, 3.0, 3.5, 5.0, 8.0, 11.0, 15.0	41-X
Viton Rubber Cup	X = 2.5, 3.0, 3.5, 5.0, 8.0, 11.0, 15.0	42-X
Conductive Silicone Rubber Cup	X = 2.5, 3.0, 3.5, 5.0, 8.0, 11.0, 15.0	43-X
Teflon Cup	X = 2.5, 3.0, 3.5, 5.0, 8.0, 11.0, 15.0	45-X
Teflon Cup	X = 20.0, 25.0, 30.0	46-X
PCTFE Slit Tip	X = 3.0, 4.5, 6.0	51-X
Conductive Nylon Slit Tip	X = 3.0, 4.5, 6.0	54-X

Vacuum Wand Kit & Accessories

- **Small Die**
- **Large Die**
- **Lenses**
- **Fiber Optics**
- **Fine Wire**
- **Contact Lenses**
- **Electronics - Multipurpose**
- **Electronics - (SMD)**
- **Jewelry**
- **Electronics - (FLAT)**
- **Flat Panels**
- **Watch and Camera**



1. 2. 3. 4. 5. 6. 7.

1. Wand Body
2. Wand Tips (See Below)
3. Wand Stand (Desk or Wall Mount)
4. Vacuum Pump with HEPA filter
5. Portable Leak Detector
6. ESD Safe Grounding Cable
7. ESD Safe Tubing

Small Semicondcutor Die Kit

For die approximately 500 micron or smaller; ESD safe. Smaller tips are available

Kit PartNo.	Description
C002	Conductive nylon die/small parts handling vac wand body, NO
25-0.1	ESD safe conductive PEEK nozzle, 0.1mm
25-0.2	ESD safe conductive PEEK nozzle, 0.2mm
26-0.3	ESD safe conductive PEEK nozzle, 0.3mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for FV10/30/60 pumps
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-30	Clean room vacuum pump, 300mmHg, 2.5 l/min, HEPA

Fiber-Optic or Fine Wire Handling Kit

ESD Safe

Kit Part No.	Description
C002	Conductive nylon die/small parts handling vac wand body, NO
54-4.5	ESD safe slit-tip, 4.5mm
54-6.0	ESD safe slit-tip, 6.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for FV10/30/60 pumps
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-60	Clean room vacuum pump, 600mmHg, 2.5 l/min, HEPA

NO* - Normally open valve

Wand Kits for Precision Parts Handling

For more information on parts/accessories, please refer to page 38

Call for quantity discounts 1-800-790-7837

Large Semiconductor Die Kit

For die 500 micron or larger; ESD safe. For very large die, consider suction cups and/or small wafer wands.

Kit Part No.	Description
C002	Conductive nylon die/small parts handling vac wand body, NO
26-0.3	ESD Safe conductive PEEK nozzle, 0.3mm
26-0.5	ESD safe conductive PEEK nozzle, 0.5mm
26-0.7	ESD safe conductive PEEK nozzle, 0.7mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for FV10/30/60 pumps
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-30	Clean room vacuum pump, 300mmHg, 2.5 l/min, HEPA

Glass Lens Kit

Suitable for a wide range of lens sizes.

Kit PartNo.	Description
F002	PTFE small parts handling vac wand body, NO
41-2.5	Silicone rubber cup, 2.5mm
41-5.0	Silicone rubber cup, 5.0mm
41-11.0	Silicone rubber cup, 11.0mm
41-15.0	Silicone rubber cup, 15.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-60	Clean room vacuum pump, 600mmHg, 2.5 l/min, HEPA

Multi-purpose Electronic Kit - ESD Safe

Includes our higher pressure vacuum pump and wide variety of tips for most applications.

Kit Part No.	Description
C002	Conductive nylon die/small parts handling vac wand body, NO
26-0.3	ESD Safe conductive PEEK nozzle, 0.3mm
26-1.0	ESD safe conductive PEEK nozzle, 1.0mm
43-2.5	ESD safe conductive silicone rubber cup, 2.5mm
43-5.0	ESD safe conductive silicone rubber cup, 5.0mm
43-11.0	ESD safe conductive silicone rubber cup, 11.0mm
43-15.0	ESD safe conductive silicone rubber cup, 15.0mm
54-6.0	ESD safe slit-tip, 6.0mm wide
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for FV10/30/60 pumps
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-60	Clean room vacuum pump, 600mmHg, 2.5 l/min, HEPA

Contact Lens Kit

Great for picking up contact lenses.

Kit Part No.	Description
F002	PTFE small parts handling vac wand body, NO
41-2.5	Silicon rubber cup, 2.5mm
41-5.0	Silicon rubber cup, 5.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-10	Clean room vacuum pump, 3 to 15 kPa, 2.7 l/min

Surface Mount Electronics Kit

For all SMD packages; ESD safe. Smaller and larger tips available.

Kit Part No.	Description
C002	Conductive nylon die/small parts handling vac wand body, NO
26-0.3	ESD Safe conductive PEEK nozzle, 0.3mm
26-1.0	ESD safe conductive PEEK nozzle, 1.0mm
43-2.5	ESD safe conductive silicone rubber cup, 2.5mm
43-5.0	ESD safe conductive silicone rubber cup, 5.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for FV10/30/60 pumps
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-30	Clean room vacuum pump, 300mmHg, 2.5 l/min, HEPA

Jewelry Kit

For jewelers, goldsmiths, and users with similar applications; ESD safe.

Kit Part No.	Description
F002	PTFE small parts handling vac wand body, NO
31-0.1	Stainless steel nozzle, 0.1mm
23-0.5	PEEK nozzle, 0.5mm
23-1.0	PEEK nozzle, 1.0mm
41-2.5	Silicone rubber cup, 2.5mm
41-5.0	Silicone rubber cup, 5.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for NO wands, with vac shut-off
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-10	Clean room vacuum pump, 3 to 15 kPa, 2.7 l/min

Flat Packaged Electronic Component Handling Kit

For most semiconductor packages, ESD safe.

KitPart No.	Description
C002	Conductive nylon die/small parts handling vac wand body, NO
43-2.5	ESD safe conductive silicone rubber cup, 2.5mm
43-5.0	ESD safe conductive silicone rubber cup, 5.0mm
43-11.0	ESD safe conductive silicone rubber cup, 11.0mm
43-15.0	ESD safe conductive silicone rubber cup, 15.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for FV10/30/60 pumps
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-30	Clean room vacuum pump, 300mmHg, 2.5 l/min, HEPA

Watch and Camera Kit

For jewelers, goldsmiths, and users with similar applications; ESD safe.

Kit Part No.	Description
F002	PTFE small parts handling vac wand body, NO
23-0.3	PEEK nozzle, 0.3mm
23-0.5	PEEK nozzle, 0.5mm
23-1.0	PEEK nozzle, 1.0mm
31-0.1	Stainless steel nozzle, 0.1mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for NO wands, with vac shut-off
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-30	Clean room vacuum pump, 300 mmHg, 2.5 l/min, HEPA

Flat Panel Kit

For lightweight flat-panel displays, etc., ESD safe.

Kit Part No.	Description
C002	Conductive nylon die/small parts handling vac wand body, NO
43-5.0	ESD safe conductive silicone rubber cup, 5.0mm
43-11.0	ESD safe conductive silicone rubber cup, 11.0mm
43-15.0	ESD safe conductive silicone rubber cup, 15.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for FV10/30/60 pumps
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-60	Clean room vacuum pump, 600mmHg, 2.5 l/min, HEPA

Micro, Miniature, and Mechanical Assembly Kit

For jewelers, goldsmiths, and users with similar applications; ESD safe.

Kit Part No.	Description
F002	PTFE small parts handling vac wand body, NO
31-0.1	Stainless steel nozzle, 0.1mm
23-0.5	PEEK nozzle, 0.5mm
41-2.5	Silicone rubber cup, 2.5mm
41-5.0	Silicone rubber cup, 5.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for NO* wands, with vac shut-off
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-30	Clean room vacuum pump, 300 mmHg, 2.5 l/min, HEPA

NO* - Normally open valve

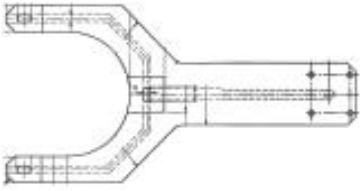
Standard Ceramic End Effectors

ASUZAC INC.

Features:

- Paddle and Fork Designs
- For 4”, 5”, 6”, 8” and 12” Wafers
- Vacuum and Non-Vacuum
- High Temperature Resistance
- Chemical Resistance
- Durable & Reliable
- Integrated Vacuum Channel

Industry Standard Fork Design Sizes 4” ~ 8”



Fork Design

Size	Part Number
4”	CEFV04FK
6”	CEFV06FK
8”	CEFV08FK

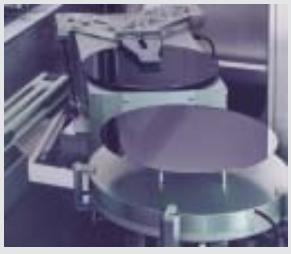
Industry Standard Paddle Design Sizes 4” ~ 12”

Paddle Design

Size	Part Number
4”	CEFV04PA
6”	CEFV06PA
8”	CEFV08PA
12”	CEFV12PA

Type of Ceramic	Purity	Color	Vacuum	Non-Vacuum
Alumina	99.5%	White	Yes	Yes
Alimina	99.6%	Cream	Yes	Yes
Alumina	99.9%	Dark Ivory	No	Yes
Silicon Carbide(SiC)	98.0%	Black	Yes	Yes

Why Ceramic?



Ceramics have superior mechanical, electrical, and thermal properties ideal for quality components. The durability of fine ceramics makes it ideal for mechanical and thermal loads that are abrasive and in chemically harsh environments.

Ceramic End Effector Properties

Properties	Alumina			Silicon Carbide(SiC)
Purity	99.9%	99.6%	99.5%	98.0%
Chemical Composition	$A1_2O_3$	$A1_2O_3$	$A1_2O_3$	SiC
Color	Dark Ivory	Ivory	White	Black
Density(g/cm^3)	3.95	3.94	3.94	3.14
Flexural Strength(kg/mm^2)	40	38	45	51
Vicker Hardness HV	1,800	1,500	1,500	3,100
Young Ratio (10^4 x kg/mm^2)	3.9	4	3.9	4.2
Fracture Toughness mPa√m	3.5	4	4	3
Coefficient of Thermal Expansion (10^{-6} °C)	7.9	8	8	3.4
Thermal Conductivity (Cal/Sec/cm)	0.07	0.07	0.07	0.33
Volume Resistivity (Ω x CM)	$>10^{-14}$	$>10^{-14}$	$>10^{-14}$	10^6
Dielectric Constant	10.5	11	11.5	--
Dissipation Factor (10^{-4}MHz)	--	8.0	4.8	--
Breakdown Voltage (Kv/mm)	15	13	15	--

In robotics, an end effector is a device or tool connected to the end of a robot arm. The structure of an end effector(see figure above), and the nature of the programming and hardware that drives it, depends on the intended task.

CUSTOM PARTS & LABORATORY SUPPLIES

We Take Pride in Our Support and Service!

Call us today for a free quote!
800-790-7837

Needing custom parts or supplies? Look no further! NetMotion offers a wide range of high-quality Bemcot wipers, caps, masks, and bed linens for all types of industries and laboratory needs. We offer custom engineered parts such as plastics, ceramic, and blow-molding parts made with PFA, PTFE, PEEK™, Vespel, even ceramic. Vacuum pumps and precision parts handling tools are also available.

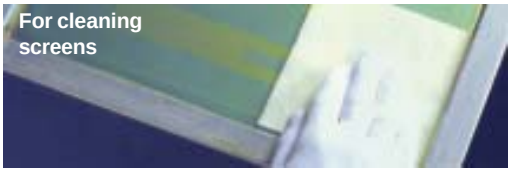
Bemcot Lint-Free Wipers

Features:

- High Liquid Absorption
- High Liquid Preservation
- Antistatic
- Excellent Heat Resistance
- Ecologically Safe

OZU CORPORATION

Bemcot wipers can be used in various industries:
Semiconductor, optical, medical, cosmetics, food & beverage, printed circuit boards, building maintenance, automobile, aircraft, LCD, magnetic tapes, magnetic disks, nuclear, etc. They are excellent for wiping water, solvent, oil, tools, equipment, PCB, glass, optics, etc.



We offer masks too!

Type	Part Number	Applications
Fine Class	Super CN TR-7F BM-Wiper PS-2	For silicon wafer conveyer belt, vacuum instruments, splashed sensitizers, spilled water & chemicals, polarizing boards, print screens of liquid crystal sealant, etc.
Regular Class	M-3 M-1 S-2, Clean Lint-Free	IC, LSI, LCD, PCB, resistor, capacitor, coil, opt-electronic parts, ceramics, light emitting diode, micro batteries, magnetic disk, magnetic tape, magnetic head, assembly, print, automobile, etc.
Lab & Assembly	Clean Wipe P	For wiping magnetic heads, production marks, etc.
Roll Wipers	Roll Wiper	Soldering machines, screen for screen printing, acrylic rolls of scanner printing, surface before printing, etc.
Heavy Duty	Bremlinen	arger and stronger than wipers for clean room use. As with a M-3, their long-fiber composition provides reduced fiber fall-off making them a suitable substitute for dustcloth and cotton.
Masks	Hepaliese Mask	Low-particle generating face mask for clean room use.

Ordering Information

Part Number	Type	Size	Quantity Per Case	Cleanroom Class
M-3	Cellulose	12.5 x 12.5cm	100pcs per bag x 30 bags	100
M-1	Cellulose	7.5 x 7.5cm	150pcs per bag x 40 bags	100
S-2	Cellulose	12.5 x 12.5cm	150pcs per bag x 30 bags	100
Super CN	Cellulose	12 x 7.5cm	50pcs per bag x 20 bags	10-100
QT - 8	Cellulose	12 x 7.5cm	80pcs per bag x 30 bags	10-100
Super NT	Cellulose	12 x 7.5cm	80pcs per bag x 30 bags	10-100
CT - 8	Cellulose	12 x 7.5cm	100pcs per bag x 30 bags	10-100
EA - 8	Cellulose	12 x 7.5cm	100pcs per bag x 30 bags	10-100
J Cloth	Heavy Duty Cellulose	17 x 15cm	10pcs per bag x 16 bags	--
TR - 7F	Cellulose	12.5 x 12.5cm	150pcs per bag x 20 bags	10-100
BM Wiper	Cellulose	30 x 30cm	50pcs per bag x 20 bags	1000
PS-2	Cellulose	10 x 21cm	300pcs per bag x 48 bags	100
Clean Wipe P	Cellulose	10 x 21cm	300pcs per bag x 60 bags	--

More Information On Bemcot Wipers

M-3

The M-3 is a standard Bemcot wiper made from the industry's only 100% cellulose, continuous long-fiber, non woven fabric. This wiper is applicable for diverse wiping needs, inside and outside clean rooms.

Size: 25.0 x 25.0 cm (expanded)
12.5 x 12.5 cm (product)
Quantity: 100 sheets/bag
30 bags/case
*The small type of the M-3 - the M-1 (15.0 x 15.Ocm:expanded)- is also available.

S-2

The S-2 - the economy wiper of theBemcot series - is best suited for delicate wiping applications where softness is required.

Size: 25.0 x 25.0 cm (expanded)
12.5 x 12.5 cm (product)
Quantity: 150 sheets/bag
30 bags/case

Super CN

Cellulose continuous long-fiber non woven fabric and synthetic fiber, combined with an inward-folding edge concept, provides the Super CN the best performance in the Bemcot series in terms of minimizing fallen fibers.

Size: 24.0 x 30.0 cm (expanded)
12.0 x 7.5 cm (product)
Quantity: 50 sheets/bag
20 bags/case

Features

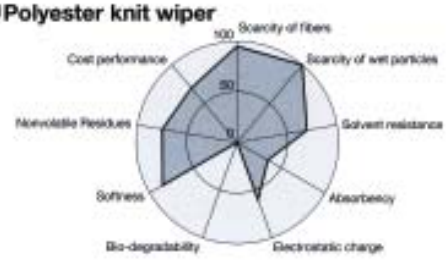
1. **Outstanding Absorbency and Retention of Liquids**
   Bemcot can absorb 13 times its weight in water.
2. **Ultra-Low Fallen Fibers**
   Thanks to its continuous filament structure, the Bemcot gives off far fewer fallen fibers than do conventional short fiber wipers. Rather, it rivals sealed edge knit wipers, giving off virtually none. Because Bemcot is lint-free, it can be used to wipe any object.
3. **Bio-Degradable**
   Because Bemcot wipers are made from 100% cellulose, continuous long fiber, nonwoven fabric, they have no negative impact on the natural environment.
4. **Antistatic**
   The cotton fiber itself has a moisture content of 11 % in its standard condition (at 20C, 65%RH), so that the possibility of static electricity generation is very slight.
5. **High Level of Purity**
   Analysis of pure water and solvents extracted from Bemcot reveal extremely slight impurities deposition.
6. **Softness**
   Bemcot is soft enough to prevent surfaces from scratching when wiped.
7. **Impervious to a Variety of Solvents**
8. **Inward-Folded for Easy Use**

Performance

Why does Bemcot hold such an overwhelming share of the Japanese non-woven wiper market? The answer is Bemcot's well-balanced performance in comparison with other wipers:

■Bemcot M-3

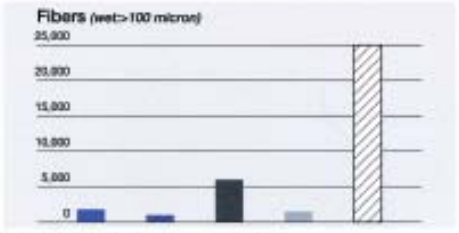
■Polyester knit wiper



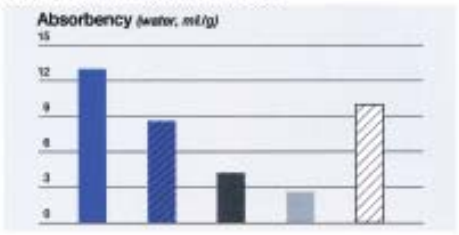
■Short-fiber, non-woven wiper

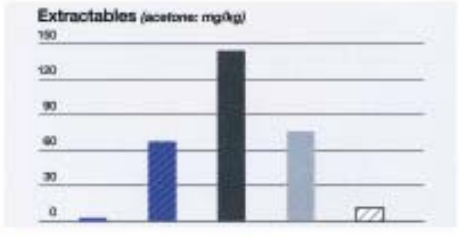
Characteristics

*Under condition of near-zero mechanical stress



*Under condition of near-zero mechanical stress





Bemcot M-3 (Cupra; continuous filament)
Bemcot Super CN (Cupra/polyester; continuous filament)
Knit wiper A (Polyester; continuous filament)
Knit wiper B (Polyester; continuous filament)
Short-fiber, non-woven wiper (Pulp/polyester; short fiber)

Call us for more information:
8 0 0 - 7 9 0 - 7 5 3 7

OZU CORPORATION

Bemcot Disposable Caps, Masks, and Bed Linens

OZU CORPORATION

Features:

- High Liquid Absorption
- High Liquid Preservation
- Antistatic
- Excellent Heat Resistance
- Ecologically Safe

Ozu Caps

- Comfortable fit, with good ventilation and absorption properties
- Soft cap made from non-woven fabric
- Strong solvent resistance
- Low-lint characteristics

Surgical Face Masks

- High bacterial filtration efficiency
- Breathable
- Effectively gathers dust, lint and bacteria
- Offers high comfort for long period wearing
- Low lint characteristics

Neo Absorbent Sheets (Disposable Bed Linen)

- High water absorption and retention, disposable sheets
- Using non-woven pulp creates a soft and smooth fabric
- Flexible in length and width

Silbon Waterproof Sheets (Disposable Bed Linen)

- Made from Bemliese cotton
- High water absorption

Ozu Caps

Part Number	Description	Color	Quantity/ Case
481050	Ozu Caps (For Doctors) DR-1	Blue	100pcs. x 5boxes
481030	Ozu Caps (For Nurses) NS-1	White	100pcs. x 5boxes
481050	Ozu Caps (For Nurses) NS-1	Green	100pcs. x 5boxes

Surgical Masks

Part Number	Description	Color	Quantity/ Case
629810	Surgical Face Mask	Blue	50pcs. x 10boxes
629760	Surgical Face Mask	Green	50pcs. x 10boxes

Neo Absorbent & Silbon Waterproof Sheets

Part Number	Description	Size	Quantity per Case
726550	Neo Absorbent Sheet	100 x 90(cm) 39.37 x 35.43 (inches)	10 pieces/bag x 10 bags
726560	Neo Absorbent Sheet	100 x 120 (cm) 39.37 x 47.24 (inches)	10 pieces/bag x 10 bags
726570	Neo Absorbent Sheet	100 x 150 (cm) 39.37 x 59.05 (inches)	5 pieces/bag x 10 bags
726580	Neo Absorbent Sheet	100 x 180 (cm) 39.37 x 70.87 (inches)	5 pieces/bag x 10 bags
726590	Silbon waterproof sheets SB-1	75 x 100 (cm) 29.53 x 39.37 (inches)	10 pieces x 10 bags
726430	Silbon waterproof sheets SB-1	75 x 120 (cm) 29.53 x 47.24 (inches)	10 pieces x 10 bags

Custom Plastics, Ceramics & Blow Molding Parts

Material: PFA, FEP, PTFE, PEEK™, UHMW Polyethylene, Vespel, Polyimide, Ceramic

Features:

- Assembly & Packaging
- Bellows, Diaphragm, Pump Assembly
- Cosmetic (PET, PEN, Dual Layers) Bottles
- Eyedrop PET Bottles/ Medical Parts
- Cutting Tool Packaging (Standard)
- Industrial Blow Molding Parts / Medical Parts
- Sheet Packaging, Stationary Bottles, Labeling

HONDA PLUS+ YOHWA

NetMotion Inc. has partnered with Honda Plus and Yohwa to supply blow molding, custom machined and fabricated components for prototype, low-volume and high-volume runs.

Industries served:
Semiconductor processing
Chemical processing
Telecommunications
Biomedical
Aerospace
Food processing
Packaging- All Kinds

PEEK (polyetherether ketone) is a high-strength polymer with excellent chemical resistance, low particle and ion emission, and excellent machine-ability.

In chemical nozzles and manifolds, PEEK allows a system to be chemically compatible with a greater variety of chemical solvents. A PEEK vacuum chuck offers low backside contamination and greater holding force in a compact package.

Material			
Vespel Polyimide	**Polyimides**	**PTFE - Polytetrafluoroethylene**	**PFA- Perfluoroalkoxy**
· Heat and wear resistance · Low coefficient of friction · Excellent dimensional stability and good toughness · Superior cleanliness · Outstanding radiation resistance · Good mechanical strength · High dielectric strength · High compressive strength · Low outgassing	· Heat and chemical resistance · Resistant to oils and greases · Outstanding radiation resistance · Commonly found in circuit boards, insulation, fibers for protective clothing, composites, and adhesives	· Elasticity of rubber combined with toughness & durability of metal · Abrasion resistance · Reduce plant maintenance and cost · Oil and solvent resistant 	· Inert to virtually all chemicals · Superior non-stick properties · Soil and stain repellant for fabric and textile products · Commonly found in aerospace, communications, electronics, industrial, process, and architecture

Vacuum Wands for Precision Parts Handling

Vacuum Wands and Tips for Small Parts Handling

Features:

- ESD Safe Wand Available
- Interchangeable Tips
- Won't Scratch like Metal Tweezers
- Picks Up All Shapes and Sizes

We have a wide selection of high quality vacuum wands and attachments/ tips available to choose from.

Nozzle: PCTFE, PEEK, Vespel, conductive PEEK, conductive nylon, stainless steel

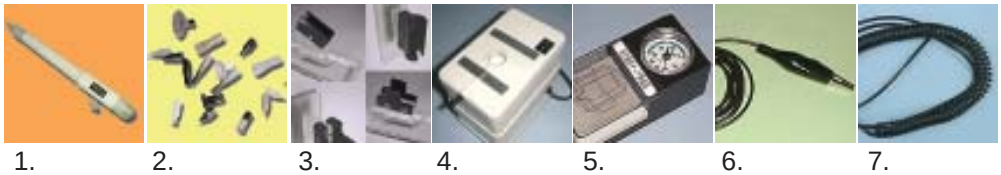
Cup: Silicone rubber, viton rubber, conductive silicon rubber, Teflon

Slit-Tip: PCTFE, conductive nylon

Description	Width of the Tips (mm.)	Tips Part Number
PCTFE Nozzle	X = 0.3, 0.5, 0.7, 1.0, 1.2, 1.5, 2.0, 2.5, 3.0	21-X
PCTFE Nozzle	X = 0.1, 0.2	22-X
PEEK Nozzle	X = 0.3, 0.5, 0.7, 1.0, 1.2, 1.5, 2.0, 2.5, 3.0	23-X
Vespel Nozzle	X = 0.3, 0.5, 0.7, 1.0, 1.2, 1.5, 2.0, 2.5, 3.0	24-X
Conductive PEEK Nozzle	X = 0.1, 0.2	25-X
Conductive PEEK Nozzle	X = 0.3, 0.5, 0.7, 1.0, 1.2, 1.5, 2.0, 2.5, 3.0	26-X
Conductive Nylon Nozzle	X = 0.3, 0.5, 0.7, 1.0, 1.2, 1.5, 2.0, 2.5, 3.0	27-X
Stainless Steel Nozzle	X = 0.3, 0.5, 0.7, 1.0, 1.2, 1.5, 2.0, 2.5, 3.0	31-X
Silicone Rubber Cup	X = 2.5, 3.0, 3.5, 5.0, 8.0, 11.0, 15.0	41-X
Viton Rubber Cup	X = 2.5, 3.0, 3.5, 5.0, 8.0, 11.0, 15.0	42-X
Conductive Silicone Rubber Cup	X = 2.5, 3.0, 3.5, 5.0, 8.0, 11.0, 15.0	43-X
Teflon Cup	X = 2.5, 3.0, 3.5, 5.0, 8.0, 11.0, 15.0	45-X
Teflon Cup	X = 20.0, 25.0, 30.0	46-X
PCTFE Slit Tip	X = 3.0, 4.5, 6.0	51-X
Conductive Nylon Slit Tip	X = 3.0, 4.5, 6.0	54-X

Vacuum Wand Kit & Accessories

- **Small Die**
- **Large Die**
- **Lenses**
- **Fiber Optics**
- **Fine Wire**
- **Contact Lenses**
- **Electronics - Multipurpose**
- **Electronics - (SMD)**
- **Jewelry**
- **Electronics - (FLAT)**
- **Flat Panels**
- **Watch and Camera**



1. 2. 3. 4. 5. 6. 7.

1. Wand Body
2. Wand Tips (See Below)
3. Wand Stand (Desk or Wall Mount)
4. Vacuum Pump with HEPA filter
5. Portable Leak Detector
6. ESD Safe Grounding Cable
7. ESD Safe Tubing

Micro, Miniature, and Mechanical Assembly Kit

For jewelers, goldsmiths, and users with similar applications; ESD safe.

Kit Part No.	Description
F002	PTFE small parts handling vac wand body, NO
31-0.1	Stainless steel nozzle, 0.1mm
23-0.5	PEEK nozzle, 0.5mm
41-2.5	Silicone rubber cup, 2.5mm
41-5.0	Silicone rubber cup, 5.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for NO* wands, with vac shut-off
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-30	Clean room vacuum pump, 300 mmHg, 2.5 l/min, HEPA

Fiber-Optic or Fine Wire Handling Kit

ESD Safe

Kit Part No.	Description
C002	Conductive nylon die/small parts handling vac wand body, NO
54-4.5	ESD safe slit-tip, 4.5mm
54-6.0	ESD safe slit-tip, 6.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for FV10/30/60 pumps
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-60	Clean room vacuum pump, 600mmHg, 2.5 l/min, HEPA

NO* - Normally open valve

Wand Kits for Precision Parts Handling

For more information on parts/accessories, please refer to page 38
Call for quantity discounts 1-800-790-7837

Contact Lens Kit

Great for picking up contact lenses.

Kit Part No.	Description
F002	PTFE small parts handling vac wand body, NO
41-2.5	Silicon rubber cup, 2.5mm
41-5.0	Silicon rubber cup, 5.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-10	Clean room vacuum pump, 3 to 15 kPa, 2.7 l/min

Glass Lens Kit

Suitable for a wide range of lens sizes.

Kit PartNo.	Description
F002	PTFE small parts handling vac wand body, NO
41-2.5	Silicone rubber cup, 2.5mm
41-5.0	Silicone rubber cup, 5.0mm
41-11.0	Silicone rubber cup, 11.0mm
41-15.0	Silicone rubber cup, 15.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-60	Clean room vacuum pump, 600mmHg, 2.5 l/min, HEPA

Multi-purpose Electronic Kit - ESD Safe

Includes our higher pressure vacuum pump and wide variety of tips for most applications.

Kit Part No.	Description
C002	Conductive nylon die/small parts handling vac wand body, NO
26-0.3	ESD Safe conductive PEEK nozzle, 0.3mm
26-1.0	ESD safe conductive PEEK nozzle, 1.0mm
43-2.5	ESD safe conductive silicone rubber cup, 2.5mm
43-5.0	ESD safe conductive silicone rubber cup, 5.0mm
43-11.0	ESD safe conductive silicone rubber cup, 11.0mm
43-15.0	ESD safe conductive silicone rubber cup, 15.0mm
54-6.0	ESD safe slit-tip, 6.0mm wide
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for FV10/30/60 pumps
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-60	Clean room vacuum pump, 600mmHg, 2.5 l/min, HEPA

Surface Mount Electronics Kit

For all SMD packages; ESD safe. Smaller and larger tips available.

Kit Part No.	Description
C002	Conductive nylon die/small parts handling vac wand body, NO
26-0.3	ESD Safe conductive PEEK nozzle, 0.3mm
26-1.0	ESD safe conductive PEEK nozzle, 1.0mm
43-2.5	ESD safe conductive silicone rubber cup, 2.5mm
43-5.0	ESD safe conductive silicone rubber cup, 5.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for FV10/30/60 pumps
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-30	Clean room vacuum pump, 300mmHg, 2.5 l/min, HEPA

Flat Packaged Electronic Component Handling Kit

For most semiconductor packages, ESD safe.

KitPart No.	Description
C002	Conductive nylon die/small parts handling vac wand body, NO
43-2.5	ESD safe conductive silicone rubber cup, 2.5mm
43-5.0	ESD safe conductive silicone rubber cup, 5.0mm
43-11.0	ESD safe conductive silicone rubber cup, 11.0mm
43-15.0	ESD safe conductive silicone rubber cup, 15.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for FV10/30/60 pumps
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-30	Clean room vacuum pump, 300mmHg, 2.5 l/min, HEPA

Jewelry Kit

For jewelers, goldsmiths, and users with similar applications; ESD safe.

Kit Part No.	Description
F002	PTFE small parts handling vac wand body, NO
31-0.1	Stainless steel nozzle, 0.1mm
23-0.5	PEEK nozzle, 0.5mm
23-1.0	PEEK nozzle, 1.0mm
41-2.5	Silicone rubber cup, 2.5mm
41-5.0	Silicone rubber cup, 5.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for NO wands, with vac shut-off
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-10	Clean room vacuum pump, 3 to 15 kPa, 2.7 l/min

Flat Panel Kit

For lightweight flat-panel displays, etc., ESD safe.

Kit Part No.	Description
C002	Conductive nylon die/small parts handling vac wand body, NO
43-5.0	ESD safe conductive silicone rubber cup, 5.0mm
43-11.0	ESD safe conductive silicone rubber cup, 11.0mm
43-15.0	ESD safe conductive silicone rubber cup, 15.0mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for FV10/30/60 pumps
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-60	Clean room vacuum pump, 600mmHg, 2.5 l/min, HEPA

Watch and Camera Kit

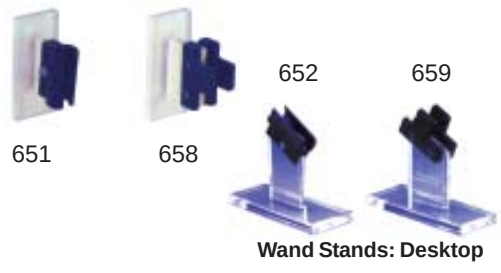
For jewelers, goldsmiths, and users with similar applications; ESD safe.

Kit Part No.	Description
F002	PTFE small parts handling vac wand body, NO
23-0.3	PEEK nozzle, 0.3mm
23-0.5	PEEK nozzle, 0.5mm
23-1.0	PEEK nozzle, 1.0mm
31-0.1	Stainless steel nozzle, 0.1mm
851-L	Coiled ESD safe tubing, 4mm ID, 2 meters extended
858	Static dissipative grounding kit for NO wands, with vac shut-off
659	Horizontal desktop stand for NO* wands, with vac shut-off
FV-30	Clean room vacuum pump, 300 mmHg, 2.5 l/min, HEPA

NO* - Normally open valve

Vacuum Wand Stand and Accessories (Continued on page 38 >>)

Wand Stands: Wall Mounted



Part No.	Material	Body NC	Body NO	Body NO+SW
651	Conductive	❖		❖
652	Nylon +	❖		❖
658*	Acrylic		❖	
659*	Resin		❖	

NC: Normally Closed
NO: Normally Open
NO+SW: Normally Open with Switch
NO+Blow:Normally Open with Blow (for Duovac)

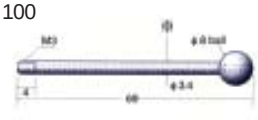
Vacuum Pumps and Wand Accessories

Features:

- Built-in inlet and outlet HEPA filters
- Oil-free for cleanroom & lab envionments
- High reliability
- Designed to minimize noise generation
- Nylon body for static protection
- Compact design

Part Number	FV-10	FV-30	FV-60
Pumping Power	2.8 l/min	2.5 l/ min	2.5 l/min.
Ultimate Pressure	-3kPa to -15kPa	-300 mmHg	-600 mmHg
Power Requirement	100 - 120 VAC	100 - 200 VAC	100 - 200 VAC
Consumption Power	5.0W	5.0W	10.0 W
Dimensions in mm. (D x W x H)	155 x 72 x 54mm.	136 x 86 x 81 mm.	136 x 88 x 129mm
Weight	600 grams	800 grams	1250 grams
Type	For small precision parts	For wafers up to 6"	For 8" & 12" wafers

100



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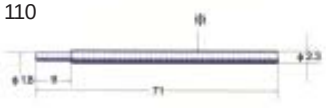
110



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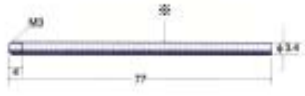

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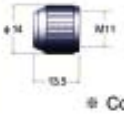
130

200



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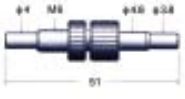


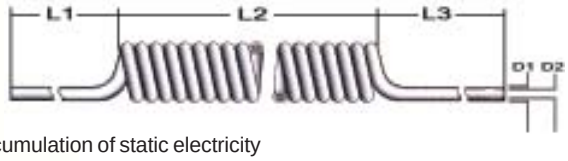
※ Covered with heat shrinkable tubing made of Teflon® FEP

Accessories & Replacement Parts

Model	Material	Connectable Tip										Connection		
		1	2	3	5	6	9	11	12	14	15			
100	SUS				●		●					X		
101	SUS+3F	●	●	●		●						X		
110	SUS	●	●	●		●								Z
111	SUS				●		●							Z
130	3F	●	●	●	●	●	●							Z
131	3F							●		●	●		Y	
200	3F	●	●	●	●	●	●		●			X		Z
812	PFA													

PFA : Perfluoroalkoxy

ESD-Safe Tubing



* No accumulation of static electricity
* Prevents sparks

Part Number	Material	Size					Weight
		D1	D2	L1	L2	L3	
851-L	Conductive Polyerethanestmer	6	4	400	500	1000	118
851-M	Conductive Polyerethanestmer	5	3	400	500	1000	84

Leak Detector

901

- Leaks are detected by measuring the vacuum level. The surface area where a wand tip is placed is made of PPS (Polyphenylenesulphide)
- D:120 W:60 H:45(mm), Weight:350(g)

OTHER PRODUCTS

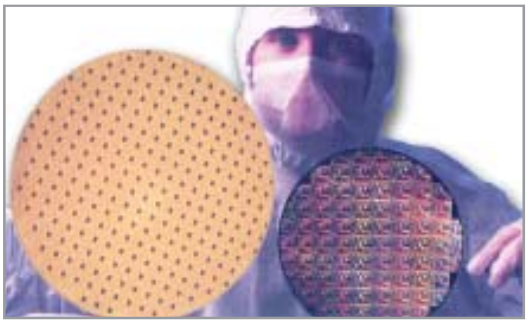
Having trouble finding what you need?

Let us help you!
800-790-7837

NetMotion offers a wide variety of new products for all industries. We have semiconductor test wafers for the hard to find 3" GaAs wafers. Introducing full of line of quality wafer containers, Ptlite LED signal light and towers. Industrial use video cameras and ultra high-resolution digital cameras, PEEK metric screws and ruby capillaries for wire bonding.

Semiconductor Test Wafers

High Quality GaAs 3” Semiconductor Test Wafers!

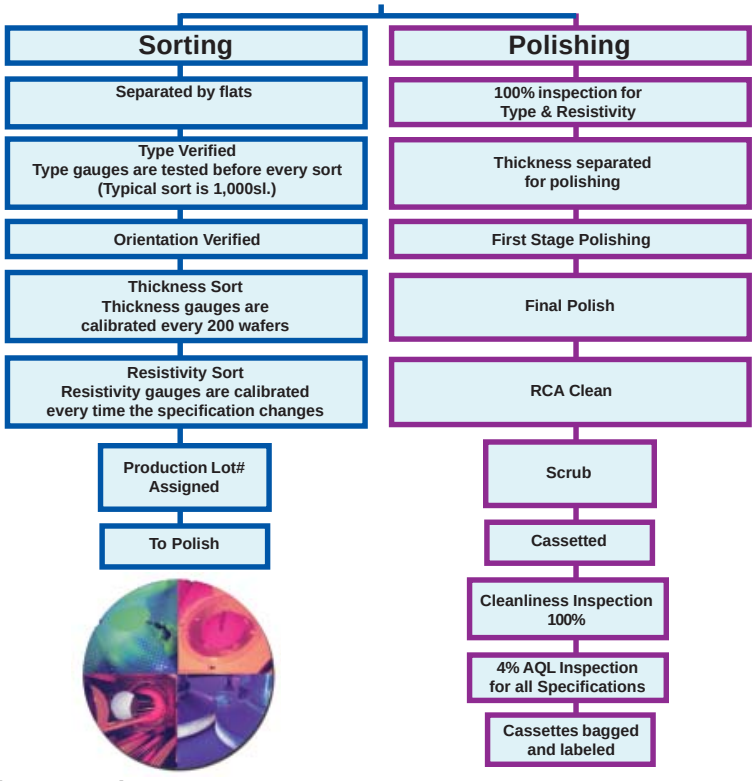


NetMotion provides high quality test wafers (single layer, multilayer, and multiple thin layers) to the semiconductor industry. We offer wafer size ranging from 1” ~12”. Customized process readily available.

Flexibility:	Completely flexible with customer designs. Available for any quantity at any delivery schedule.
Quality:	Highly uniform wafer. Complete information in data sheet. Test and trial wafers available.
Reliability:	Stringent production control.
Delivery:	Guaranteed on-time delivery.
Dopant:	N Type - Phosphorous, Antimony, Arsenic P Type - Boron Other dopants available
Orientation:	<100>, <111>, <110>, Others
Diameters:	25.4mm (1 inch) 125mm (5 inch) 50mm (2 inch) 150mm (6 inch) 76mm (3 inch) 200mm (8 inch) 100mm (4 inch) 300mm (12 inch)

For more information, please contact us at 1-800-790-7837 or e-mail sales@netmotion.com

Basic Wafer Process



Advanced Technology for Semiconductor Material Processing

Silicon Wafers

Back Slide Polishing	Monitor/ Dummy Wafer Polishing	Epitaxial Layer Growing
• Back side grinding, lapping and polishing of processed wafer with pattern • Back side polishing of extremely thin processed wafer with pattern • DI wafer • Arsenic dope wafer • Other special processing	• Recycling of used silicon wafer • Manufacturing of virgin monitor/dummy wafer	• 4 inch and 5 inch wafer • NBL defusion

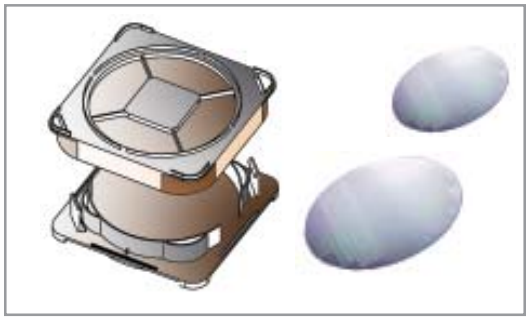
Semiconductor Compounds Wafer

GaP Wafer Polishing	GaAs Wafer Polishing	InP Wafer Polishing
• As sliced wafer • Epitaxial wafer • Wafer processing (grooving, edge grinding, etc.) • Recycling of used wafer	• As sliced wafer • Epitaxial wafer • Back side polishing of processed wafer with pattern • Recycling of used wafer	• As sliced wafer • Epitaxial wafer • Recycling of used wafer

... and more. Please contact us.

Wafer Containers, Canisters and Jars

Canisters, Jars, Separators, Shipping Boxes for Single or Multiple Wafers



NEW

Features:

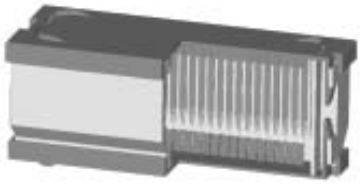
- Wide selection of wafer containers, wafer jars, die trays and reticle boxes.
- Internationally certified ISO9002, ISO14001 and QS9000
- Interchangeable desings
- eBin available for sorting

Secure Wafer Canisters - Single and Multiple

- Secure 4 latch system (with 2 latch option)
- Single and stackable designs
- Enhanced protection of wafer surface
- Impact resistant design
- Advanced particle generation performance
- Large label areas
- Holds CD jewel case
- Interfaces with industry robotic handling equipment
- Drop-in replacement for old industry designs
- Recessed slots for easy loading and unloading

Wafer Edge Support Shipping Boxes

- Designed to hold 25 wafers by the edge
- 3 piece design includes Top, Cassette, and Base
- Desgined to interface with automatic equipment

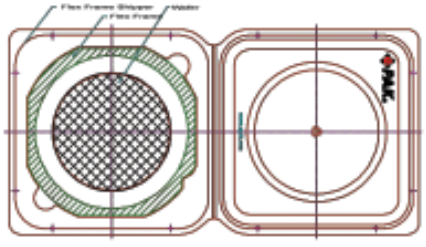


Masterpak

External packaging solution for 2,3, and 4" coin style single wafer shipper

Flex Frame Shipper

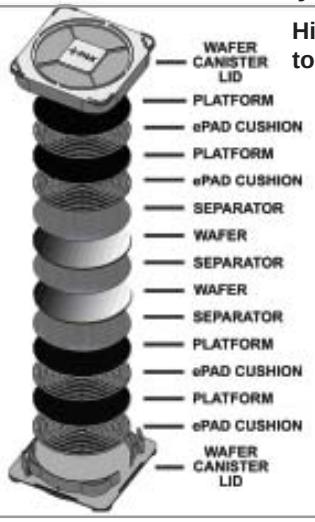
- Designed for 100, 125, 150 and 200mm wafers
- Available in anti-static coated PVC and conductive PS material



Wafer Jars

- Easy loading/ unloading in automated or manual applications
- Impact resistant contain ers feature a snap-on lid for secure packing
- Available in both conduc- tive PP and natural (non- conductive) PP materials
- A wide range of cushion disks, jar liners and wafer separators are available

ePAD Wafer Protection System



High performance alternative to foam-based solutions

- Made from proprietary, low-ionic, flexible, conductive polystyrene
- Ideal for both Cu and Al metallized wafers
- Best choice for both long and short term storage needs
- Avaialble for 6"m 8" and 12" wafers

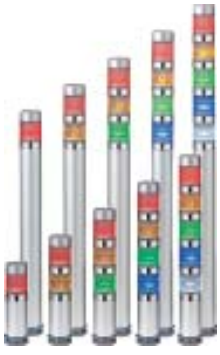
Patlite Signal Lights and Tower

LED Indicating Lights and Signal Towers For Equipment and Machinery

PATLITE

- **ME Series - Super slim LED Indicating Light** LED
  Super clear lenses and rust-free aluminum body
- **LCE Series - LED Indicating Light** LED
  Full range of LED signal lights for every need. They are versatile and energy efficient
- **LME Series - LED Indicating Light with Alarm** LED
  Double reflection system to maximize the brilliance of the high intensity LED. Can mount up to five colors along with an integral alarm and flashing circuit.

Applications: Great for medical/ pharmaceutical lab use,machine status indicator, environmental safety indicators.



LED

ME Series Super Slim Indicating Light with Ø25mm round LED lights

The ME series are direct mounted, super-slim lights with rust-free aluminum bodies.

Features:

· Colors available: red, amber, green, blue, and clear
· Lenses are made of heat and shock resistant polycarbonate resin.
· Special high intensity light design.
· Rust and corrosion proof anodized aluminum tower body.
· Can be mounted on a flat surface with a single hole.
· PNP open collecter version is available by special order. (min. 5pcs. per order)
· **Longer body size: 500mm MEL / Standard : 200mm ME / Shorter: 40mm MES**
· Protection against solid objects larger than **Ø 1mm.**
· Protection against dripping water when tilted up to 15°.
· Aluminum body, open-collector NPN only, pre-assembled/pre-wired.

Applications: Great for clean rooms, test labs, production areas, or any kind of environment that requires indicating lights.

LED

LCE Series Indicating Light with Ø40mm round LED lights

The LCE series offers the latest in LED technology. Versatile and energy efficient.

Features:

· Colors available: red, amber, green, blue, and clear
· LCE & LCE-FB/FBW Type:IP-54. LCE-W:IP-65.
· Superior high intensity LED.
· Low operating costs, lower power consumption and maintenance free.
· Two different integral alarm sound. 90dB at 1m (FB type). volume adjustable.
· Pole mount type includes mounting bracket (SZ-012) (LCE/LCE-FB)
· Free voltage style available, 100 to 240V AC.
· Total protection against dust.
· Protection against splashing water and water jets.
· Open-collector, pre-assembled/ pre-wired.

Applications: Great for indicating machine status in test labs, production areas, or any kind of environment that requires indicating lights.

LED

LME Series Indicating Light with Ø60mm round LED lights

The LME series provides the latest in LED technology.

Features:

· Colors available: red, amber, green, blue, and clear
· IP Rating: IP-65 / (FB Type: IP-54).
· **LED** modules are stackable and interchangeable after purchase, up to 5 LED modules. (New shaft purchase is required.)
· Alarms: FB-type include 2 different integral alarms with adjustable volume to 90dB (at 1m).
· Mounting: direct mount or pole mount (pole mount includes two top mounting bracket).
· 220V AC type available by special order.
· Total protection against dust.
· Protection against splashing water and water jets.
· Open-collector, pre-assembled/ pre-wired.

PEEK™ Metric Screws

PEEK™ Polymer Screws Offer Superior Chemical and Corrosion Resistance to Most Strong Acids

Features:

- Excellent chemical resistance
- Excellent heat & water resistance
- Thermal-shock resistance
- Wear and fatigue resistant
- Excellent replacement for nylon, teflon, fiber, and ceramic screws

PEEK™ (polyetheretherketone) screws are extremely stable, chemical, wear and fatigue resistant. NetMotion offers a full range of screws, nuts and bolts for all your applications.

WHY USE PEEK™ SCREWS?

PEEK™ (polyetheretherketone) polymerare designed to fill the gap between metallic screws and low-performance nonmetallic screws.

This highly crystalline thermoplastic maintains its properties under an extreme range of conditions, and it offers good wear resistance, low moisture absorption, and excellent hydrolysis resistance. It withstands high temperature levels, even under sustained pressure, and with a continuous use temperature rating of 482°F (250°C), it can be sterilized repeatedly without damage to the material. It is also known for its excellent chemical resistance (organic, inorganic solvents, aqueous reagents) and high mechanical strength, including good flexural, tensile, impact and fatigue properties.

If you are looking for injection molded, non-metallic screws., these “off-the-shelf” PEEK screws are ideal for assembling semiconductor production equipment, and may be used in applications where stainless steel corrodes or other plastics lack sufficient strength.

When screws are required to assemble critical components, readily available fasteners, such as those made from carbon steel, stainless steel, and nylon, are frequently used based on their convenience and cost. These common screws, however, no longer meet the challenges posed by today’s engineers who continue to push the design envelope with higher-performance materials.

Carbon-steel screws cannot be used in such applications as wastewater treatment, pollution control, chemical processing, or industrial machinery because of corrosion from water or chemicals. In these situations, stainless steel is often considered as an alternative because of its improved corrosion-resistance properties. However, many chemicals, including strong acids and inorganics such as salts, will attack stainless steel.

A second alternative in harsh industrial applications is the non-metallic polymer screw—usually nylon—which has inherent corrosion resistance. However, nylon has limited resistance to harsh chemicals and high temperatures, and a limited ability to withstand high loads.

When compared to nylon screws, high-performance PEEK polymer screws offer superior chemical and corrosion resistance to most strong acids, bases, inorganics, and solvents. In contrast, nylon screws are attacked by strong acids and bases at elevated temperatures, and swell when exposed to some polar solvents, including water and alcohol. PEEK screws also have inherently higher strength and temperature-resistance properties.

Available in **PEEK™ - Flat Head, Pan Head, Hex Bolts, Socket Head, Nuts & Washers**

Flat Head

Pan Head

Hex-Slotted

Hex Head & Nut

Hex Head

Type	Size
Flat Head Screw (Philip)	M2, M2.6, M3, M4, M5, M6, M8
Pan Head Screw (Philip)	M1.7, M2, M2.6, M3, M4, M5, M6, M8
Hex Head Screw (Slotted or None)	M4, M5, M6, M8, M10, M12
Socket Head Screw	M3, M4, M5, M6, M8
Nut	M2, M2.6, M3, M4, M5, M6, M8, M10, M12
Washer	M3, M4, M5, M6, M8, M10, M12

Compact Video Cameras

Great for Surveillance / Secuirty and Video Conferencing Applications. With and Without Audio

Features:

- High resolution
- Many models available
- Color video camera and cameras with audio
- Compact designs measure at as small as 23mm(W) x 77mm (H) x 9mm (D)
- Low power consumption

PXG-105N-PH

Video Camera

- CCD color video camera
- 10 lux sensitivity with F3.5 lens
- Superior image quality
- Low power consumption
- Compact and versatile design

PXG-150N-PH "Picolo"

Video Camera

- CCD color video camera
- 10 lux sensitivity with F3.5 lens
- High quality
- Low power consumption
- Compact and versatile design

PXG-160N-ST

Video Camera

- CCD color video camera
- 2 lux sensitivity with F2.0 lens
- Superior image quality
- Low power consumption
- Compact and versatile design

Model	PXG-105N-PH	PXG-150N-PH "Picolo"	PXG-160N-ST
Image Sensor	1/4" 270k Pixel IT-CCD	1/4" 270k Pixel IT-CCD	1/4" 270k Pixel IT-CCD
Effective Number of Pixels	512(H) x 492(V) Pixels	512(H) x 492(V) Pixels	512(H) x 492(V) Pixels
Resolution	Horizontal 330 TV lines	Horizontal 330 TV lines	Horizontal 330 TV lines
Output Signal	NTSC or PAL video signal	NTSC or PAL video signal	NTSC or PAL video signal
signal Processing	DSP (8bit A/D, 10bit D/A)	DSP (8bit A/D, 10bit D/A)	DSP (8bit A/D, 10bit D/A)
Sensitivity	10 lux	10 lux	2 lux with F2.0 lens
S/N	46dB	46dB	46dB
AGC	6dB	6dB	6dB
Electronic Shutter	1/60 sec - 1/1000 sec. Auto	1/60 sec - 1/1000 sec. Auto	1/60 sec - 1/1000 sec. Auto
White Balance	Auto	Auto	Auto
Gamma Correction	0.45 typ.	0.45 typ.	0.45 typ.
Lens Standard	Pinhole Lens: F3.5. f=3.7mm	Pinhole Lens: F3.5. f=3.7mm	F2.8, f=3.8mm, D:66°H:53°V:39°(ST2.8)
Lens Option			F2.0, f=3.8mm, D:66°H:53°V:39°(ST2.0)
			F2.0, f=2.0mm, D:119°H:98°V:75°(WA2.0)
			F2.0, f=2.5mm, D:107°H:94°V:67°(WA2.5)
View Angle	D:68° H:54° V:40°	D:68° H:54° V:40°	
Synchronization	Internal synchronization	Internal synchronization	Internal synchronization
Size	23mm(W) x 46mm(H) x~8mm(D)	23mm(W) x 74mm(H) x 9.5mm(D)	23mm(W) x 77mm(H) x 9mm(D)
Power Consumption	DC 4.0V 140mA	DC 4.0V 140mA	DC 4.0V 140mA
Power Supply Requirement	DC 4.5V±5%, 300mA	DC 4.5V±5%, 300mA	DC 4.5V±5%, 300mA
Operating Temperature	14°F - 122°F (-10°C ~ 50°C)	14°F - 122°F (-10°C ~ 50°C)	14°F - 122°F (-10°C ~ 50°C)
Operating Humidity	10% ~ 90%, RH	10% ~ 90%, RH	10% ~ 90%, RH

High-Resolution Digital Camera Systems

For Scientific, Industrial, and Studio Applications

Applications:

- Biological Sciences
- Medical Sciences
- Material Sciences
- Industrial

15fps Color Viewfinder (640 x 480 pixels) Studio and Level Adjustment

Product Range:

- Penguin Series: From 1.5 up to 5.8 Million Pixels with cooled CCD
- Pro Series: From 1.5 up to 5.8 Million Pixels
- 120es: 1.2 Million Pixels with enhances sensitivity
- Professional: 1.2 Million Pixels

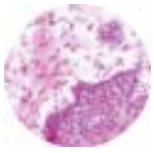
Pixera's family of digital camera systems for microscopy offers outstanding image quality and simplicity of usage. The cameras range from 1.2 million pixels to 5.8 million pixels with COOLED CCD models for low light fluorescence imaging. These are reliable, highly sensitive camera systems that are easy to learn and operate for highest quality and productivity results. Pixera's Camera Systems are designed by a high calibre R&D team, responsible for developing leading edge technology in camera design and image processing software. (Below are two models but more models are available. please contact us!)

Penguin 600CL

COOLED CCD

- Ultra-high resolution: Up to 5.8 million real pixels
- Excellent sensitivity, 0.002lux
- High signal-to-noise ratio
- High dynamic range
- Low dark current
- Fast 15ftps viewfinder @ 640x480
- Long integration exposure
- Live specimen capture at 1.5M Pixels

DAPI, niba Fluorescence



Brightfield

DAPI, wig Fluorescence

Pro 600ES

- Up to 5.8 million real pixels
- Excellent sensitivity, 0.05lux
- High signal-to-noise ratio
- High dynamic range
- Low dark current
- 24/48 bit RGB true color imaging
- Fast 15ftps viewfinder @ 640x480
- Long integration exposure
- Live specimen capture at 1.5M Pixels

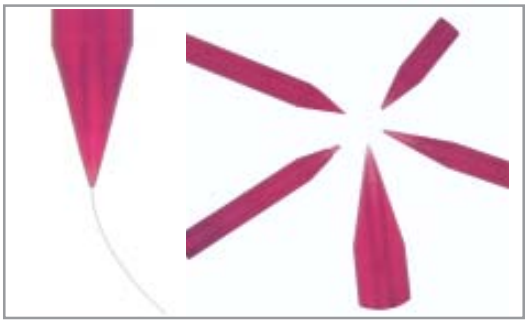
Model	Penguin 600CL (COOLED CCD)
Resolutions	2776 x 2074, 1392x 1040, 640x480
Image Sensor	1/2", 1.5 million pixels CCD
Pixel Size	4.65µm(H) x 4.65µm(V)
COOLED CCD	for reduced dark current noise
Sensitivity	0.002lux
S/N Ratio	62dB
Dynamic Range	60dB
Image Processing Speed	5-20 sec
Viewfinder**	15 fps @ 640 x 480 pixels
Long Integration Exposure	Up to 64min***
Sensitivity	ISO 200/400/800/1600
Other Features	Save & preload prior image settings
	Spot detection (various size and location)
	External hand switch
Cooling Sytem	Type: 4 stage thermoelectric Peltier Device
	Cooling temperature****: -20°C (±4°C)
	Time to reach: 2min (±30sec)

Model	Pro 600ES
Resolutions	2776x2074, 1392x1040, 640x480
Image Sensor	1/2", 1.5 million pixels color CCD
Color Depth	24 or 48 bit RGB
Sensitivity	0.05lux
S/N Ratio	62dB
Dynamic Range	60dB
Image Processing Speed*	5-20 sec
Viewfinder**	15 fps @ 640 x 480 pixels
Long Integration Exposure	Up to 64min***
Sensitivity	ISO 50/100200/400
Other Features	Save & preload prior image settings
	Spot detection (various size and location)
	RGB color specific enhancement
Options	External hand switch (Remote image capture) - standard feature for Penguin 600CL)
	Foot switch (Hands free image capture)

* including the processing time to display
** maximum frame rate is system dependent
*** maximum exposure time
**** 20°C below compared with a non-cooled condition

Ruby Capillaries

For Ultra-Smooth Wire Bonding

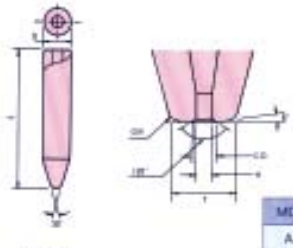


The technology of the semiconductor component integration is rapidly advancing to a degree not previosly believed possible. High integration demands both existing manufacturing precision and high product relability at low cost.

Ruby capillaries offers the best solution for high endurance, cost-effective, highly stabilized bonding. Compring to ceramic capillary nozzles, ruby capillaries are smoother on surface than ceramic capillaries. Along with lower friction coefficient, the ruby capillaries can withstand higher temperature than other materials available on the market.

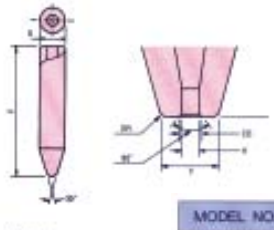
Characteristics	Ruby	Ceramic	German Degussa Sintered Al_2O_3
Chemical Composition	$Al_2O_3$99.0%$Cr_2O_3$1.0%	Al_2O_3 99.8%	Al_2O_3 99.9%
Color	Red	White	White
Crystal Size	Single Crystal	Polycrystal 3µm	Polycrystal 3µm
Specific Gravity	3.99	3.95	3.96
Water Absorption Rate	0.000%	0.001%	0.001%
Melting Point	2050°C	2000°C	2050°C
Specific Heat 25°C	0.18Cal/g	0.20Cal/g	0.206Cal/g
Inches Hardness	Mohs 9	Mohs 9	Mohs 9
Expansion Coefficient	4.4 x 10^6 kg/cm^2	4.4 x 10^6 kg/cm^2	3.67 x 10^6 kg/cm^2
Lapped Surface	<0.1µm	<25µm	<25µm
Thermal Conductivity 25°C	0.065Cal/sec·cm°C	0.05Cal/sec·cm°C	0.049Cal/sec·cm°C
Electric Resistance	at 500°C 1.3x10^{10}	at 500°C 1.3x10^{10}	at 500°C 1.3x10^{10}

Thermosonic Capillaries



MODEL NO.	H±2	T±5	CD±5	OR±5	WD
AD-1-25	25	140	64	20	18
AD-1-33	33	140	64	20	18
AD-1-38	38	166	74	25	25
AD-1-43S	43	166	74	25	25
AD-1-43	43	230	74	30	25,30
AD-1-46	46	230	74	38	25,30
AD-1-51	51	230	102	38	30,38
AD-1-56	56	240	102	38	38
AD-1-64	64	240	102	38	38
AD-1-76	76	330	140	64	51,64
AD-1-89	89	330	127	64	64,76
AD-1-102	102	330	140	64	64,76
AD-1-127	127	356	190	76	76

Thermocompression Capillaries



MODEL NO.	H±2	T±5	CD±5	OR±5	WD
AD-2-25	25	76	41	8	18
AD-2-33	33	102	49	8	20
AD-2-38S	38	89	54	8	25
AD-2-38	38	114	54	8	25
AD-2-43	43	152	59	8	25,30
AD-2-51	51	152	67	8	38
AD-2-64	64	191	80	8	51
AD-2-76	76	229	96	10	51
AD-2-102	102	305	122	10	64
AD-2-127	127	381	147	10	102
AD-2-152	152	457	178	13	127

NetMotion, Inc.

Your Design Solutions Provider!

Call 1-800-179-7837 or
Click on www.NetMotion.com today!

Contact Us

If you are outside US/Canada, call 510 440-8040
For Customer Service, Call Monday through Friday
8:00am - 5:00pm (Pacific Time)

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