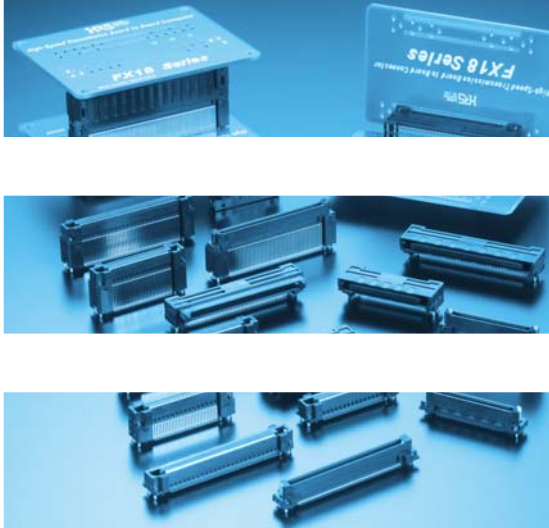


# Board to Board

# FunctionMAX™

## High Performance Board-to-Board Connectors

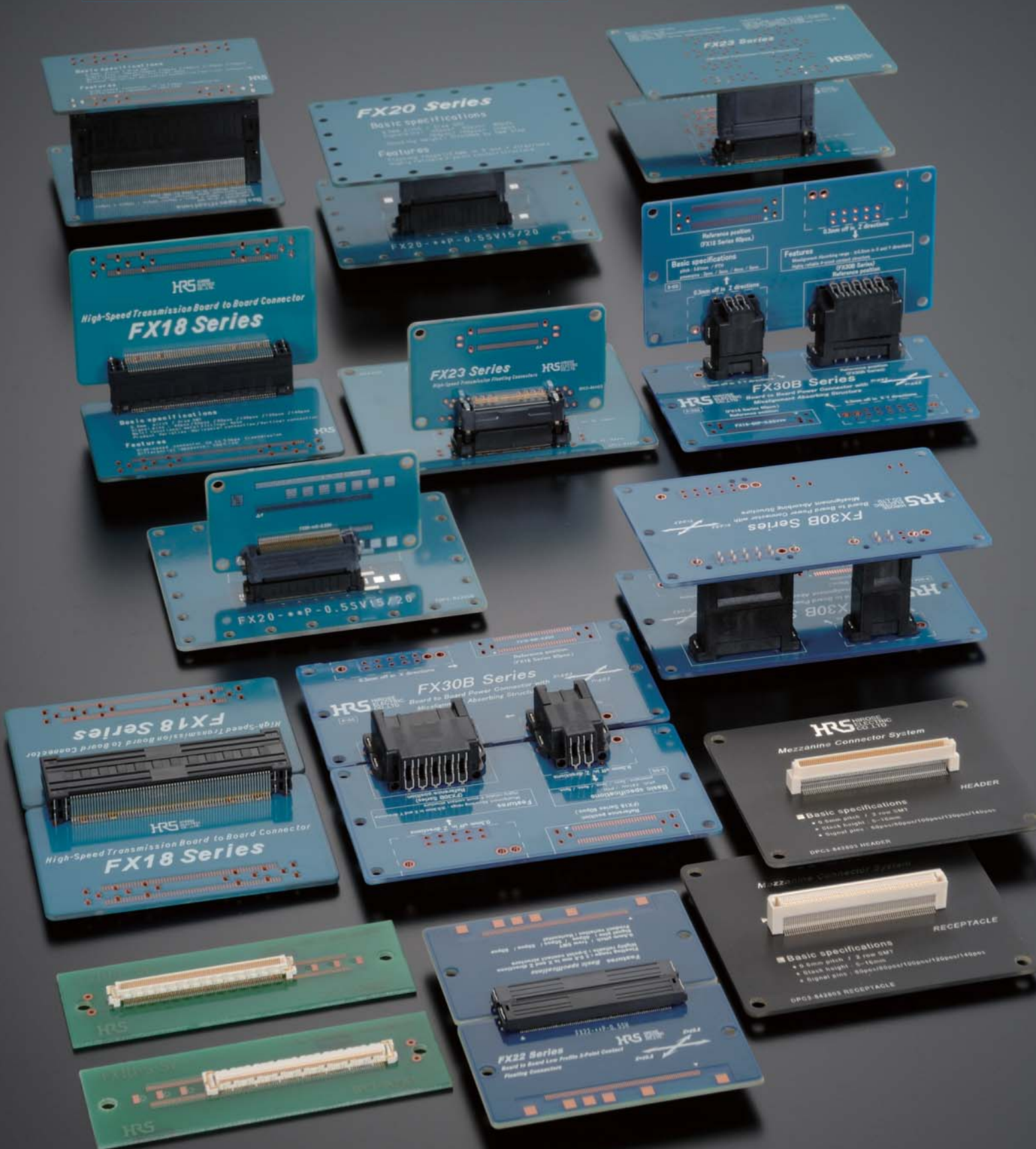


# Board

Maximum functionality with cutting edge products.  
The next trend in industrial devices.

# to Board

# FunctionMAX™



## 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.

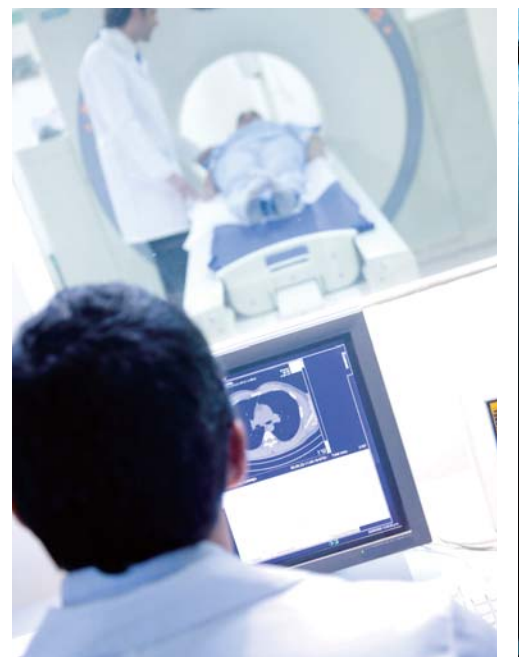




# Marketing and Innovation

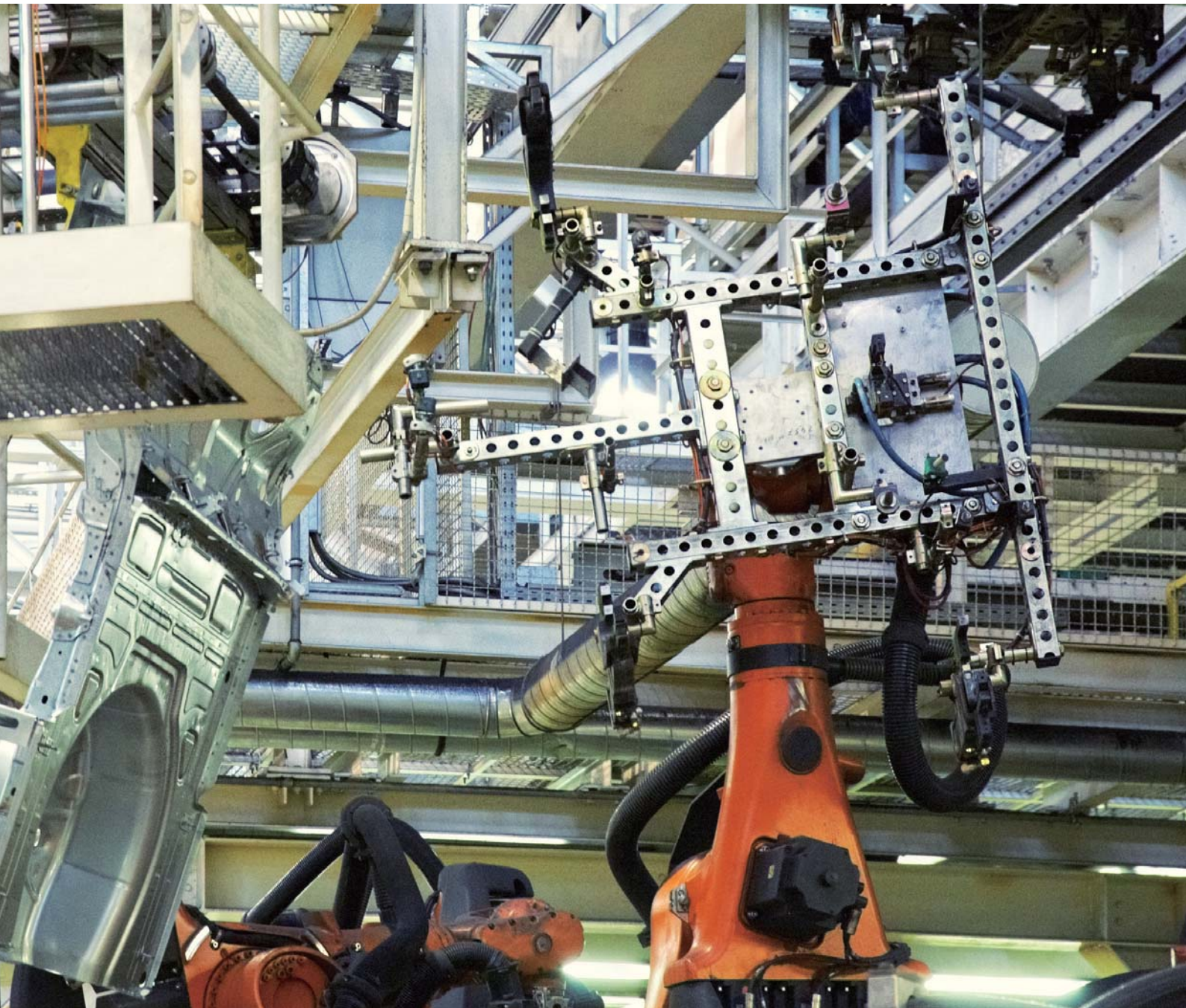
Hirose produces all its products based on its development policy of “marketing and technological innovation”. This goal can only be achieved by actively visiting users and seeking development themes for new products. Not only do sales and marketing personnel participate in Hirose's unique research and 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.



# Board to Board





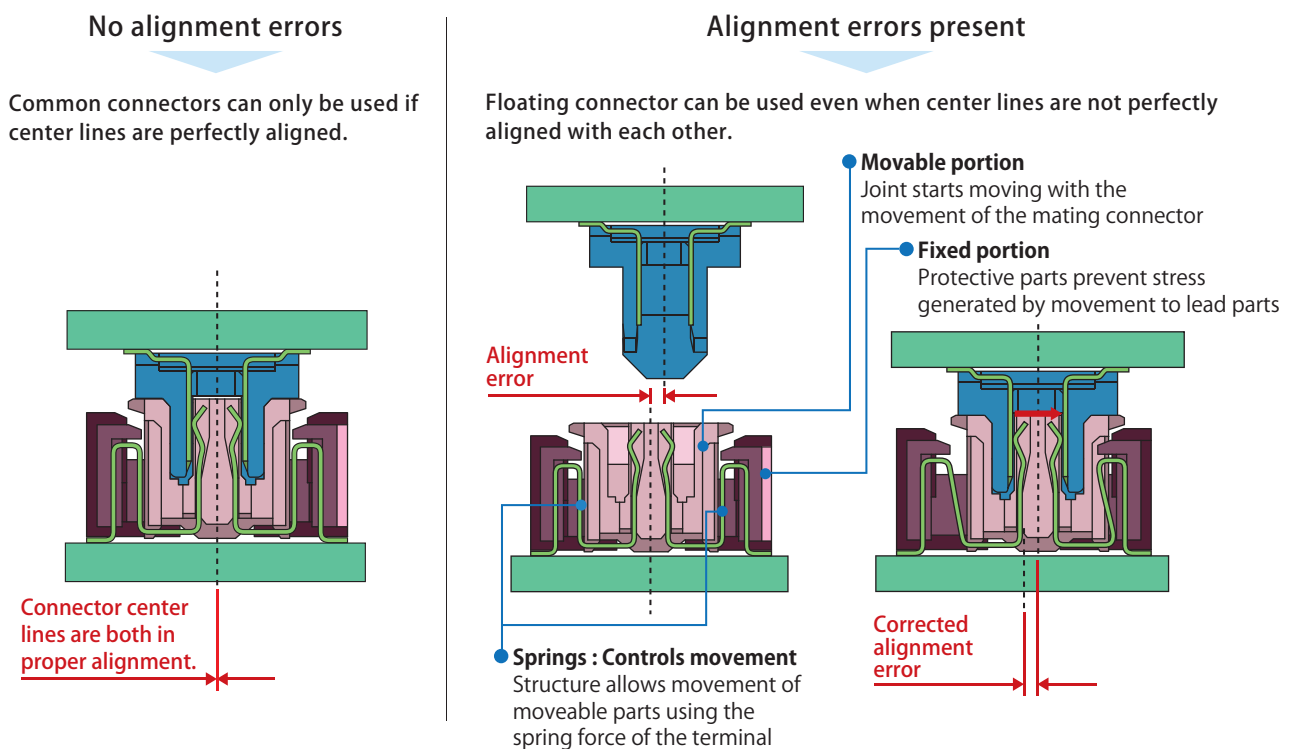


# FunctionMAX. In pursuit of the ultimate floating and high-speed transmission functions

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

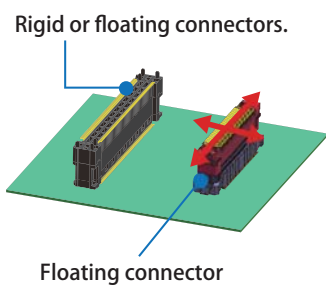
The floating structure offers a degree of "play" between the contacts during mating and allows the connector to absorb alignment errors.

### Leading example of floating structures

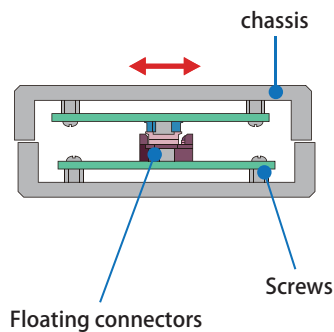


### Benefits of a floating function

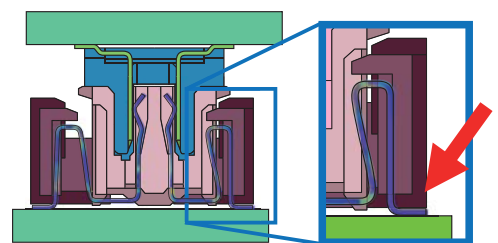
① Multiple floating connectors can be used on the same PCB.



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  $(\Omega) \pm 10\%$ . 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.

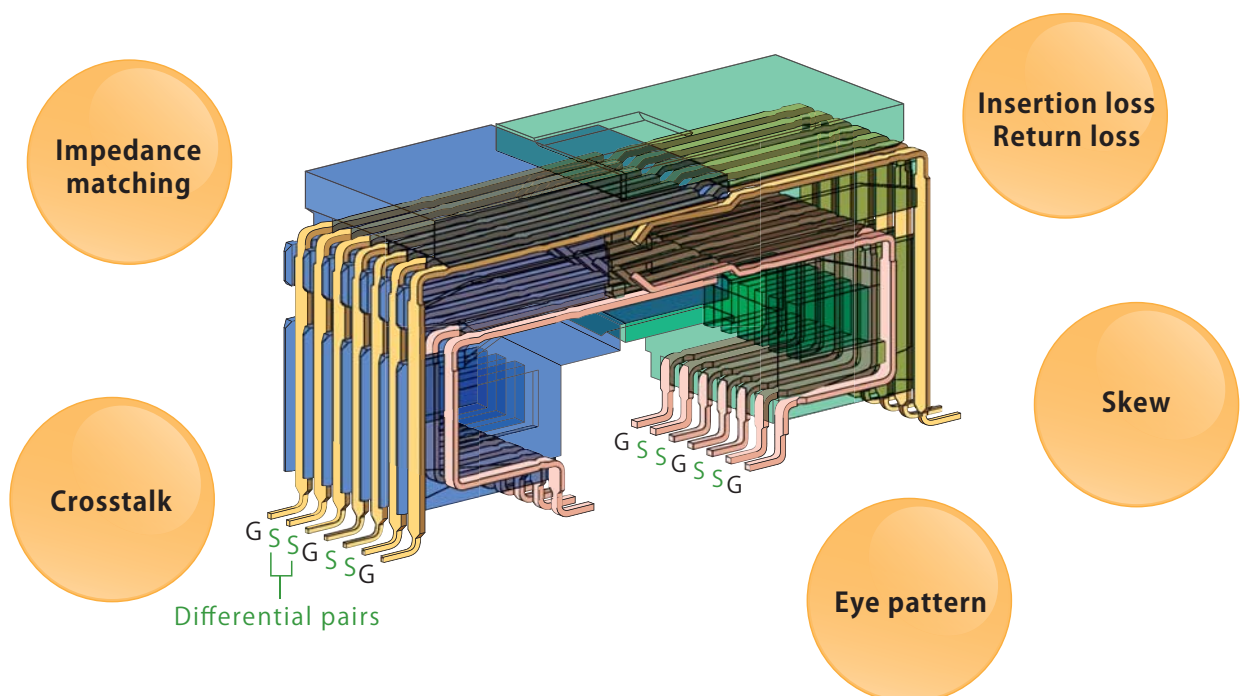
Note : Some products do not have equally-arranged lengths between opposite differential pairs.

#### 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

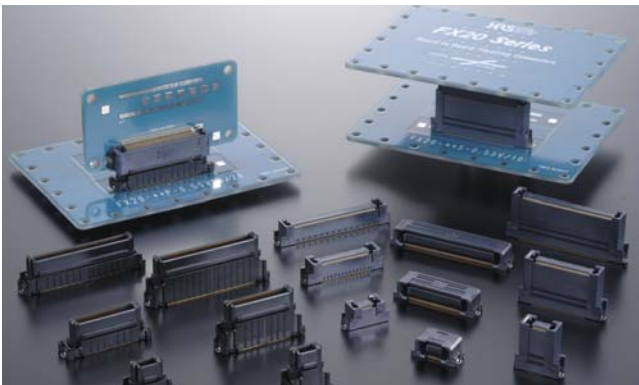
Hirose supports customer decision-making by providing connector simulation models, (e.g. Touchstone and IBIS), SI supports, or conformance checks for signal standards.



## 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.

Floating design

Dual-contact

Right angle

Parallel

### 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.

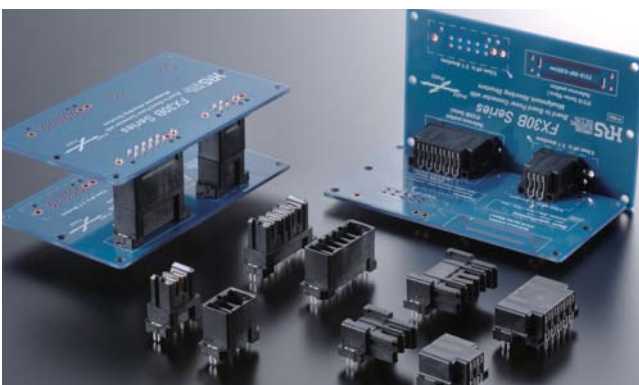
The ultra-short design contributes to the reduced size of finished product sets.

Floating design

Dual-contact

Coplanar

### 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)

Floating design

Power/Signal hybrid

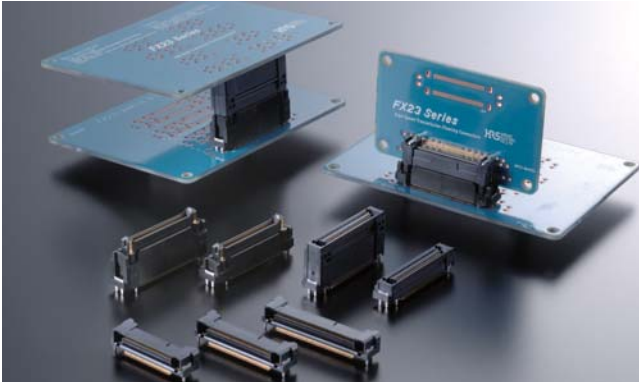
Right angle

Parallel

Coplanar



## 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.

Floating design

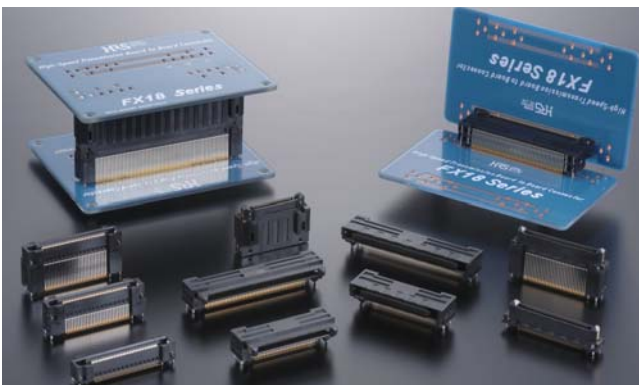
High-speed Transmission

Power/Signal hybrid

Right angle

Parallel

## 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.

High-speed Transmission

Power/Signal hybrid

Right angle

Parallel

Coplanar

## FX8 Series



### ● 0.6mm Pitch

A long-standing connector series with strong market support.

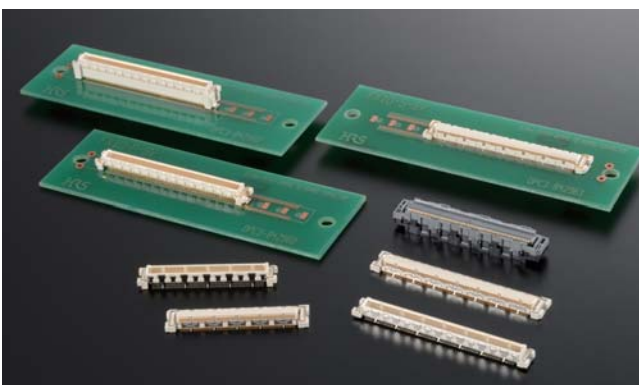
Features wide product variations with different stack heights and pin counts.

Compact structure allows easy mounting, and excellent high-speed transmission

High-speed Transmission

Parallel

## 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.

Floating Design

High-speed Transmission

Parallel

**FunctionMAX™** : Cross reference chart

Series		FX10	FX20	FX22	FX23	FX8	FX18	FX30B
Pitch (mm)		0.5	0.5	0.5	0.5	0.6	0.8	3.81 7.62
Pin Count		80 - 168	20 - 140	40 - 80	20 - 120	60 - 140	40 - 140	2 - 5
Connection	Parallel (mm)	● 4 - 13	● 15 - 30		● 15 - 30	● 3 - 16	● 10 - 45	● 20 - 30
	Vertical		●		●		●	●
	Coplanar			●			●	●
	Cable							
Rating	Current (A)	0.3	0.5	0.7	0.5	0.4	0.5	13 - 17
	Voltage (V)	AC50	AC50	AC50	AC50	AC100	AC100	AC / DC150+
Mounting	SMT	ALL SMT	●	●		●		
		SMT + Through-hole reflow			●	●	●	
	Through hole							●
Additional features	Floating (Mis-alignment absorption)	● ±0.3mm	● ±0.6mm	● ±0.6mm	● ±0.6mm			● ±0.3mm
	High-speed transmission	● 15Gbps			● 8Gbps	● 3.125Gbps	● 10Gbps	
	Dual-contact		●	●				●
	Power/Signal hybrid				● 3.0A		● 3.0A	
	Shielding	●						
	Sequential structure						●	
	Standard							UL / C - UL , TÜV

Note: Specifications shown here are for the standard items. Please consult our sales representatives in case of application requirements outside the standard range.

● Available



## Other Board-to-Board Connectors: Cross reference chart

Series		DF12	FX11	FX6	FX5	FX2	A3/A4	A1/A2	HIF3
Pitch (mm)		0.5	0.5	0.8	1	1.27	2	2.54	2.54
Pin Count		10 - 80	60 - 140	20 - 100	20 - 120	20 - 120	2 - 50	6 - 64	6 - 64
Connection	Parallel (mm)	● 3 - 5	● 2 - 3	● 5 - 9		● 12 - 66	● 5 - 6	● 12	● 12 - 17
	Vertical				●	●	●	●	●
	Coplanar					●			●
	Cable					●	●	●	●
Rating	Current (A)	0.3	0.3	0.5	0.5	0.5	1	3	1
	Voltage (V)	AC50	AC50	AC100	AC100	AC125	AC200	AC200	AC200
Mounting	SMT	ALL SMT	●	●	●	●	●		
		SMT + Through-hole reflow							
	Through hole				●	●	●	●	●
Additional features	Floating (Mis-alignment absorption)								
	High-speed transmission		● 10Gbps						
	Dual-contact						●	●	●
	Power/Signal hybrid								
	Shielding		●						
	Sequential structure				●				
	Standard								MIL

Note: Specifications shown here are for the standard items. Please consult our sales representatives in case of application requirements outside the standard range.

● Available

# Creative Links to World Electronics



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

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<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.  
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