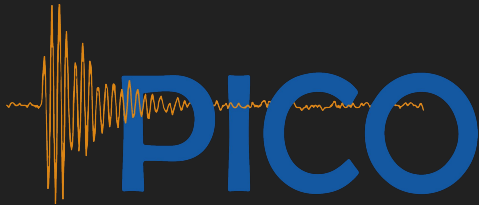


PLC Patch Panel/Jumper Options

Michael Rangen
August 20, 2024



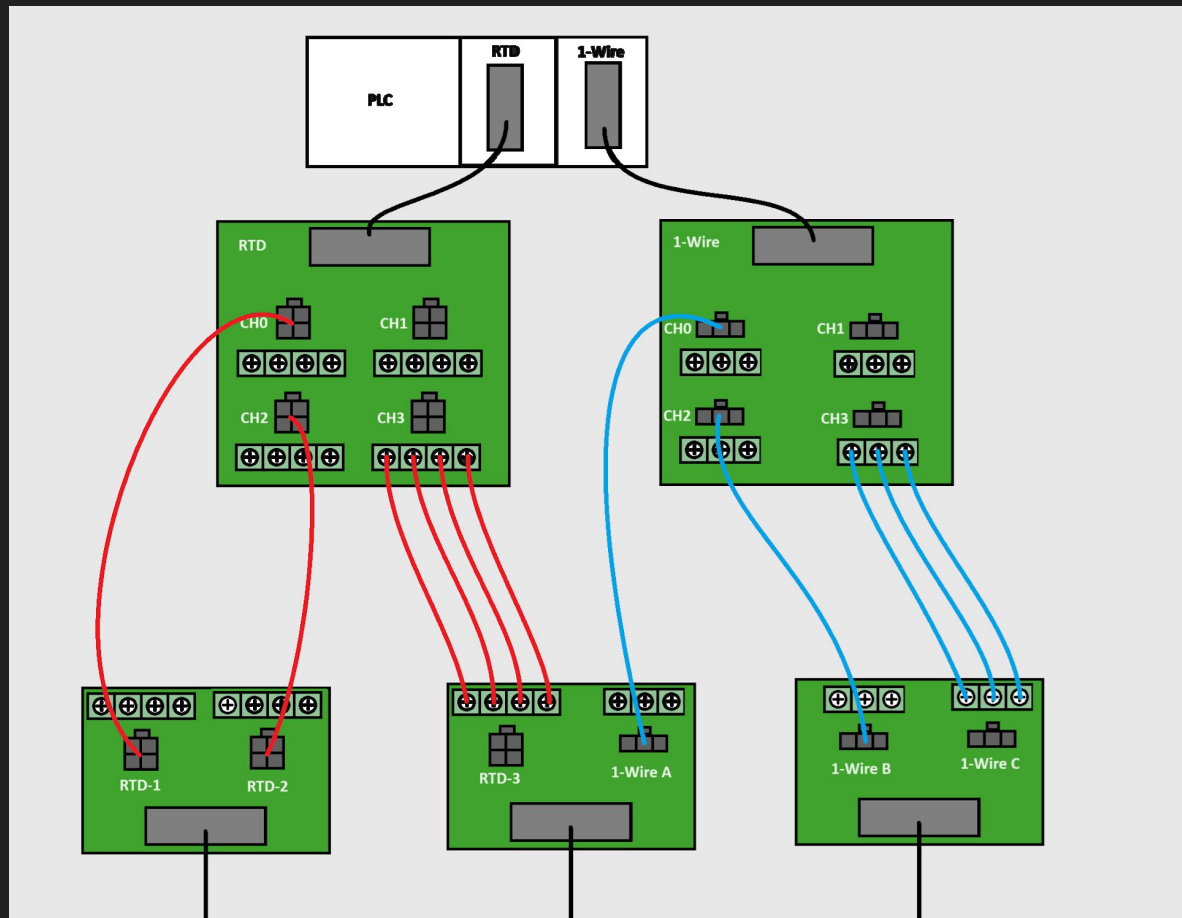
Arthur B. McDonald
Canadian Astroparticle Physics Research Institute

Key Principles

- Add a layer of abstraction to the electrical cabinet that allows researchers to troubleshoot at the cable layer, rather than the wire layer, through the use of cables that have a connector shape specific to the signal it is carrying.
- 1-Wire cables will have a specific 1-Wire connector, RTD cables will have unique connector, etc.
- Reduces risk of damage to the detector during troubleshooting while increasing speed and ease
 - Swapping channels or sensors to perform a sanity test is quick and easy
 - Wires are not exposed when cable disconnected
 - Provides places to make easy multimeter connections
 - Provides an avenue for connecting to the sensors with a device other than the PLC
 - Provides a place for added fuses, LED indicators, and ESD protection
 - Terminal blocks included for manual wiring and future flexibility

Conceptual Drawing

- PLC Module Breakout
 - A cable or wires that route signals from the PLC modules to a breakout board.
- DB-50 Detector Breakout
 - Breaks out the signals carried by the DB-50 cables that run down to the detector.



Implementation Principles

- Keyed connectors to prevent incorrect insertion
- Latched connectors to lock them in place
- Pre-built commercially available cables
- LED power indicators
- Labeling on all cables, connectors, PCBs, etc.
- Fuses
- ESD Protection
- PCBs designed to mount to rack
- Connectors positioned to keep cables contained within cable raceways
- Through-Hole connectors, surface mount models are less robust
- Goldilocks sizing
 - Not too big, not too small
 - Can be manipulated with hands, tools not required or desired
 - Cable should be able to be disconnected without pulling on the wires



- Molex offers many families of wire-to-board connectors that cover a broad spectrum of use cases
- <https://www.molex.com/en-us/products/connectors/wire-to-board-connectors>



CORE SIGNAL CONNECTORS

0.80-2.50MM PITCH

COMMON FEATURES AND ADVANTAGES



FRICION LOCK

Provides a convenient locking mechanism and maintains a small connector footprint



POSITIVE LOCK

Helps ensure mated connector assemblies will not accidentally disengage; indicate to the operator through and audible click that the part is fully mated



POTTING

Offers an excellent option for applications that require high resistance to vibration, impacts, abrasion, heat and/or chemicals
Provides protection against electrical stress, and used for high



LOW PROFILE

Offers easy-to-use connector solutions in a slim, low profile package
Provides space savings on the PCB and in various applications



TPA RETAINER

Helps ensure terminals are fully seated in the proper position of their housing
Improves the quality of assembly and can therefore save on costs



<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/milli-grid-connectors>

WIRE-TO-BOARD

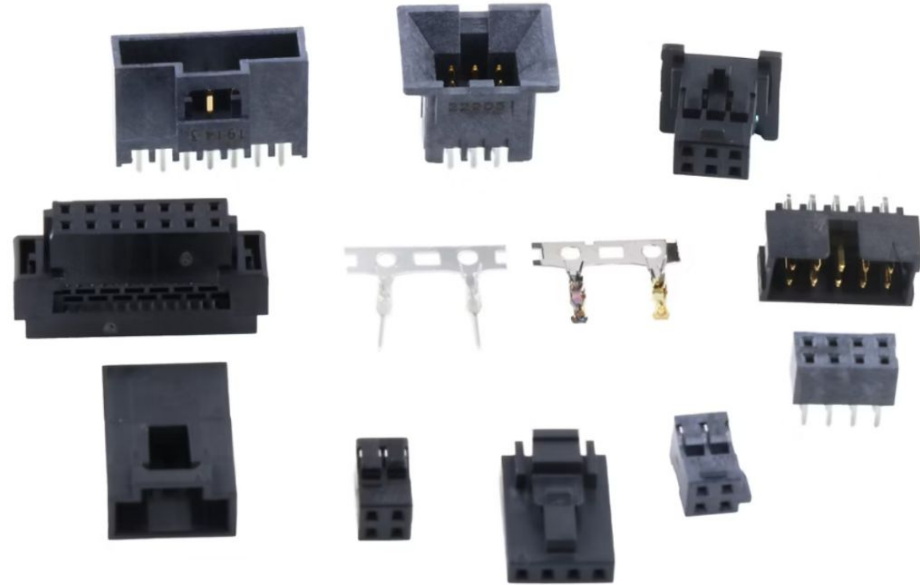
Milli-Grid Connectors

A high-density connector system based on a 2.00 by 2.00mm grid pattern that offers complete design flexibility for wire-to-board, board-to-board and cable-to-board applications.

Find Parts →

Contact Us →

Style	Pitch	Current	Circuits	Operating Temperature
Board-to-board Cable-to-board Wire-to-board	2.00mm	4.5A	2 to 50	0 to +75°C



A space saving, high-density connector system based on a 2.00-by-2.00mm grid pattern that offers complete design flexibility.

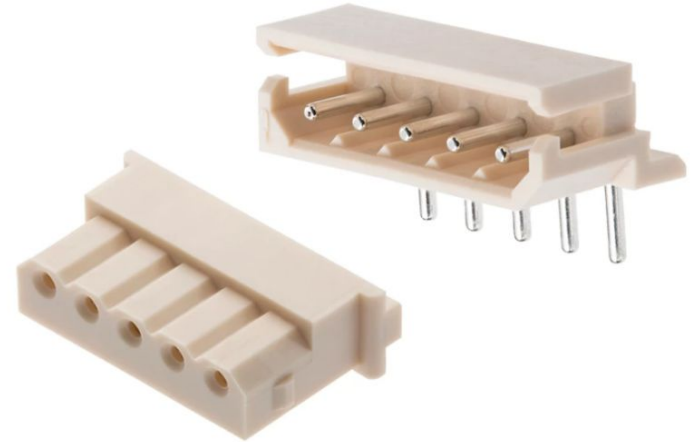
<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/mini-spox-connectors>

Mini-SPOX Connectors

Ideal for compact applications, the Mini-SPOX 2.50mm Wire-to-Board Connector System provides electrical and mechanical reliability in a high-temperature design that meets automotive, consumer and industrial industry requirements.

Find Parts →

Contact Us →



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
2.50mm	3.0A	22 to 28 AWG	250V	Through Hole

Provides a fine-pitch connector system that features lower profile heights and various circuit sizes in vertical and right-angle configurations, with an additional polarization feature which helps to avoid mismatching.

<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/kk-connectors>

KK Connectors

The KK Connector System includes wire-to-board and board-to-board solutions that deliver design flexibility and reliable electrical connectivity. KK connectors are engineered for low-to-mid-power applications, while KK Plus connectors provide quality solutions for high-power needs. Manufacturers can save time and money with KK products, as they offer diverse configurations for streamlined designs and efficient assembly.

Find Parts →

Contact Us →



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
-------------	----------------	------------	----------------	--------------------

2.54mm, 3.96mm, 5.08mm	2.5A to 13.0A*	18 to 30 AWG	250V, 600V	Through Hole
------------------------------	----------------	--------------	---------------	--------------

*Dependent upon product

KK Connector Systems are customizable for a variety of power and signal applications. Available in industry-standard 2.54, 3.96 and 5.08mm pitch sizes, this single-row, wire-to-board and board-to-board product family is cost effective and versatile.

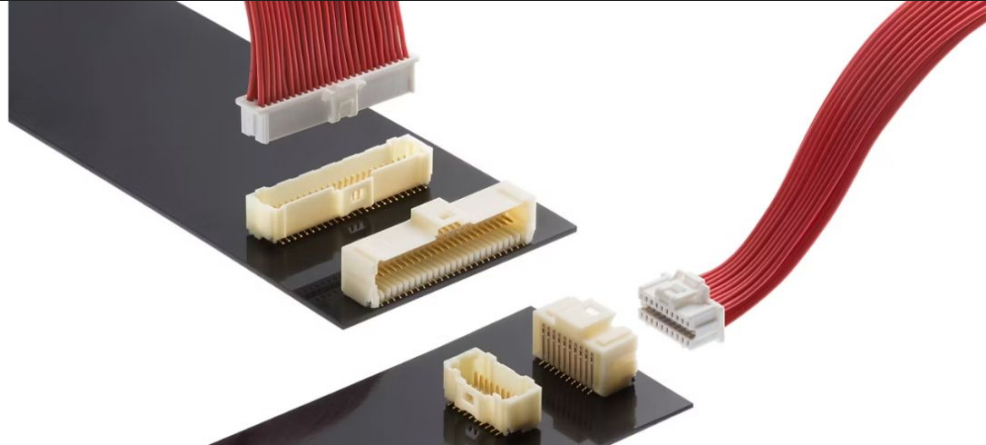
<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/pico-clasp-connectors>

Pico-Clasp Connectors

Molex's core 1.00mm-pitch, wire-to-board Pico-Clasp Connectors offer a versatile system that offers a variety plating and design options, ideal for nearly all applications.

[Find Parts →](#)

[Contact Us →](#)



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
-------------	----------------	------------	----------------	--------------------

1.00mm	2.0A	28 to 32 AWG	100V	SMT
--------	------	--------------	------	-----

Offer a variety of mating styles and orientations plated in tin or gold to provide design flexibility in a vast array of compact applications.

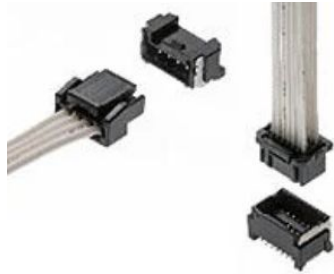
<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/micro-lock-plus-connectors>

Micro-Lock Plus Connectors

Ideal for compact applications, the Micro-Lock Plus Connector System provides electrical and mechanical reliability in a high-temperature design that meets other industry requirements.

Find Parts →

Contact Us →



Pitch (mm):

Current (MAX):

Wire Size:

Voltage (MAX):

Termination Style:

1.25mm,
2.00mm

3.6A

22 to 30
AWG

250V

SMT

Delivers high performance and reliability in a compact size; available in vertical and horizontal configurations for design flexibility and color coding to aid assembly.

<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/clik-mate-connectors>

CLIK-Mate Connectors

CLIK-Mate connectors are designed for applications that require higher pin count connectors to carry more signal lines in less space; the system includes a unique tuning-fork terminal concept that provides low-insertion force and secure mating contact.

Find Parts →

Contact Us →



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
1.25mm 1.50mm 2.00mm	3.0A	24 to 30 AWG	100V	SMT, Through Hole

Provides lower mating insertion and extraction forces than competitive versions, which makes assembly easier for operators.

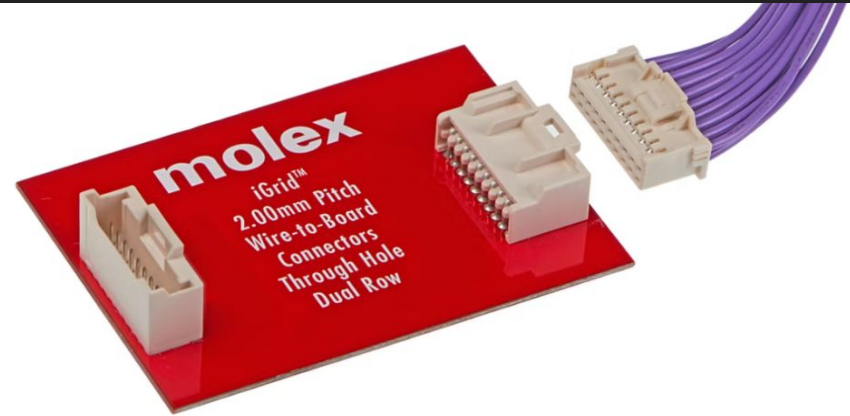
<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/igrid>

iGrid

Molex's iGrid 2.00mm pitch connector system offers compact design and anti-tangle internal lock for applications requiring good mating retention.

[Find Parts →](#)

[Contact Us →](#)



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
-------------	----------------	------------	----------------	--------------------

2.00mm	2.0A	22 to 28 AWG	250V	Through Hole
--------	------	--------------	------	--------------

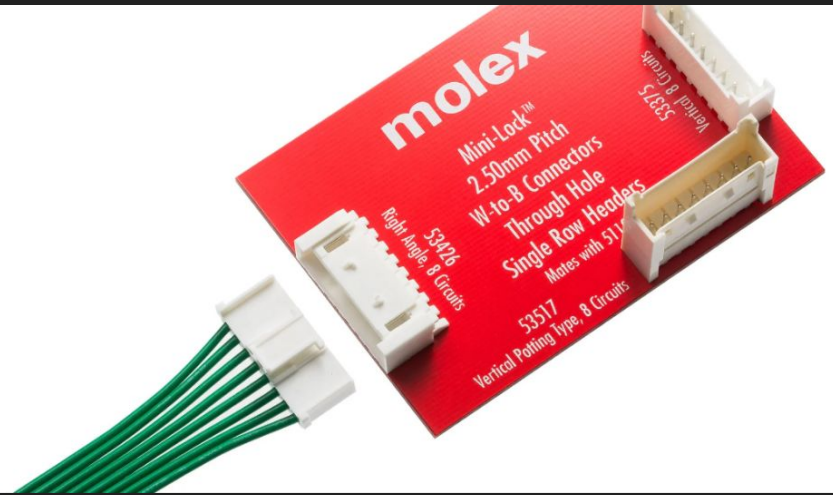
<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/mini-lock-connectors>

Mini-Lock Connectors

Mini-Lock Wire-to-Board/Wire-to-Wire 2.50mm pitch system is a versatile and proven product with a broad range of features that include TPA, positive-lock and a glow wire capable option to meet varying industry needs.

Find Parts →

Contact Us →



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
2.50mm	5.0A	20 to 26 AWG	250V	SMT, Through Hole

A fully shrouded versatile wire-to-board/wire-to-wire system for broad ranges of 2.50mm pitch industry-standard applications includes straight and right-angle headers.

<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/rast-connectors>

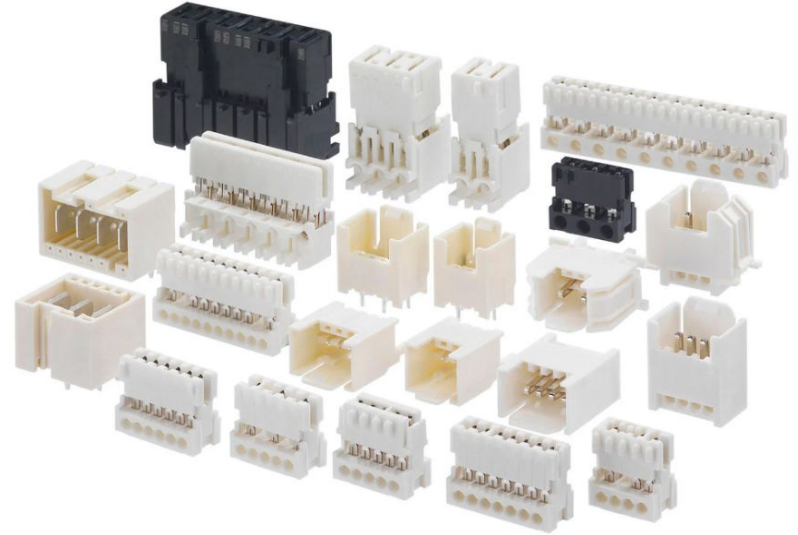
RAST Connectors

The UL-94V0-rated, glow wire capable RAST Connector System delivers a range of current ratings to offer design flexibility for a variety of home appliance and automotive lighting applications.

Find Parts →

Contact Us →

Current	Compliance	Mating Cycles
Up to 16.0A	Glow Wire, Hot Wire and Various Approvals	10 Minimum



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
2.50mm, 5.00mm	16.0A	20 to 22 AWG	250V	Through Hole, IDT, Pierce

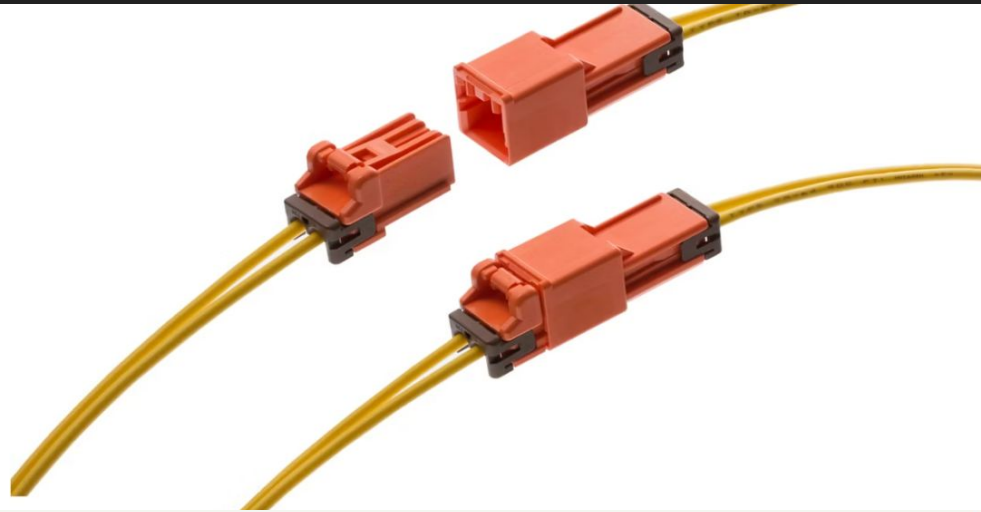
<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/cp-connectors>

CP Connectors

Leveraging full-keying and color-pairing features, the foolproof Wire-to-Wire CP-2.5 Mini, CP-3.3, CP-4.5 and CP-6.5 Connector Solutions, and Wire-to-Board CP-6.5 Connector Solutions enhance user-safety while speeding up consumer and industrial interconnect assembly applications; available in 2.50, 3.30, 4.50 and 6.50mm pitch sizes.

Find Parts →

Contact Us →



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
2.50mm, 3.30mm, 4.50mm, 6.50mm	3.0A to 12.5A*	16 to 28 AWG	300V, 500V, 600V*	Through Hole

*Dependent on product

<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/micro-one-connectors>

Micro-One Connectors

As the need for contact reliability in compact, harsh environment applications grows, Molex's Micro-One Wire-to-Board Connector System provides a 2.00mm pitch solution with integrated Independent Secondary Lock (ISL), independent TPA, potting capabilities and glow wire capable options.

[Find Parts →](#)

[Contact Us →](#)



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
-------------	----------------	------------	----------------	--------------------

2.00mm	4.0A	22 to 28 AWG	250V	SMT, Through Hole
--------	------	--------------	------	----------------------

Provides an integrated ISL to ensure proper terminal insertion and prevent accidental back-outs to achieve a secure electrical contact and improved mating retention in high-vibration applications.

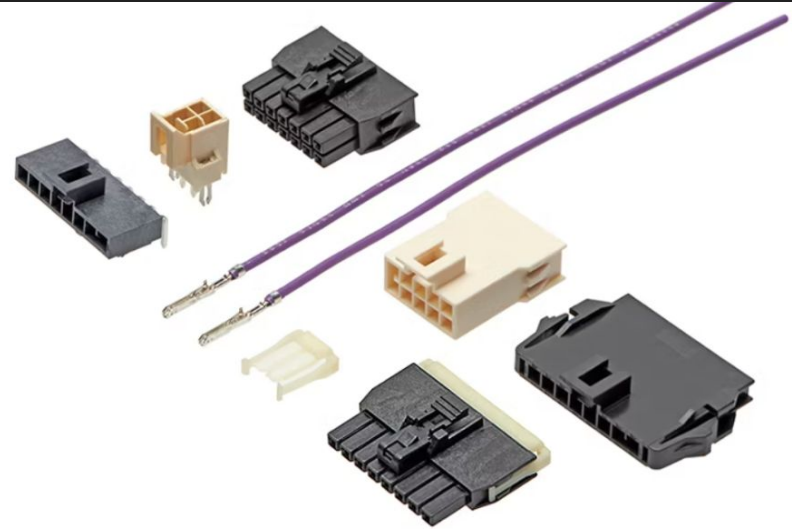
<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/nano-fit-connectors>

Nano-Fit Connectors

Nano-Fit Power Connectors deliver fully protected header terminals, a small pitch size color-coding/keying options that ensure proper mating and terminal position assurance (TPA) to reduce terminal back-out; available in Wire-to-Board and Wire-to-Wire configurations.

Find Parts →

Contact Us →



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
2.50mm	8.0A	20 to 26 AWG	250V	SMT, Through Hole

The smallest to-date, fully isolated header that meets customers' power needs while providing protection for the terminals in a small package.

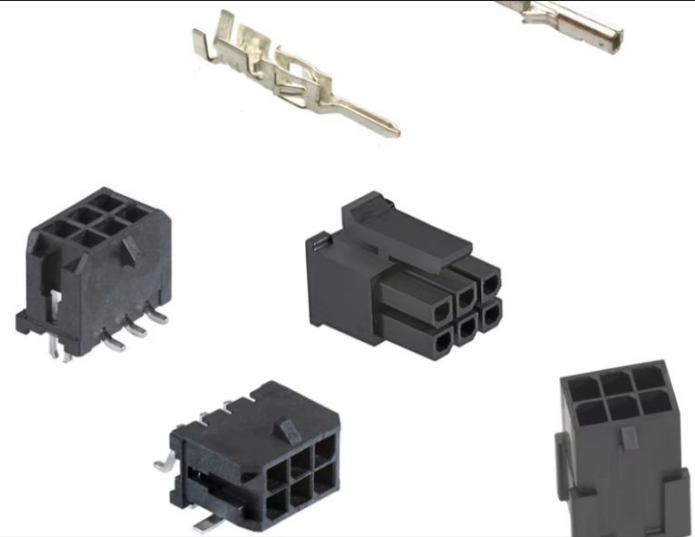
<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/micro-fit-connectors>

Micro-Fit Connectors

The Micro-Fit Connector family can withstand operating temperatures up to 125°C, is available in multiple circuit sizes and cable lengths for power applications and board-to-board, wire-to-board and wire-to-wire configurations.

Find Parts →

Contact Us →



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
3.00mm	10.5A	18 - 30 AWG	600V	Solder or Weld, SMT, Through Hole

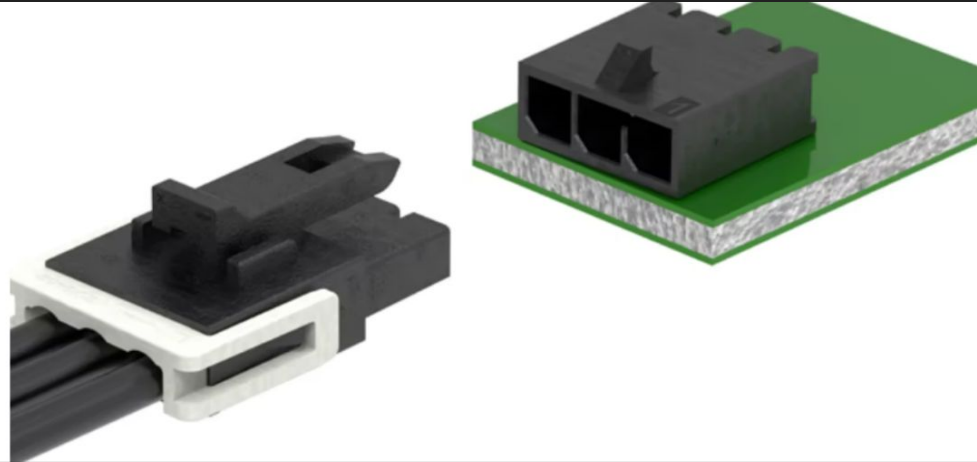
<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/micro-fit-plus-connectors>

Micro-Fit + Connectors

The Micro-Fit+ Connector System is a glow wire capable wire-to-board and wire-to-wire system which offers a 3.00mm pitch, a higher-current rating of up to 13.0A and superior design options for flexibility and efficient assembly.

Find Parts →

Contact Us →



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
3.00mm	13.0A	16 to 30 AWG	600V	SMT, Through Hole

<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/ultra-fit-connectors>

Ultra-Fit Connectors

Ultra-Fit Power Connectors deliver color-coding and keying options that eliminate same-circuit-size mis-mating, and offer the tangless feature that allows the terminal locking mechanism to be incorporated into the receptacle housing.

[Find Parts →](#)

[Contact Us →](#)



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
3.50mm	14.0A	16 to 22 AWG	600V	Through Hole

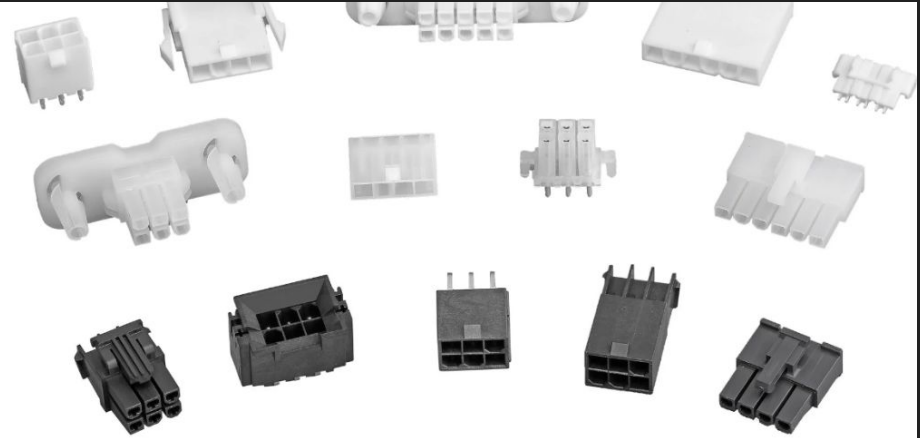
<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/mini-fit-connectors>

Mini-Fit Connectors

The Mini-Fit Connector family delivers an operating temperature up to +125° C, offers a double crimp tool and is available in Board-to-Board, Wire-to-Board and Wire-to-Wire configurations.

Find Parts →

Contact Us →



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
4.20mm	20.5A*	14 to 28 AWG	600V	SMT, Through Hole, CPI

*Dependent upon product

<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/mega-fit-connectors>

Mega-Fit Connectors

Mega-Fit Single-Row Wire-to-Board and Dual-Row Wire-to-Wire and Wire-to-Board Connectors deliver up to 30.0A per circuit through fully protected header pins and receptacle terminals, while offering unique keying options to ensure proper mating during termination.

[Find Parts →](#)

[Contact Us →](#)



Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
5.70mm	30.0A	10 to 16 AWG	600V	Through Hole

<https://www.molex.com/en-us/products/connectors/wire-to-board-connectors/mlx-connectors>

MLX Connectors

MLX Power Connectors provide a cost-effective solution for various industrial applications in wire-to-board and wire-to-wire combinations and offer greater design flexibility in mating with existing wire harnesses, connectors and PCB headers.

[Find Parts →](#)

[Contact Us →](#)



6.35mm pitch, 2.13mm diameter pin and socket power connector system. Also includes MLX Ground Block System to centralize electrical ground wiring.

Pitch (mm):	Current (MAX):	Wire Size:	Voltage (MAX):	Termination Style:
6.35mm	20.0A	14 to 24 AWG	600V	Through Hole

Questions?

Concerns?

Biases?

Ideas?