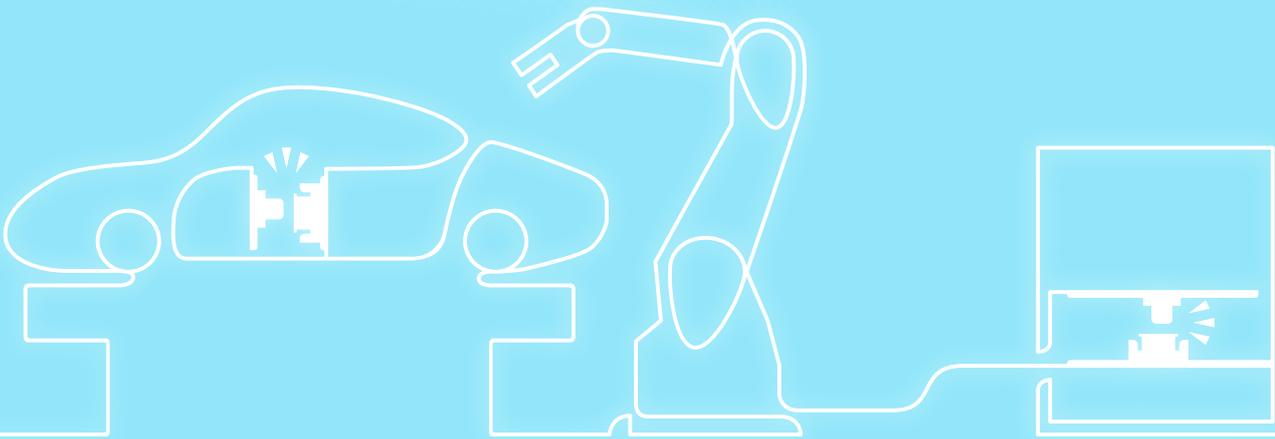


# **FunctionMAX™**

# **HRS**

To the Highest Peaks of  
"Floating" and "High Speed Transmission"



Floating Board-to-Board,  
Connecting Business-to-Business

**HIROSE ELECTRIC CO., LTD.**

# Maximum Functions and Advanced Proposals for New Trends in Equipment

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 that 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 interface design and high speed transmission.

FunctionMAX will never stop pursuing the highest level of functionality for its floating design and high speed transmission connectors, as well as cutting-edge technology for tomorrow's innovative applications.

We create interconnections for demanding applications that enable our customers to select the most suitable products from our extensive product lineup.

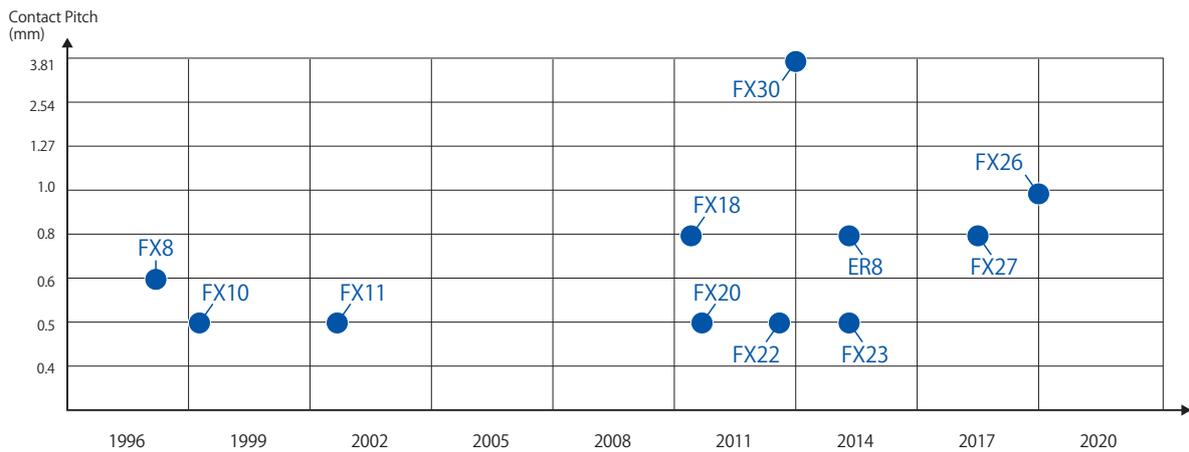
***FunctionMAX***<sup>TM</sup>



# FunctionMAX is compatible with all kinds of industrial equipment due to its wide range of product variations

The FunctionMAX family includes both a floating design and high speed transmission capabilities. These series possess additional unique features to meet requirements of various industrial applications.

## The Product Development History



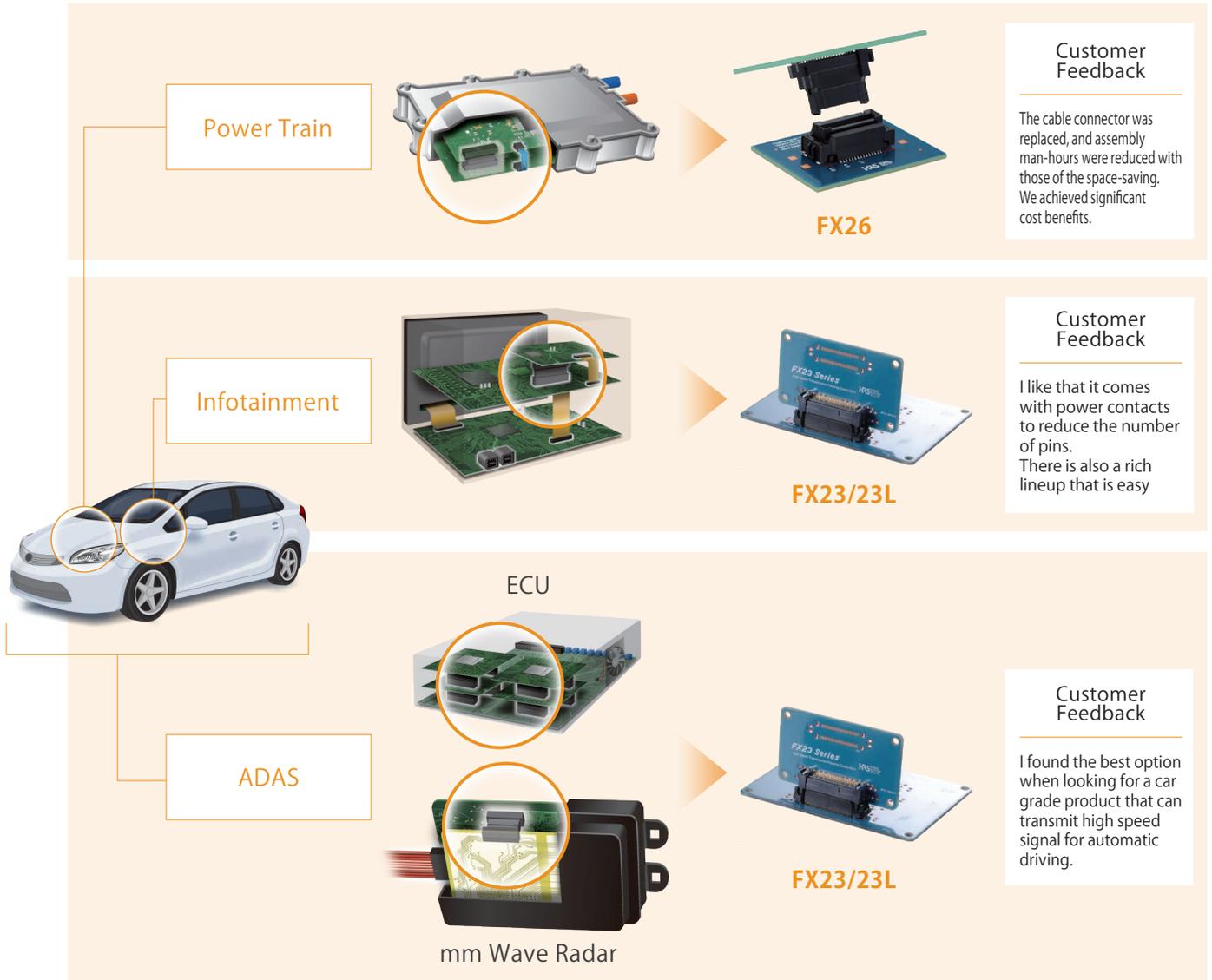
## Connection Examples and Customer Feedback

Servo Drive			<p><b>Customer Feedback</b></p> <p>Since the height can be freely set with one connector, the design labor and cost is reduced.</p>
PLC			<p><b>Customer Feedback</b></p> <p>The floating design absorbs the case and board misalignment, making designing equipment easier.</p>
Robot Controller			<p><b>Customer Feedback</b></p> <p>Easy to choose due to the wide connection varieties, including parallel, right angle and horizontal, and high speed signal capability.</p>

# FunctionMAX has a strong presence in the automotive field.

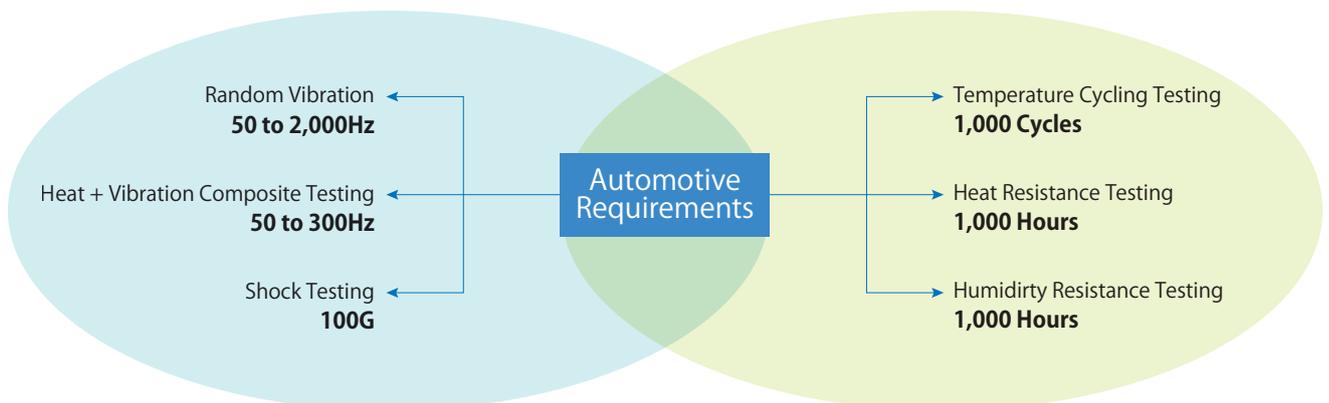
The FX23/23L Series, a prominent product in the FunctionMAX brand family, is recommended for automotive equipment. Additionally, the FX26 Series, which is compatible with powertrains, is now available. It is a highly reliable product that meets strict automotive requirements.

## Connection Examples and Customer Feedback



## Mechanical Performance

## Environmental Performance



# FunctionMAX, in pursuit of the ultimate floating and high speed transmission functions

## Floating connections correct alignment issues due to assembly errors

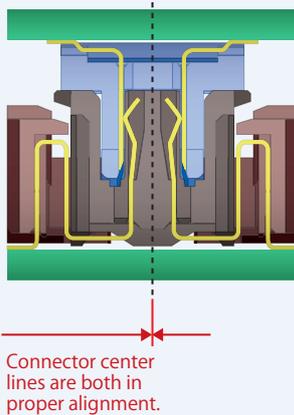
### — Floating Functions

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

#### ■ Leading Example of Floating Design

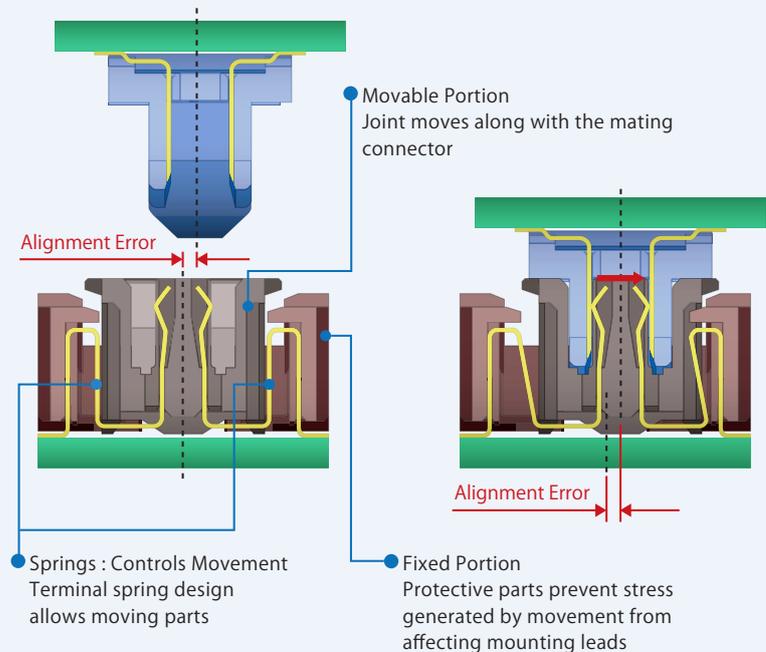
##### No Alignment Errors

Ordinary connectors can only be used if center lines are perfectly aligned.



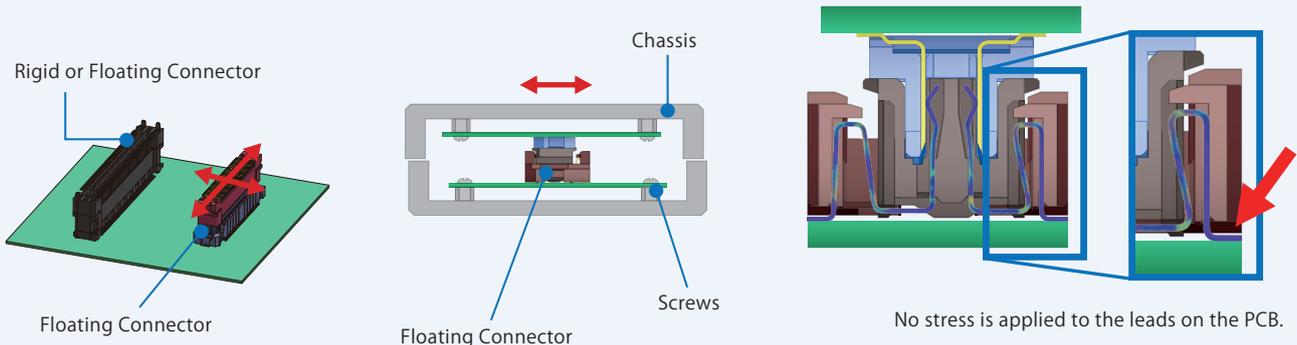
##### Alignment Errors Present

Floating connectors can be used even when center lines are not perfectly aligned with each other.



#### ■ Benefits of 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.



## 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 design for such fields as telecommunications, automotive, factory automation and medical devices.

### High Speed Transmission Characteristics

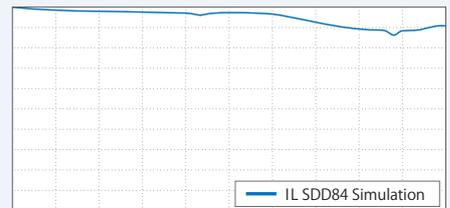
#### ① Return Loss (Reflection)

Return loss is reduced by impedance matching, including the floating portion, based on the pitch of the terminals, signal contact width, distance from the ground terminal, and dielectric constant of the insulation material.



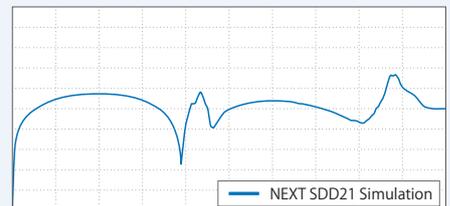
#### ② Insertion Loss (Attenuation)

The pitch of the terminals, the width and thickness of the signal contact, the dielectric loss tangent of insulation materials, and other factors are used to optimize the design, including the floating portion, so as to minimize resonance and ensure that the insertion loss is proportional to the frequency.



#### ③ Cross Talk (Leakage)

The terminal and ground pin assignment between the differential pairs are optimized according to the terminal pitch and transmission rate to minimize resonance and crosstalk.

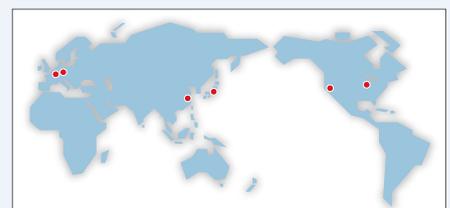


### Support System

#### ① Global Support

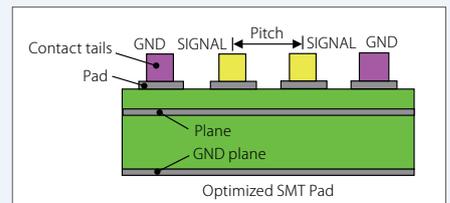
Since 2006, the SI Engineering Unit has been stationed at our US base to provide technical support for routers and other telecommunications customers and to accumulate know-how.

Engineers at our bases in Europe, China and Japan assist customers with inquiries and resolving high speed transmission problems.



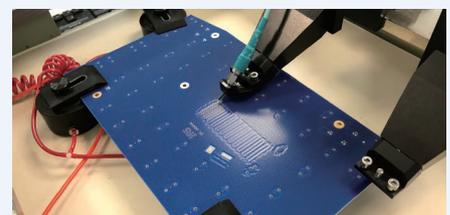
#### ② Circuit Simulation

In addition to 3D electromagnetic field analysis of connectors, etc., circuit simulation software can be used to propose the optimum wiring including PAD and Via of the circuit board to help solve or examine the customer's problem such as compliance with various signal standards.



#### ③ Correlation

We have accumulated know-how on correlation between analysis and measurement, and provide highly accurate analysis models such as Touchstone and IBIS. We also lend evaluation boards that can be measured to support customers' examination of the product.



# FunctionMAX is the best selection for board-to-board connectors.

## Contact Pitch and Stacking Height



### FX25 Series 0.4mm Pitch

The most small size floating connector for both pitch and stacking height in right angle connection type.

Floating

High Speed

Vertical

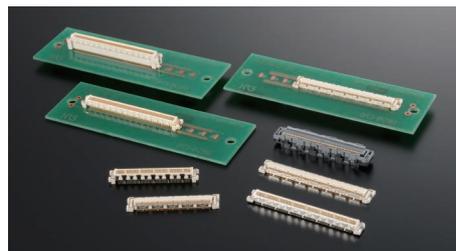


### FX10/11 Series 0.5mm Pitch

These two series focus on high speed transmission. Wide product variations with different stack heights and pin counts. These series have enjoyed strong market support. The three-piece design allows for a floating design.

High Speed

Parallel



### FX22 Series 0.5mm Pitch

Developed as a horizontal version of the FX20. Enables co-planar connections with multiple connectors. This series also incorporates a highly-reliable two-point contact design. The ultra low-profile design contributes to the reduced size of finished product sets.

Floating

Two-point contact

Low profile

Horizontal



### FX8/8C Series 0.6mm Pitch

One of the most popular FunctionMAX connectors with a long sales history. Wide variations with a variety of stacking heights and pin counts are available. Compact design allows easy mounting, and supports excellent high speed transmission.

High Speed

Parallel



### ER8 Series 0.8mm Pitch

Samtec "Edge Rate" Licensed Second Source. Low profile design that supports high speed transmission and enables high density mounting. Halogen free available.

High Speed

Parallel

Vertical

Horizontal



# Superior performance is ensured in diverse environments.

## FX18 Series 0.8mm Pitch

User-friendly with a broad range of options.  
Power terminals can also be used for sequence and grounding applications and act as multi-function terminals.

- High Speed
- With Power Contacts
- Parallel
- Vertical
- Horizontal



## FX27 Series 0.8mm Pitch

Added floating function and high speed transmission capability to this card edge connector.  
As an interface between top and bottom boards, it can be also used as a parallel connector. Stacking height, wiring and component mounting are customizable.

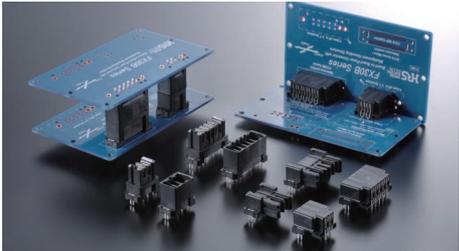
- Floating
- Card Edge
- High Speed
- Parallel
- Vertical



## FX30B Series 3.81mm Pitch / 7.62mm Pitch

Developed for power sources.  
Features a special misalignment absorbing design similar to floating connectors. UL/C-UL and TÜV compliant.

- Floating
- With Power Contacts
- Parallel
- Vertical
- Horizontal

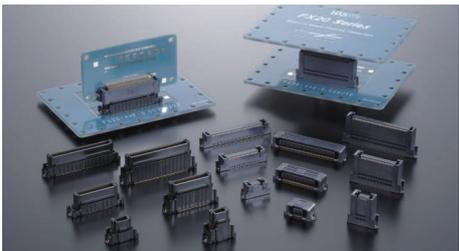


### For Automotive Applications

## FX20 Series 0.5mm Pitch

This is the first floating connector series developed at Hirose.  
The independent two-point contact provides high contact reliability and resistance to vibration and impact.

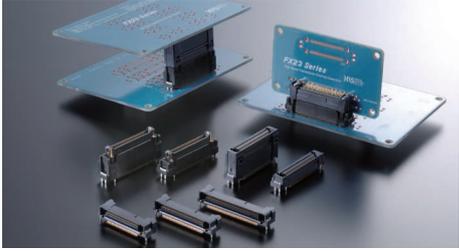
- Floating
- Two-point contact
- Automotive
- Parallel
- Vertical



## FX23/23L Series 0.5mm Pitch

This series achieves two functions in one connector: floating function and high speed transmission.  
Saves space by incorporating a power hybrid design.  
Connectors are also suitable for use with conformal coatings applied after soldering.

- Floating
- High Speed
- With Power Contacts
- Up to 105°C
- Automotive
- Parallel
- Vertical



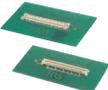
## FX26 Series 1.0mm Pitch

This high-spec series was developed with the aim of creating a product with specifications that can be used in the engine room.  
Two-point contact with a vibration resistant and floating design that can be used safely under continuous vibration and in high temperature environments up to 140°C.

- Floating
- Vibration resistant
- Up to 140°C
- Two-point contact
- Automotive
- Parallel



# FunctionMAX™ Product Comparison Chart

						
Series		FX25	FX10	FX11	FX20	FX22
Pitch		0.4mm	0.5mm	0.5mm	0.5mm	0.5mm
Pin Count		80 - 110	80 - 168	60 - 140	20 - 140	40 - 80
Connection	Parallel (Stacking Height)		● 4 - 13mm	● 2 - 3mm	● 15 - 30mm	
	Vertical	●			●	
	Horizontal					●
	Cable					
Rating	Current	0.4A	0.3A	0.3A	0.5A	0.7A
	Voltage	50V AC/DC	50V AC	50V AC	50V AC	50V AC
Mounting	SMT	ALL SMT	●	●	●	
		SMT + Through Hole Reflow				
	Through Hole					
Additional Features	Floating (Misalignment Absorption)	● ± 0.45mm	● ± 0.3mm		● ± 0.6mm	● ± 0.6mm
	High Speed Transmission	● PCI-e Gen.1 (2.5Gbps)	● PCI-e Gen.4 (16Gbps)	● PCI-e Gen.4 (16Gbps)		
	Multi-Point Contact				●	●
	With Power Contacts					
	Shielding		●	●		
	Sequential Design					
	Standard					
	Automotive Application					●

\*These are general specifications.  
Please contact a Hirose representative if you require over the specification range.

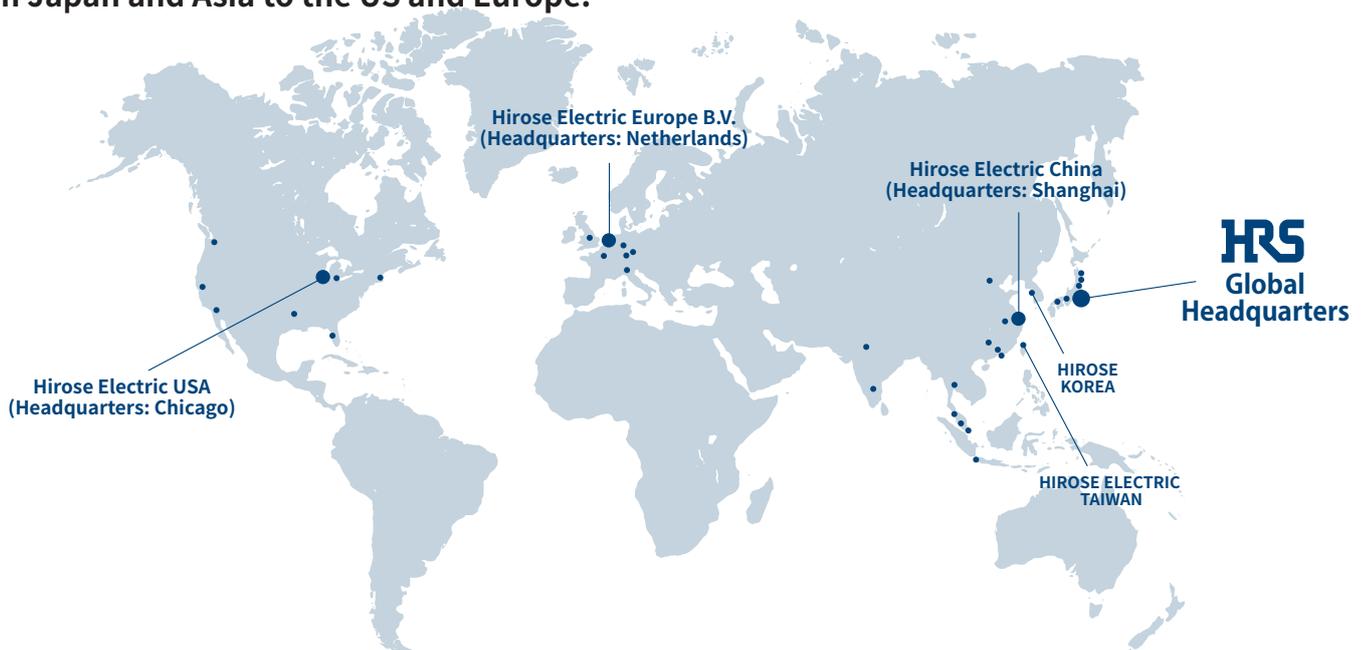
						
FX23/23L	FX8/8C	ER8	FX18	FX27	FX26	FX30
0.5mm	0.6mm	0.8mm	0.8mm	0.8mm	1.0mm	3.81mm 7.62mm
20 - 120	60 - 140	10 - 120	40 - 140	40 - 120	20 - 60	2 - 5
● 8 - 30mm	● 3 - 16mm	● 7 - 12mm	● 10 - 45mm	● 22mm -	● 12 - 5mm	● 20 - 30mm
●		● (120 Pin Only)	●	●		●
		● (120 Pin Only)	●			●
0.5A	0.4A	0.5A	0.5A	0.5A	0.7A	20-25A
50V AC	100V AC	100V AC	100V AC	100V AC	125V AC	250V AC/DC 600V AC/DC
	●	●		●		
●		● (Vertical Type Only)	●		●	
						●
● ± 0.6mm				● ± 0.6mm	● ± 0.7mm	● ± 0.3mm
● PCI-e Gen.4 (16Gbps)	● PCI-e Gen.3 (8Gbps)	● PCI-e Gen.4 (16Gbps)	● PCI-e Gen.4 (16Gbps)	● PCI-e Gen.1 (2.5Gbps)		
					●	●
● 3.0A			● 3.0A			
			●			
						UL/C-UL, TÜV
●					●	

# Marketing and Innovation

Hirose produces all its products based on its development policy of "marketing and technological innovation". We believe that our mission in the market is to provide products with unprecedented concepts by discerning potential needs and repeating hypotheses and tests, rather than focusing merely on existing needs.



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



**FunctionMAX**™ Special Site →

HIROSE FunctionMAX

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