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Electronic Design

Rugged Solutions for Board-to-Board Industrial Connections

Sponsored by Digi-Key and Harwin: Cutting the size of typical connectors in half, this series of 1.27-mm-pitch these compact devices provide the added space/flexibility needed for engineers dealing with multi-board industrial designs.

Electrical connectors play a crucial role in linking various electronic components such as printed circuit board (PCBs), expansion cards, and external data interfaces, and their performance has a direct effect on overall system reliability. As sophisticated electronics become the norm in industrial settings, demand is on the rise for robust components suitable for this market.

Highly automated production flows being networked together depend on board-to-board connectors to provide signal connections in an accurate and repeatable manner. These connectors consist of two linking parts—the first part has pins and is attached to a single board, while the other part containing receptacles is mounted to another PCB.

1.27-mm-Pitch Connectors

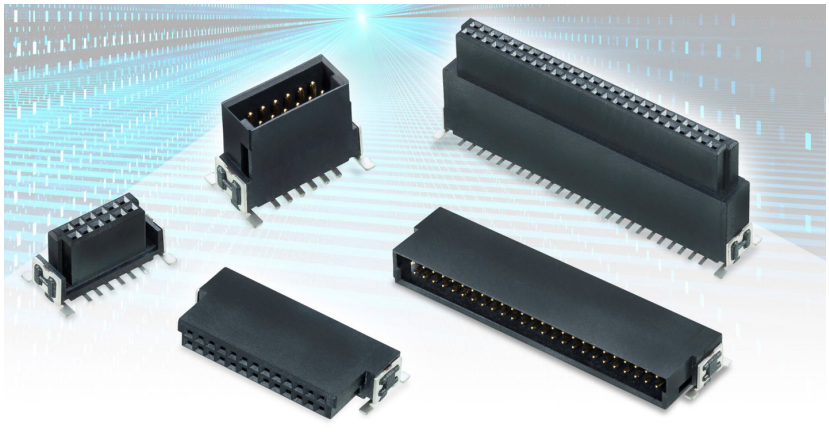
When using two or more interconnected boards makes sense, engineers can opt for the Harwin Archer Kontrol range of compact board-to-board 1.27-mm-pitch connectors *(Fig. 1)*. These connectors offer designers a robust and flexible connection choice for a wide scope of industrial applications, such as drives and controls, factory hardware, data loggers, IoT installations, portable monitoring equipment, vehicle control systems, rail equipment, and road- and track-side monitoring/telemetry systems.

Because many of these applications don't require the current-carrying load of 2.54-mm-pitch (0.1 in.) connectors, the choice of 1.27-mm (0.05 in.) pitch becomes an excellent alternative. The 50% space saving frees up a significant amount of area for other components or smaller units overall. Yet despite the small pitch, the Archer Kontrol connectors offer a high current rating of up to 1.2-A current per contact.

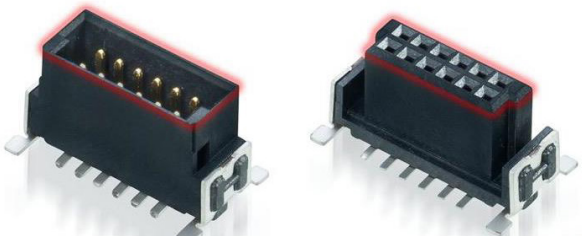
Archer Kontrol connectors are designed to occupy a mid-range requirement. These are superior to previous consumer electronics connectors that are unable withstand the additional demands of the factory floor, but not as high-end as true high-reliability connectors such as the company's Gecko line.

The Archer Kontrol series offers enhanced performance and reliability over a standard pin header and socket design, with the addition of a number of improved design features:

- All connectors in this range feature fully shrouded and recessed contacts, to prevent accidental damage to the miniature contacts from mis-mating and ensure continued interconnect integrity. The fully shrouded design assists with



1. The Archer Kontrol range of connectors features a 1.27-mm pitch.



2. Both male and female connectors are designed to fully shroud the contacts, in both mated and un-mated conditions. Both contact designs also have the ends of the contacts recessed behind the front face, so that anything placed on the top surface doesn't touch the contacts.

blind mating—the mating action can be accomplished without wrenches or other tools. Chamfered front edges allowing up to 0.7-mm offset assists with blind mating, where visibility during the mating action is obscured or absent.

• Shrouding also provides protection from lateral and twisting forces caused by vibration, which is bad for mated connectors because vibration can temporarily disconnect the mating surfaces. Female (socket) connectors with two points of contact are more desirable in these conditions, so that one surface of the contact stays in contact with the male pin. Mated Archer Kontrol connectors can withstand 20G of vibration, making them well-suited for automation and mechanized processes.

• These connectors support data rates of up to 3 Gb/s. This data rate in combination with the series' mechanical robustness ensures the long-term integrity of high-speed industrial data.

• Archer Kontrol connectors exhibit strong resilience to the high humidity levels (to 96 hours at 90-95% relative humidity) and extreme temperatures often found in industrial settings. Their temperature range extends from minus 55 to 125°C. As such, temperature performance is superior to that of conventional pin header and socket ranges, which typically can handle only –40 to 105°C.

• To assist with correct board placement, all connectors feature location pegs or posts to inhibit movement during the solder process. To improve surface-mount retention to the PCB, retention tabs are located on either end of the connectors, which provide additional solder strength. Soldering heat resistance is 260°C for 10 seconds.

• Gold-plated phosphor bronze contact areas enable these connectors to handle up to 500 mating cycles.

• All male and female SMT connectors are available in tape-and-reel packaging options to facilitate automated assembly processes. In addition, the connector's shrouding is shaped to provide a positive polarization to enable assembly in only one direction.

The Archer Kontrol series covers pin counts of 12 to 80 contacts and variable vertical connector heights allow for board-to-board spacings of 8 to 20 mm. With both vertical and horizontal connectors in male and female designs, all mating configurations are possible—edge-to-edge co-planar, parallel board-to-board, and right-angle mother-to-daughterboard. Easy blind mating along with right-angle connection means these components are suitable for backplane connections. (To refresh, a backplane is a group of electrical connectors in parallel with each other, so that each pin of each connector is linked to the same relative pin of all other connectors, forming a computer bus.)

Let's look, as an example, at one series of Archer Kontrol connectors: the M55 series of male and female shrouded connectors for board-to-board and cable-to-board connection. All board-mount connectors are double row and surface mount. The socket connectors are twin-beam female contacts, and these mate to solid pin male connectors. Both male and female connectors are available in vertical or horizontal orientations, with three height options on the vertical connectors.

The series can be used for parallel board-to-board (mezzanine layouts), right-angle motherboard-to-daughterboard, or co-planar/edge-to-edge layouts. Connector housings feature a latch for quick and secure mating to the male half.

Recently, Harwin expanded its Archer Kontrol board-to-board industrial connector portfolio to meet cable-to-board requirements. The company has introduced off-the-shelf insulation displacement connector (IDC) assembly options to accompany the existing discrete connector components.

On each of these assemblies, a ribbon cable is fitted with female connectors at either end, making it easier for engineers to implement Archer Kontrol units into systems. Cable lengths of 150 mm or 300 mm are available off-the-shelf; other lengths are available with lead time upon request. The design offers engineers a low-profile, flexible solution that will bend considerably to fit into tight spaces. The horizontal cable exit orientation also saves significant headroom above the connector.

The new cable assemblies support all existing contact counts in this connector family (12, 16, 20, 26, 32, 40, 50, 68, and 80). To deliver greater durability, the contact areas have a gold flash finish deposited on them. A latching mechanism assures cable retention, resisting vibration, and accidental disconnection. The components are optimized for modern industrial settings as they can handle data rates of up to 3 Gb/s.

In Summary

Harwin's Archer Kontrol range of compact 1.27-mm-pitch board-to-board connectors combines a 3-Gb/s data rate with mechanical robustness to ensure the long-term integrity of high-speed data for a wide scope of markets, from industrial applications to IoT and transportation. The company's portfolio of connectors has been developed specifically to attend to the needs of modern electronic designs, where densely populated PCBs are placed closely together.

In addition, Harwin's experts can advise on your requirements, provide more detail on Archer Kontrol, or suggest other products from the Harwin range if something else is more suitable.