Board-to-Board

High Performance
Board-to-Board Connectors

Maximum functionality with cutting edge products.
The next trend in industrial devices.
Floating, high-speed transmission
FunctionMAX brings you top-quality industrial interconnects.

As the name “FunctionMAX” implies, this product family is a series of Board-to-Board connectors from Hirose with a mission to meet all the needs of the industrial market with maximum functionality. Since Hirose first began developing connectors in the 1970s, it has been continuously generating new series to create entire product families. Powerful marketing support along with applied knowledge and tireless effort has enabled us to develop technical innovations year after year. Recently, Hirose has been working even more vigorously on research and development for two key themes: floating structure design and high speed transmissions.

FunctionMAX will never stop pursuing the highest level of functionality for its floating design and high-speed transmission connectors, as well as connectors with cutting-edge technology for tomorrow’s innovative applications. We create interconnects for demanding applications that allow our customers to select the most suitable products from our extensive product lineup.

Yokohama Center, the heart of technology and marketing
Hirose established the Yokoyama Center as a multi-purpose base in Japan’s historic harbor city, often considered Japan’s window to the world. The Center incorporates a technical network consisting of a Technical Division, a Production Technology Division, a Quality Management Division, and a sales and market network. This highly sophisticated structure ensures that we will always be able to promptly meet advancing market needs.
Marketing and Innovation

Hirose produces all its products based on its development policy of “marketing and technological innovation”. This goal can only be achieved by actively visiting users and seeking development themes for new products. Not only do sales and marketing personnel participate in Hirose’s unique research and development activities, but our engineers are also actively involved. FunctionMAX was also developed in this same team environment. Hirose’s strong commitment to product development is reflected in its results. Our approach is to ascertain potential needs, then formulate and test hypotheses to create a solution. We then create and market products with unique and desirable features instead of simply following existing demand trends. The FunctionMAX consists of Hirose’s top industrial connector series designed for advancing technologies in devices and systems.
FunctionMAX. In pursuit of the ultimate floating and high-speed transmission functions

Floating connections correct alignment issues due to assembly errors — Floating functions

The floating structure offers a degree of "play" between the contacts during mating and allows the connector to absorb alignment errors.

Leading example of floating structures

No alignment errors
Common connectors can only be used if center lines are perfectly aligned.

Alignment errors present
Floating connector can be used even when center lines are not perfectly aligned with each other.

- Movable portion
  Joint starts moving with the movement of the mating connector

- Fixed portion
  Protective parts prevent stress generated by movement to lead parts

Benefits of a floating function

1. Multiple floating connectors can be used on the same PCB.

2. These connectors contribute to the device design by absorbing assembly errors and help to reduce the need for corrective re-work operations.

3. Spring portion of the terminal absorbs stress imparted by alignment errors. This reduces the stress applied to the mounted parts. This also enhances reliability and prevents solder cracking.

No stress is applied to the leads on the PCB.
Reliable performance to meet the needs for future communication speeds. — High-speed transmission

Hirose’s connectors meet high-speed communication needs with their solid performance and structure. With such needs as tele-communications, automotive, factory automation and medical devices.

- Designed to meet high-speed transmission needs.

FunctionMAX is designed based on a differential transmission system and offers excellent noise resistance and high-speed signals.

1. Impedance
Hirose optimizes the shape of terminals that serve as communication paths, accounting for contact pitch and insulation materials. The connectors conform to general specifications for substrates, targeting a matching value of \( \Omega \) ± 10%. FunctionMAX high-speed transmission connectors are designed to fully ensure impedance matching.

2. Crosstalk
FunctionMax connectors optimize ground assignment of contacts between differential pairs to reduce crosstalk, accounting for contact pitch and transmission rates.

3. Insertion/return loss
This is the most commonly used parameter for judging signal quality, so high-speed connectors must be tested. Characteristics are basically adjusted by matching impedances.

4. Skew
Paths (terminal lengths) within differential pairs, adjacent differential pairs, and opposed differential pairs are designed to be equal. Note: Some products do not have equally-arranged lengths between opposite differential pairs.

5. Eye pattern
Hirose considers eye pattern as a characteristic obtained from 1 through 4 above, so a good eye aperture can be ensured. This policy is the opposite of promoting high-speed transmission by focusing only on opening eye pattern, regardless of other factors.

6. Signal Integrity (SI) support system
Hirose supports customer decision-making by providing connector simulation models, (e.g. Touchstone and IBIS), SI supports, or conformance checks for signal standards.
FunctionMAX is the best selection for board-to-board connectors
Superior performance is ensured in diverse environments.

The FunctionMAX family is comprised of both floating structure and high-speed connectors. These series possess unique features in addition to floating functions and high-speed transmission to meet requirements of various industrial applications.

FX20 Series

- **0.5mm Pitch**
  This is the first floating connector series developed. With the high contact reliability structure of independent dual-contact designs, the series can withstand the severe conditions required by industrial applications as well as in-vehicle units.

FX22 Series

- **0.5mm Pitch**
  Developed as a coplanar version of the FX20. Enables co-planar connections with multiple FX20 connectors. This series also incorporates a highly-reliable two-point contact structure. The ultra-short design contributes to the reduced size of finished product sets.

FX30B Series

- **3.81mm Pitch / 7.62mm Pitch**
  This series is developed for power sources. Features a special shift-absorbing function similar to that of floating connectors. Meets safety standards (UR/C-UL and TÜV)
FX23 Series

- **0.5mm Pitch**
  This series achieves two functions in one connector: floating function and high-speed transmission. Saves space by incorporating an integrated power source structure. Connectors are also suitable for use with conformal coatings applied after soldering.

FX18 Series

- **0.8mm Pitch**
  This series is a core product developed for FunctionMAX. User-friendly with a broad range of product options. The power terminals can also be used for sequence and grounding applications and act as multi-function terminals.

FX8 Series

- **0.6mm Pitch**
  A long-standing connector series with strong market support. Features wide product variations with different stack heights and pin counts. Compact structure allows easy mounting, and excellent high-speed transmission.

FX10 Series

- **0.5mm Pitch**
  A no-nonsense connector series that focuses on high-speed transmissions. Wide product variations with different stack heights and pin counts. This series has enjoyed strong market support. The three-piece design allows for a floating structure.
### FunctionMAX™ Cross Reference Chart

<table>
<thead>
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<th>Series</th>
<th>FX10</th>
<th>FX20</th>
<th>FX22</th>
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Note: Specifications shown here are for the standard items. Please consult our sales representatives in case of application requirements outside the standard range.
Other Board-to-Board Connectors: Cross reference chart

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Creative Links to World Electronics

Hirose's connector distribution network location span across the globe, from Japan and Asia to the US and Europe.

- HIROSE ELECTRIC CO., LTD. (Headquarters)
  Phone: 03-3491-5300
  http://www.hirose.co.jp/
- HIROSE ELECTRIC CO., LTD.
  Yokohama Center (Sales & Marketing Div. office)
  Phone: 045-620-3526
  http://www.hirose.co.jp/
- HIROSE ELECTRIC (SHANGHAI) CO., LTD.
  Phone: 86-21-6391-3355
  http://www.hirose.com/cn/
- HIROSE ELECTRIC ELECTRONICS (SHENZHEN) CO., LTD.,
  Phone: 86-755-8207-0851
  http://www.hirose.com/cn/
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  http://www.hirose.com/hk/
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  http://www.hirose.com/tw/
- HIROSE KOREA CO., LTD.
  Phone: 82-31-496-7000 or 7124
  http://www.hirose.co.kr/
- HIROSE ELECTRIC SINGAPORE PTE. LTD.
  Phone: 65-6324-6113
  http://www.hirose.com/sg/
- HIROSE ELECTRIC SINGAPORE PTE. LTD.
  DELHI LIASON OFFICE
  Phone: 91-11-666-8008
  http://www.hirose.com/sg/
- HIROSE ELECTRIC SINGAPORE PTE. LTD.
  BANGALORE LIASON OFFICE
  Phone: 91-80-4130-1907
  http://www.hirose.com/sg/
- HIROSE ELECTRIC SINGAPORE PTE. LTD.
  PENANG LIASON OFFICE
  Phone: 604-619-2564
  http://www.hirose.com/sg/
- HIROSE ELECTRIC SINGAPORE PTE. LTD.
  BANGKOK OFFICE (Representative Office)
  Phone: 66-2-686-1255
  http://www.hirose.com/th/
- HIROSE ELECTRIC (U.S.A.), INC. HEADQUARTERS
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  http://www.hirose.com/us/
- HIROSE ELECTRIC (U.S.A.), INC. SAN JOSE OFFICE
  Phone: 1-408-253-9640
  http://www.hirose.com/us/
- HIROSE ELECTRIC (U.S.A.), INC. CHICAGO OFFICE
  Phone: 1-630-282-6701
  http://www.hirose.com/us/
- HIROSE ELECTRIC (U.S.A.), INC. DETROIT OFFICE
  (Automotive)
  Phone: 1-734-542-9963
  http://www.hirose.com/us/
- HIROSE ELECTRIC EUROPE B.V.
  Phone: 31-20-6057460
  http://www.hirose.com/eu/
- HIROSE ELECTRIC EUROPE B.V.
  GERMAN BRANCH
  Phone: 49-711-4560-02-1
  http://www.hirose.com/eu/
- HIROSE ELECTRIC EUROPE B.V.
  NUERNBERG OFFICE
  Phone: 49-911 32 68 89 63
  http://www.hirose.com/eu/
- HIROSE ELECTRIC EUROPE B.V.
  HANOVER OFFICE
  Phone: 49-511 97 82 61 30
  http://www.hirose.com/eu/
- HIROSE ELECTRIC EUROPE B.V.
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