

# SPRING-LOADED CONNECTORS

MAXIMUM CONNECTIONS



**MILL-MAX<sup>®</sup>**

## BACKGROUND

Increasingly complex product design requirements call for dependable connectivity. The reliability and longevity of a product can often be impacted by its connector system. The Mill-Max spring-loaded connector has risen to the forefront as a versatile connector solution, helping to solve numerous modern design challenges.

Thanks to the advantages spring-loaded connectors offer, companies in the telecommunications, military, medical, transportation, aerospace and industrial automation industries have utilized the technology to enhance their final product capabilities.

### What Are Spring-Loaded Pins?

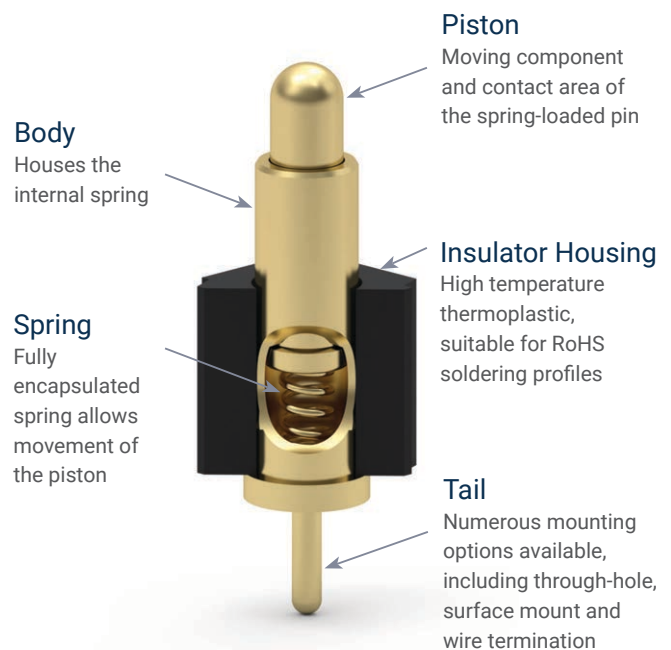
Spring-loaded pins are comprised of separate, precision-machined components assembled with a coil spring. Spring-loaded pins allow “travel” to overcome many design obstacles and provide both signal and power in a wide range of applications. These pins are inserted into high-temperature thermoplastic insulators to form a complete connector solution.

### Key Features

- Precision-machined; gold-plated components provide optimal electrical & mechanical performance
- Current rating availability from 2A to 9A
- Typical contact resistance of <math><20\text{m}\Omega</math> at working travel
- 100,000 to 1,000,000 typical mating cycle life

Mill-Max has the widest selection of standard spring-loaded products available in the industry. We continue to set benchmarks as a pioneer in product innovation, satisfying the most demanding applications. Our in-house machining capabilities enable us to respond to both high and low demand enquiries with flexibility and speed.

### The Components of a Spring-Loaded Connector



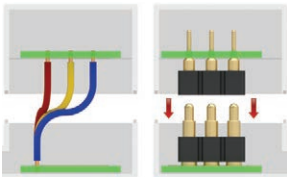
For our latest product developments and to sign up for notifications via email, visit [www.mill-max.com/newproducts](http://www.mill-max.com/newproducts)

## INDUSTRIAL AUTOMATION

Gas exploration, valve control systems, chemical processing, and energy harvesting are just a few of the industrial applications using Mill-Max's spring-loaded connectors.



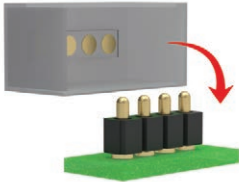
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## Eliminate wired connections

The need for a wired solution can be eliminated, creating modular assemblies and reducing final assembly and labor costs.

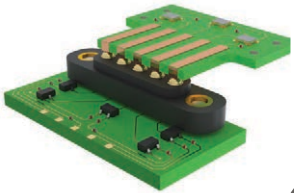
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## Blind mating

Ideal for connections with restricted visibility due to alignment forgiveness when mating. Zero insertion requirement greatly reduces potential damage to components.

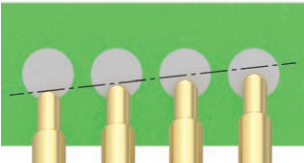
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## Sliding action

Sliding and rotational mating action is possible, allowing numerous mating possibilities.

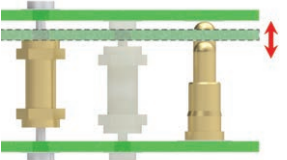
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## Mis-alignment compensation

Errors in alignment, flatness, and parallelism are no longer problematic.

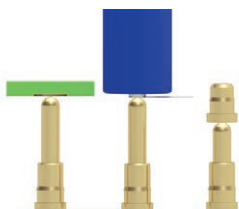
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## Tolerance stack-up

Positional and assembly tolerances can be overcome due to the range of allowable movement.

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## Numerous mating options

Can be mated with a wide range of surfaces including PCB pads, battery contacts and dedicated Mill-Max target connectors.

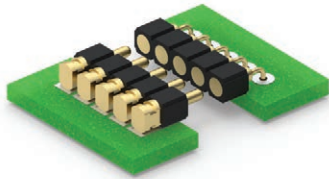
## ADVANTAGES

Mill-Max spring-loaded (pin) connectors provide reliable electrical connections in the most rigorous environments.

### Other advantages:

- Off-the-shelf availability
- Quick, low-cost customization options
- High Cycle life
- Reduced production time
- Low profile & high-density design is achievable

# PRODUCT RANGE



Horizontal mount



Vertical mount



Wire termination



Magnetic connection

## Spring-Loaded Connectors

Mill-Max offers a wide range of standard spring-loaded connector arrays to meet numerous application requirements.

- Connectors with .050" (1.27mm), .079" (2mm), .100" (2.54mm) & .157" (4mm) pitch
- Surface mount, through-hole, right-angle and solderless mounting options
- Selectively loaded arrays and first mate/last break (FMLB) capabilities
- Solder cup and crimp terminal features for wire termination
- Optional threaded inserts for mechanical fastening
- Magnetic connector options available to provide quick, secure "breakaway" type connections

**Search for spring-loaded connectors at [www.mill-max.com/SLC](http://www.mill-max.com/SLC)**



## Individual Spring-Loaded Contacts

Mill-Max offers numerous discrete pin designs for individual spring-loaded pin requirements.

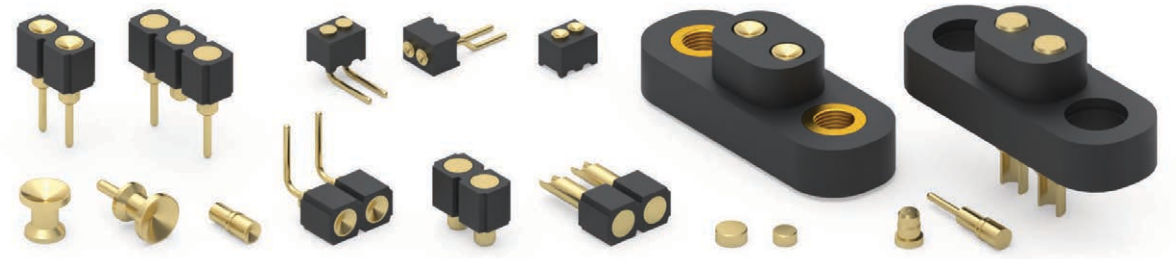
- Current ratings from 2A to 9A at a low 10°C temperature rise
- A range of standard off-the-board heights, starting from .100" (2.54mm)
- Spring travel options from .024" (0.6mm) to .118" (3mm)
- Low, standard, and high spring force options
- Very low profile and small diameter contacts for applications with limited space
- Rugged contacts for the most demanding environments
- Solder cup and crimp terminal features for wire termination
- Rolling ball interface option available for sliding or rotational applications
- Insulated contacts for electrical isolation from surrounding components

**Search for individual spring-loaded contacts at [www.mill-max.com/springcontacts](http://www.mill-max.com/springcontacts)**

## MEDICAL

Mill-Max has deep experience working with medical customers on devices from monitoring stations to surgical tools.





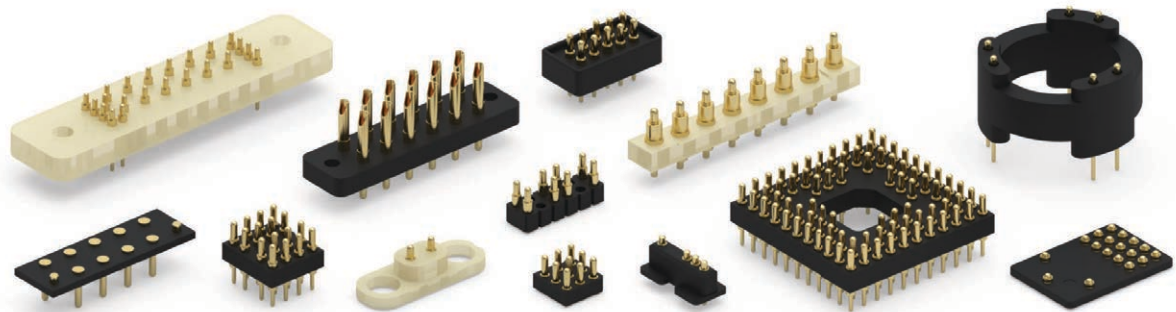
## Target Connectors

In addition to connectors that mate directly with a PCB, battery contact or any conductive metal surface, Mill-Max has a dedicated line of “target” connectors. These are purpose-made components, designed to mate with our spring-loaded connectors. They include:

- Through-hole connectors and “nail-head” style pins
- SMT connectors and individual target discs for low profile, space-saving applications
- Concave-face availability to maximize surface contact and increase alignment capability

Target pins and connectors ensure the spring compression is optimized for sustained mechanical and electrical performance.

**Learn more at [www.mill-max.com/SLCtarget](http://www.mill-max.com/SLCtarget)**



## Custom Parts

Can't find a suitable design on the shelf? Mill-Max offers custom spring-loaded connector products. Our engineering department will work with you on a connector designed specifically to meet your application's needs. With low minimums and competitive pricing, we can design the ideal solution, whether it's for full production or prototype purposes.

**Learn more at [www.mill-max.com/customSLC](http://www.mill-max.com/customSLC)**

**Learn more about spring-loaded connectors at [www.mill-max.com/learnSLC](http://www.mill-max.com/learnSLC)**

## MILITARY

Mill-Max has provided rugged connector options, even on the most obscure designs, to military and defense contractors for decades.





## TYPICAL APPLICATIONS

Mill-Max spring-loaded connectors are ideal for numerous applications with a unique design that can solve the challenge of establishing an electrical path between mating points.



### Board-to-board

Connecting two (or more) parallel or perpendicular boards is possible, using the benefit of spring travel to accommodate for tolerance stack-ups, misaligned boards and errors in parallelism and co-planarity. Mating directly with a pad on a PCB also eliminates half of the traditional connector solution.



### Cable termination

A wire or cable harness can use Mill-Max spring-loaded pins as its termination point. Terminating the cable into a spring-loaded pin and over-molding or press-fitting the spring-loaded pin into a plastic housing allows the user to create a cable-terminated connector with a spring-loaded contact as the connection point.



### Battery & portable device charging

Numerous profile, travel and spring force options provide an ideal solution for charging batteries and docking handheld devices requiring data and power transfer. The spring-loaded pin allows for blind mating and can compensate for misalignment within a charging cradle.

### Test points

Mill-Max spring-loaded pins are often used on manual test jigs and ATE (automatic test equipment) probe arrays, allowing multiple-point PCB testing. The high number of mating cycles ensures test-fixture longevity.

Learn more at [www.mill-max.com/SLApplications](http://www.mill-max.com/SLApplications)

## HIGH-END CONSUMER PRODUCTS

To avoid costly recalls and replacements, many leading consumer brands, such as smart-home device manufacturers, use Mill-Max's reliable spring-loaded connectors.

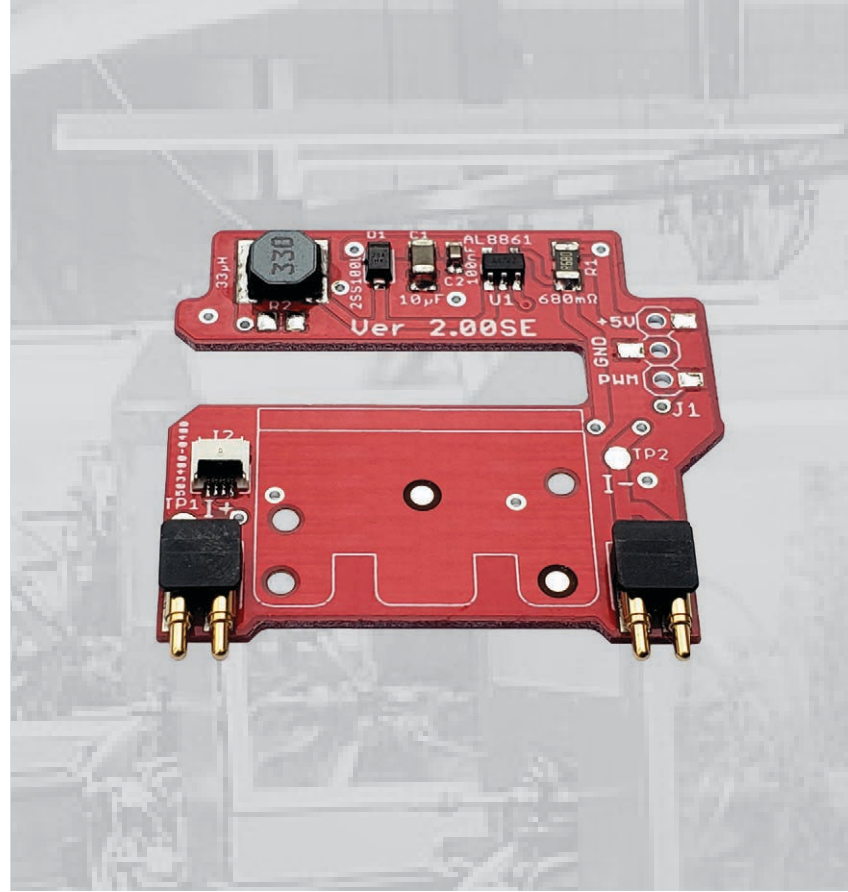


Spring-loaded interconnects provide a 'drop-in' conductivity solution without impacting the overall design.

A leading anti-condensate and defogger solutions provider was sought by a pharmaceutical company to retrofit a solution into its existing systems to eliminate barcode-read errors due to condensation on scanner lenses.

An anti-condensate controller was developed on a 0.6mm-thin circuit board assembly (PCBA). A unique shape and thinness allowed the PCBA to be retrofitted into the customer's original design without significant displacement of existing internal parts—saving a costly redesign. Mill-Max interconnects bridged the connection between the controller and custom conductive glass lenses located on the opposing half of the customer's clamshell enclosure design.

The novel design, along with compact size of the interconnects, provided an anti-condensate solution without the need for any retooling of the customer's enclosure—and maintained the ingress protection of the sealed enclosure. Thanks to quick assistance from Mill-Max, progress was able to move quickly from initial customer contact to custom engineering and production manufacturing in only six weeks. To date, thousands of units have been deployed with a 100% reliability rate.



## CASE STUDIES

**A custom solution ensures a reliable charging connection.**

The most important attribute of an efficient communications device is connection reliability. A handheld listening device manufacturer determined this could be achieved with the integration of both magnets and spring-loaded connectors in their device charging dock. However, its exact connector needs were not available as a standard part.

Mill-Max was consulted on the possibility of creating a custom spring-loaded connector that would mate with a competitor's mating contact. Mill-Max worked rapidly with the manufacturer's design team to develop both the spring-loaded connectors and the mating contact, while minimizing connector development costs. Prototypes were provided to determine the correct spring force and connector height needed for a reliable connection. Both cost and performance were key features for the integration of magnets into the charging station pockets.

With the help of Mill-Max's team, a device was brought to the market that provides a consistently reliable connection that resulted in significant customer satisfaction.



## About Mill-Max

Mill-Max Manufacturing Corporation, an engineering and manufacturing company, is the largest manufacturer of precision-machined interconnect components—more than 100 million each week—in North America.

## What We Offer

Mill-Max's interconnect components include precision-machined contact pins and receptacles, spring-loaded connectors, PCB pins and solder terminals, IC sockets, and board-to-board interconnects, all available in SMT and through-hole.

## What Sets Us Apart

Mill-Max exercises total control from raw materials to finished product. Our 150,000-square-foot plant houses all facilities including engineering, customer service, sales and marketing, tooling, primary and secondary machining, stamping, electroplating, injection molding, and automatic assembly operations.

Our customer-driven philosophy means we welcome custom designs, regardless of volume, beyond the more than 20,000 standard products we offer in our catalog and website.

## Our Focus

From order entry to product shipping, Mill-Max is focused on the total satisfaction of our customers. Our products are sold directly through our sales representative organizations and through a network of authorized distributors located throughout the U.S. and in various locations worldwide. Contact us at 516-922-6000 or via our online contact form.

Our commitment to excellence makes Mill-Max your source for maximum interconnect solutions.



## WORLDWIDE DISTRIBUTION



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