

## FH55/FH55M Series

# 0.4/0.5mm Pitch, 1.5mm Height, Bottom Contact, High-Speed FPC Connector with Front Flip Design



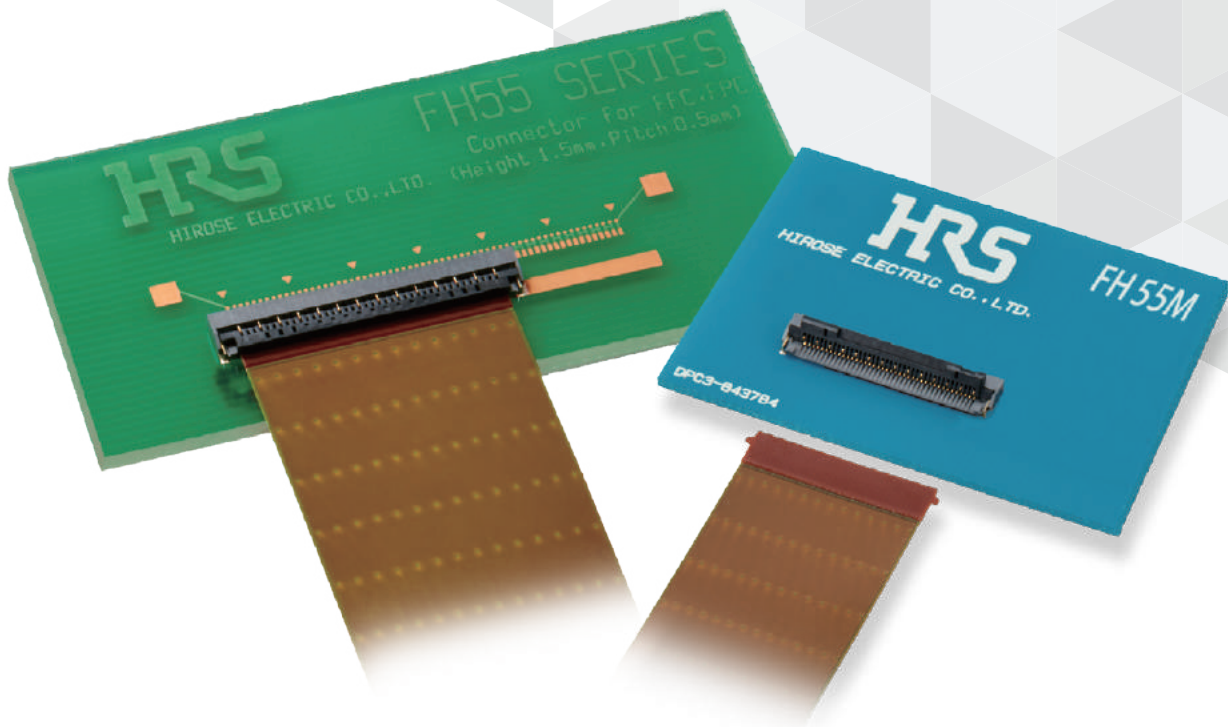
P=0.4/0.5mm



High Speed



Front Flip



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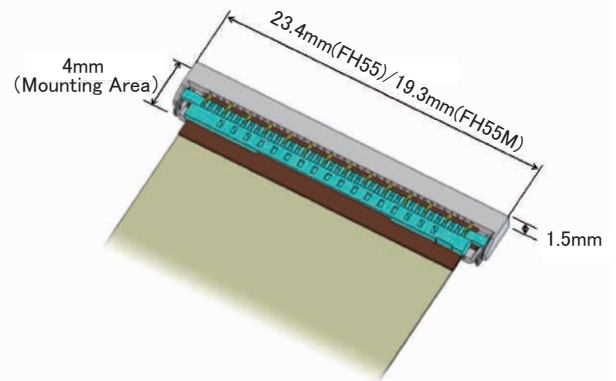


## Features

### 1. High Speed transmission FPC Connector

Capable of high-speed differential signal transmission using a GSSG (Ground-Signal-Signal-Ground) layout, achieving speeds 16+ Gbps. (The GSSG layout utilizes differential signals, but the contacts can also be used for applications other than differential signaling.)

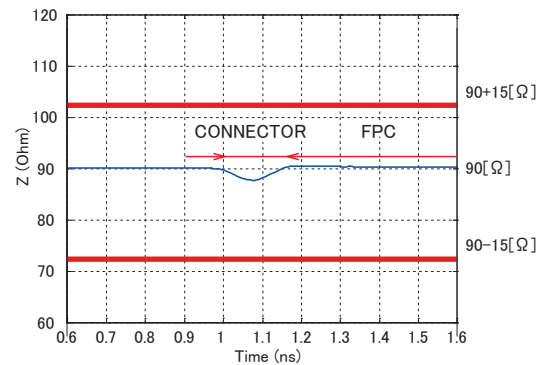
Dimensional Drawing : 40pos.



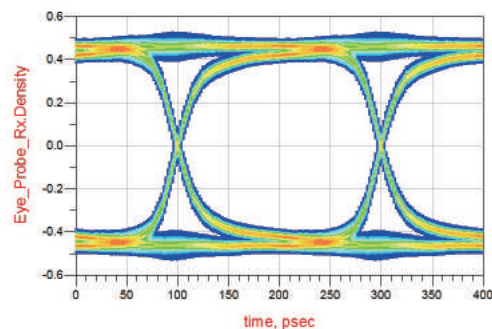
### 2. Impedance Matched Contact Design

Designed with impedance control to enhance high-speed transmission capabilities.

FH55 Differential Impedance  
50ps rise time (20–80%)



FH55 Eye Pattern (5Gbps)

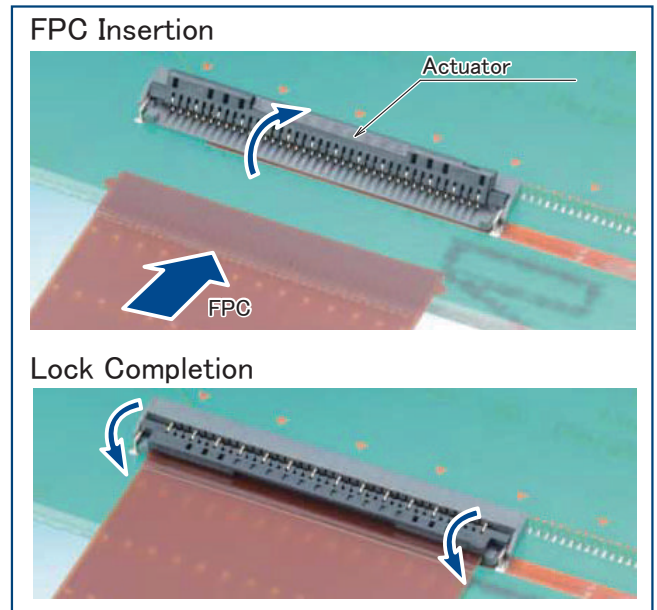


### 3. Fully Enclosed Molded Structure (Over molding Structure)

The connector's underside is covered with resin, allowing for PCB patterning beneath it, thus enhancing PCB design flexibility.

## 4. Flip-Lock System Provides Reliability and FPC Security

Features a flip-lock (one-touch rotational lock) ZIF structure for reliable, easy-to-secure FPC connection, complemented by a tactile click to prevent incomplete locking.



## 5. Easy FPC insertion

Incorporates guide tabs that facilitate temporary holding and accurate positioning during FPC insertion, ensuring consistent connections.

## 6. Compatible with 0.3mm Thick FPC

Designed for use with standard 0.3mm thick FPC in a 0.5mm pitch, reinforced with a board to prevent FPC deformation during insertion and mating.

## 7. Automatic Mounting Option Available

Supports automatic mounting through emboss packaging, available in quantities of 5,000 pieces per reel.

## 8. Halogen-free

No chlorine or bromine exceeding the standard values are used in this connector.

\* As defined by IEC 61249-2-21 Br : 900ppm Max., Cl : 900ppm Max., Br+ Cl : 1,500ppm Max.

## 9. Supporting a variety of transmission standards

- USB4 Gen.2(10<sup>+</sup>Gbps)
- PCI Express Gen.4(16<sup>+</sup>Gbps)
- HDMI 1.4a Embedded Display
- Port 1.3 Serial ATA Gen.3

\*The status of support for transmission standards change depending on FPC specification and length.

Contact a Hirose sales representative for detail.

### Product Specifications

Rated Current (Note 1)	0.5A (0.5mm Pitch)	Operating Temperature (Note 2)	-55 to +85°C
	0.4A (0.4mm Pitch)	Operating Humidity Range	RH 90% Max. (No Condensation)
Rated Voltage	50Vrms AC (0.5mm Pitch)	Storage Temperature (Note 3)	-10 to +50°C
	40Vrms AC (0.4mm Pitch)	Storage Humidity Range	RH 90% Max. (No Condensation)

Compatible FPC · FFC Terminal Specifications	t=0.3 ± 0.03 Gold Plating
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Item	Standards	Condition
Insulation Resistance	500M Ω Min.	Measured at 100V DC
Withstanding Voltage	No flashover or dielectric breakdown	150Vms AC (0.5mm pitch) 120Vms AC (0.4mm pitch) for 1 min.
Contact Resistance	100m Ω Max. * Includes FPC conductor resistance.	Measured at 1mA
Mating Durability	Contact Resistance : 100m Ω Max. No damage, cracks or part dislocation.	20 times
Vibration Resistance	No electrical discontinuity of 1 μs or more Contact Resistance : 100m Ω Max. No damage, cracks or part dislocation.	Frequency 10 to 55 Hz, Half amplitude 0.75mm, 10 cycles in each of the 3 axis
Shock Resistance	No electrical discontinuity of 1 μs or more Contact Resistance : 100m Ω Max. No damage, cracks or part dislocation.	Acceleration : 981m/s <sup>2</sup> , Duration : 6 ms Sine halfwave : 3 times each in 3 axial both directions
Steady-State Moisture Resistance	Contact Resistance : 100m Ω Max. Insulation Resistance : 50M Ω Min. No damage, cracks or part dislocation.	Leave in a temperature of +40°C and humidity of 90 to 95% for 96 hours.
Temperature Cycle	Contact Resistance : 100m Ω Max. Insulation Resistance : 50M Ω Min. No damage, cracks or part dislocation.	Temperature : -55 → +15 to +35 → +85 → +15 to +35°C Time : 30 → 2 to 3 → 30 → 2 to 3 min. 5 cycles under the above conditions
Solder Heat Resistance	No deformation in appearance and no significant rattling of terminals, etc.	1) Reflow : peak temperature 250°C Max., 60 seconds Max. at above 230°C . 2) Soldering iron : 350 ± 10°C for 5 seconds

Note 1 : Use at 70% of the current rating when all pins are energized with current rating.

Note 2 : Temperature rise at the time of electrification is included.

Note 3 : The term "storage" refers to the long-term storage condition of unused products before board mounting. The operating temperature and humidity ranges apply to non-energized state after board mounting.

## Materials / Finish

Component	Material	Color / Finish	Remarks
Insulator	LCP	Gray, Black	UL94V-0
Contact	Phosphorous Bronze	Gold Plating	-
Retention Tab	Brass	Pure Tin Reflow Plating	-

## Product Number Structure

Refer to the chart below when determining the product specifications from the product number.  
Please select from the product numbers listed in this catalog when placing orders.

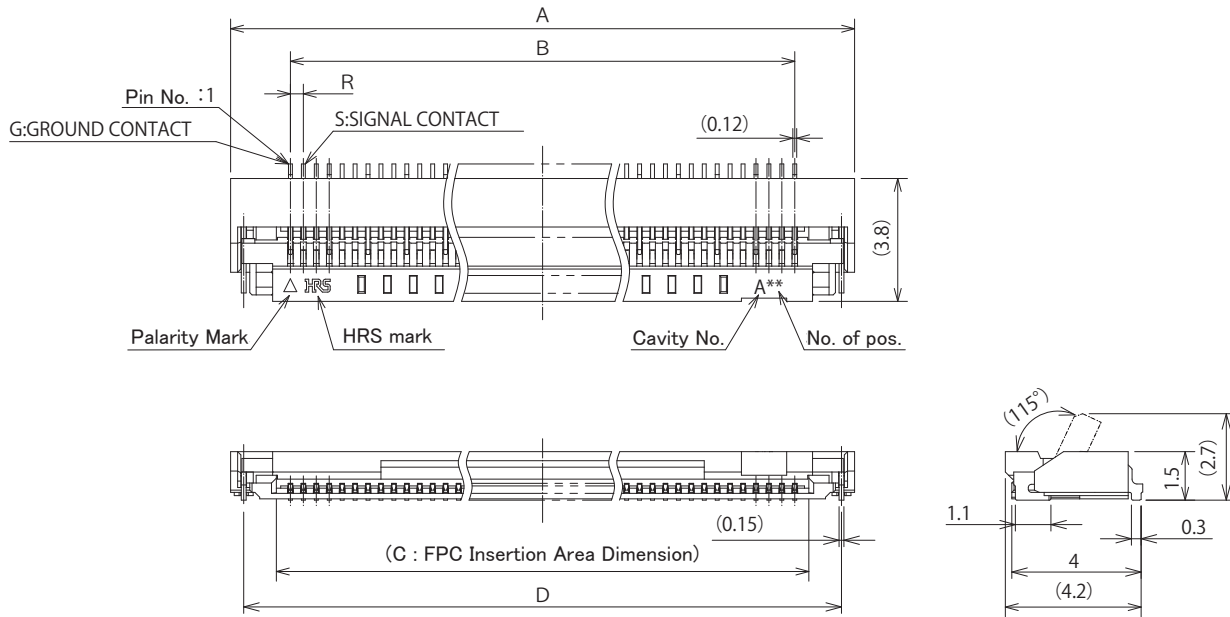
### **FH 55 M - 40S - 0.5 SH**

- ①    ②    ③            ④            ⑤    ⑥

① Series Name	FH	④ No. of Pos.	10 to 61pos. (0.5mm pitch) 10 to 79pos. (0.4mm pitch)
② Series No.	55	⑤ Contact Pitch	0.5mm, 0.4mm
③ Pitch Type	None : 0.5mm Pitch M : 0.4mm Pitch	⑥ Contact Type	SH··SMT Horizontal Mounting Type

## Connector Dimensions

### ● 0.5mm/0.4mm Pitch Products



- Notes 1 : The dimensions in parentheses ( ) are reference values.  
 Notes 2 : The lead co-planarity of connector and reinforcing metal part is MAX 0.1mm.  
 Notes 3 : This product is emboss-packaged. See the package specification diagram for details.  
 Notes 4 : Dimensions may be changed for sink mark prevention due to improvement, etc.  
 Notes 5 : Black dots, etc. may occur in mold resin but do not create a quality problem.  
 Notes 6 : This product satisfies halogen free requirements defined as 900ppm maximum chlorine, 900ppm maximum bromine, and 1,500ppm maximum total of chlorine and bromine.  
 Notes 7 : See the table below for available pin arrangements.

S : SIGNAL CONTACT  
 G : GROUND CONTACT

\* Pins are arranged in the sequence of GSSG to manage high-speed differential signals ; however, all contacts can be used as signals for normal signals other than high-speed signals. Please contact our sales representative for any questions.

Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39			
Pin Assignment	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S
	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79		
	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S	G	S	S

Unit : mm

Part No.	HRS No.	No. of Pos.	No. of Signal Contacts	No. of Ground Contacts	A	B	C	D	R	Purchase Unit	
FH55-10S-0.5SH	Under Planning	10	6	4	8.4	4.5	5.57	7.59	0.5	5,000pcs per reel	
FH55-22S-0.5SH	CL0580-3707-7-00	22	14	8	14.4	10.5	11.57	13.59			
FH55-31S-0.5SH	CL0580-3704-9-00	31	20	11	18.9	15.0	16.07	18.09			
FH55-40S-0.5SH	CL0580-3700-8-00	40	26	14	23.4	19.5	20.57	22.59			
FH55-49S-0.5SH	Under Planning	49	32	17	27.9	24.0	25.07	27.09			
FH55-61S-0.5SH	Under Planning	61	40	21	33.9	30.0	31.07	33.09			
FH55M-10S-0.4SH	CL0580-3710-0-00	10	6	4	7.3	3.6	4.47	6.49	0.4		5,000pcs per reel
FH55M-19S-0.4SH	Under Planning	19	12	7	10.9	7.2	80.70	10.09			
FH55M-31S-0.4SH	CL0580-3711-0-00	31	20	11	15.7	12.0	12.87	14.89			
FH55M-40S-0.4SH	CL0580-3706-4-00	40	26	14	19.3	15.6	16.47	18.49			
FH55M-49S-0.4SH	Under Planning	49	32	17	22.9	19.2	20.07	22.09			
FH55M-61S-0.4SH	Under Planning	61	40	21	27.7	24.0	24.87	26.89			
FH55M-79S-0.4SH	Under Planning	79	52	27	34.9	31.2	32.07	34.09			

Note : Products without HRS No. are currently being planned for development. Please contact a Hirose representative regarding questions on pin count variation development.

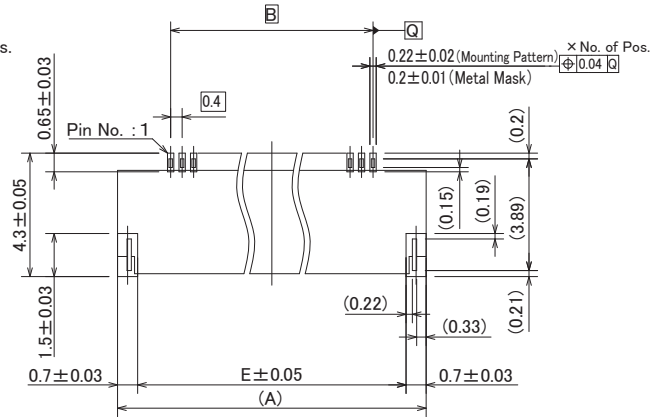
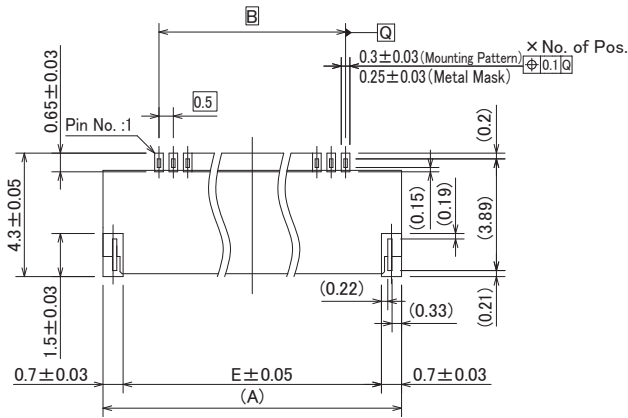
## Recommended PCB Mounting Pattern, Metal Mask Dimensions

### ● FH55 Series

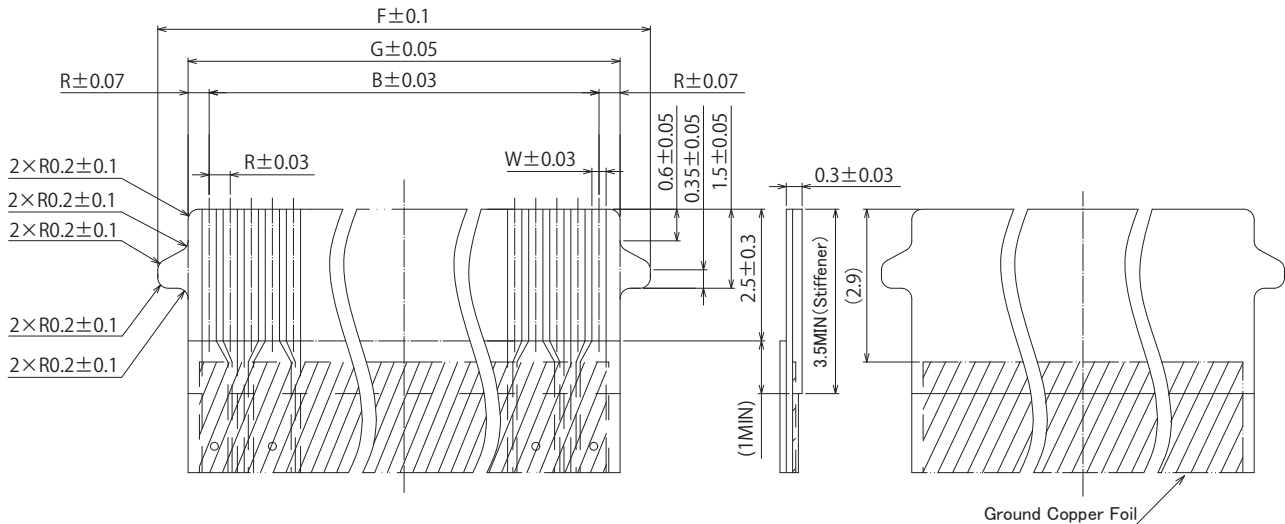
### ● FH55M Series

Recommended Metal Mask Thickness : t=0.10

Recommended Metal Mask Thickness : t=0.10



## Recommended FPC Dimensions



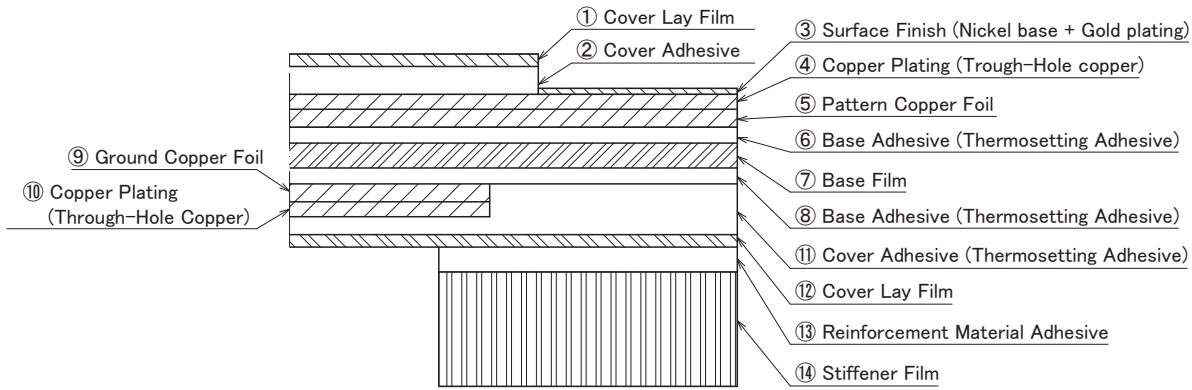
Unit : mm

Part No.	HRS No.	No. of pos.	No. of Signal Contacts	No. of Ground Contacts	E	F	G	R	W
FH55-10S-0.5SH	Under Planning	10	6	4	7.0	6.65	5.5	0.5	0.37
FH55-22S-0.5SH	CL0580-3707-7-00	22	14	8	13.0	12.65	11.5		
FH55-31S-0.5SH	CL0580-3704-9-00	31	20	11	17.5	17.15	16.0		
FH55-40S-0.5SH	CL0580-3700-8-00	40	26	14	22.0	21.65	20.5		
FH55-49S-0.5SH	Under Planning	49	32	17	26.5	26.15	25.0		
FH55-61S-0.5SH	Under Planning	61	40	21	32.5	32.15	31.0	0.4	0.3
FH55M-10S-0.4SH	CL0580-3710-0-00	10	6	4	5.9	5.55	4.4		
FH55M-19S-0.4SH	Under Planning	19	12	7	9.5	9.15	8.0		
FH55M-31S-0.4SH	CL0580-3711-0-00	31	20	11	14.3	13.95	12.8		
FH55M-40S-0.4SH	CL0580-3706-4-00	40	26	14	17.9	17.55	16.4		
FH55M-49S-0.4SH	Under Planning	49	32	17	21.5	21.15	20.0		
FH55M-61S-0.4SH	Under Planning	61	40	21	26.3	25.95	24.8		
FH55M-79S-0.4SH	Under Planning	79	52	27	33.5	33.15	32.0		

Note : Products without HRS No. are currently being planned for development. Please contact a Hirose representative regarding questions on pin count variation development.



## FH55/FH55M Series Recommended FPC Construction

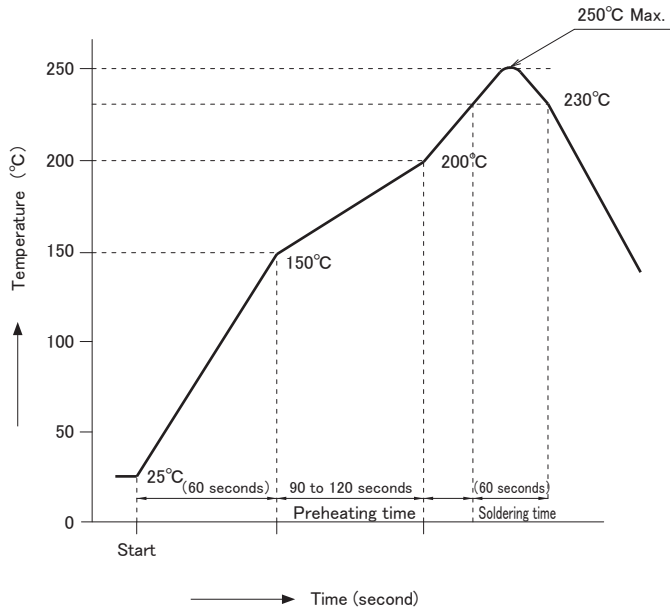


Names of Materials	Material Thickness ( $\mu\text{m}$ )		
	LCP 2-Layer CCL	PI 2-Layer CCL	PI 3-Layer CCL
① Cover Lay Film	12.5	12.5	12.5
② Cover Adhesive	28	28	28
③ Surface Treatment (Nickel Base + Gold Plating)	(6)	(6)	(6)
④ Copper Plating (Through - Hole Copper)	15	15	15
⑤ Pattern Copper Foil	9	18	18
⑥ Base Adhesive (Thermosetting Adhesive)	-	-	16
⑦ Base Film <span style="border: 1px solid black; padding: 0 2px;">02</span>	50	25	25
⑧ Base Adhesive (Thermosetting Adhesive)	-	-	16
⑨ Ground Copper Foil	9	18	18
⑩ Copper Plating (Through - Hole Copper)	15	15	15
⑪ Cover Adhesive (Thermosetting Adhesive)	28	28	28
⑫ Cover Lay Film	12.5	12.5	12.5
⑬ Reinforcement Material Adhesive (Thermosetting Adhesive)	50	50	30
⑭ Stiffener Film	125	150	125
Total (Mating Area Thickness : Total of ③ to ⑧ and ⑪ to ⑭)	295.5	304.5	291.5

Note 1 : This is a reference FPC construction.  
 Make the thickness of the FPC mated portion  $0.3 \pm 0.03\text{mm}$  in reference to the FPC construction.

02 This is a reference example of Base Film Material. LCP indicates Liquid Crystal Polymer, PI indicates Polyimide.

## Temperature Profile



### Applicable Conditions

Reflow System : Far-Infrared, Hot-Air Reflow

Reflow Chamber Atmosphere : Air

Solder : Paste type Sn/3.0Ag/0.5Cu  
(M705-221CM5-42-10.5 ; Senju Metal Industry Co., Ltd.)

Test Board : Board material and size  
Glass epoxy 30 × 60 × 1.0mm

Land dimensions Contact area 0.3 × 0.65mm  
(0.5mm pitch product)  
0.22 × 0.65mm  
(0.4mm pitch product)

Metal part area 0.7 × 1.5mm

Metal Mask : Thickness 0.1mm

Aperture Dimension Contact area 0.25 × 0.65mm  
(0.5mm pitch product)  
0.2 × 0.6mm  
(0.4mm pitch product)

Metal part area 0.7 × 1.5mm

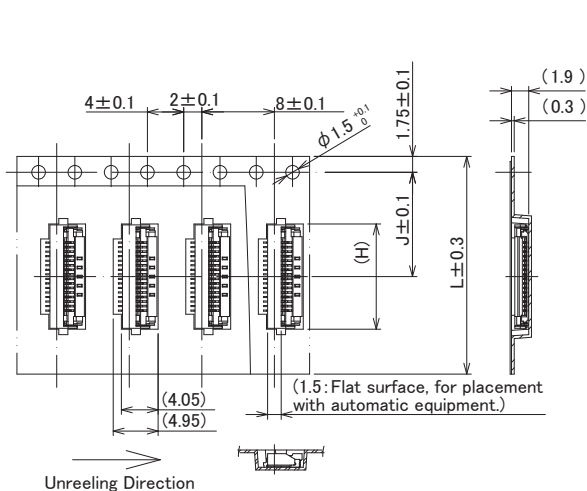
The temperature profile shown above is based on the above applicable conditions.

Due to the changing conditions such as solder paste types, manufacturers, board size and other soldering materials, please check to ensure the proper soldering conditions before use.

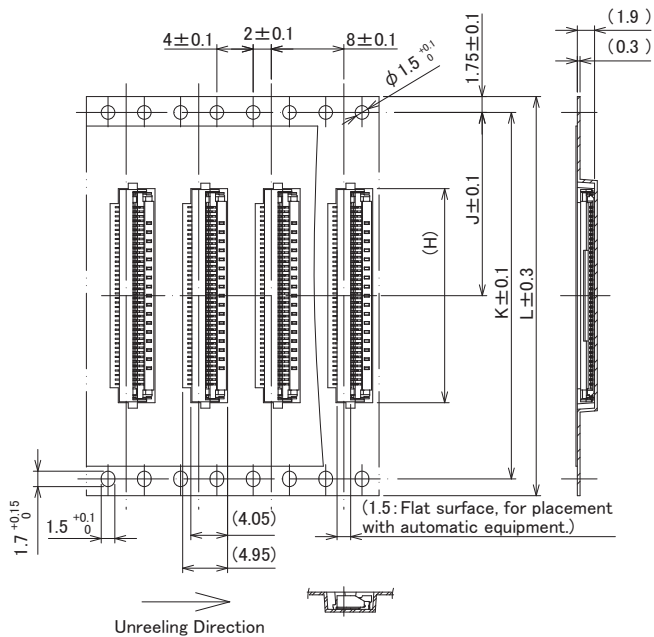
## Packaging Specifications

### ● Embossed Carrier Tape Dimensions

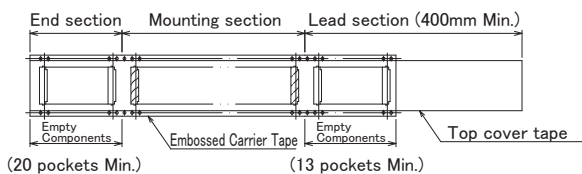
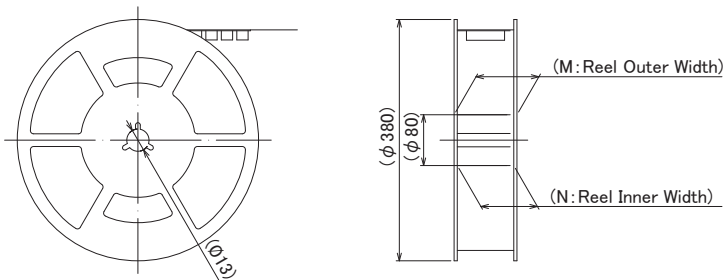
(Tape Width 24mm Max.)



(Tape Width 32mm Min.)



### ● Reel Dimensions



Unit : mm

Part No.	HRS No.	No. of Pos.	No. of Signal Contact	No. of Ground Contact	H	J	K	L	M	N
FH55-10S-0.5SH	Under Planning	10	6	4	8.6	11.5	-	24.0	29.4	25.4
FH55-22S-0.5SH	CL0580-3707-7-00	22	14	8	14.6		-			
FH55-31S-0.5SH	CL0580-3704-9-00	31	20	11	19.1	14.2	28.4	32.0	37.4	33.4
FH55-40S-0.5SH	CL0580-3700-8-00	40	26	14	23.6	20.2	40.4	44.0	49.4	45.4
FH55-49S-0.5SH	Under Planning	49	32	17	28.1					
FH55-61S-0.5SH	Under Planning	61	40	21	34.1	26.2	52.4	56.0	61.4	57.4
FH55M-10S-0.4SH	CL0580-3710-0-00	10	6	4	7.5	11.5	-	24.0	29.4	25.4
FH55M-19S-0.4SH	Under Planning	19	12	7	11.1					
FH55M-31S-0.4SH	CL0580-3711-0-00	31	20	11	15.9	14.2	28.4	32.0	37.4	33.4
FH55M-40S-0.4SH	CL0580-3706-4-00	40	26	14	19.5	20.2	40.4	44.0	49.4	45.4
FH55M-49S-0.4SH	Under Planning	49	32	17	23.1					
FH55M-61S-0.4SH	Under Planning	61	40	21	27.9					
FH55M-79S-0.4SH	Under Planning	79	52	27	35.1					

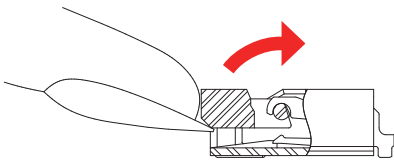
Note : Products without HRS No. are currently being planned for development. Please contact a Hirose representative regarding questions on pin count variation development.

## Operation of Connector and Precautions

### 【Operation】

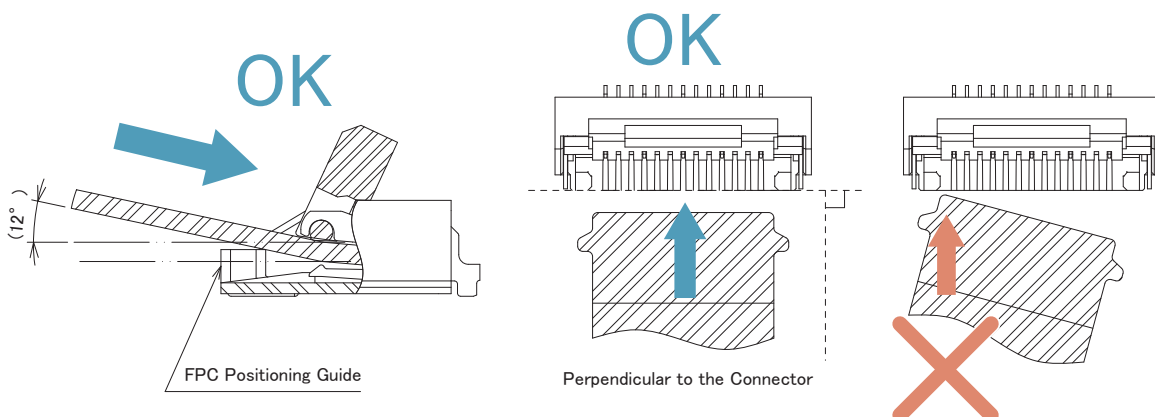
#### 1. FPC Insertion Method

- ① Operate the actuator upwards to open it.  
It is designed for easy operation using just a fingernail.

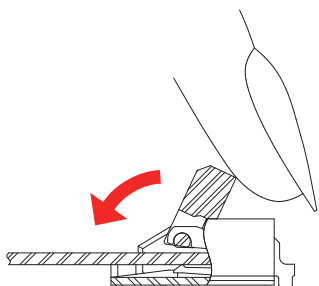


- ② Insert FPC with its conductor side facing down.

There is an FPC position guiding tab. Insert FPC at an angle of approximately 12° against the PCB surface and perpendicular to the connector. Make sure to insert it completely.

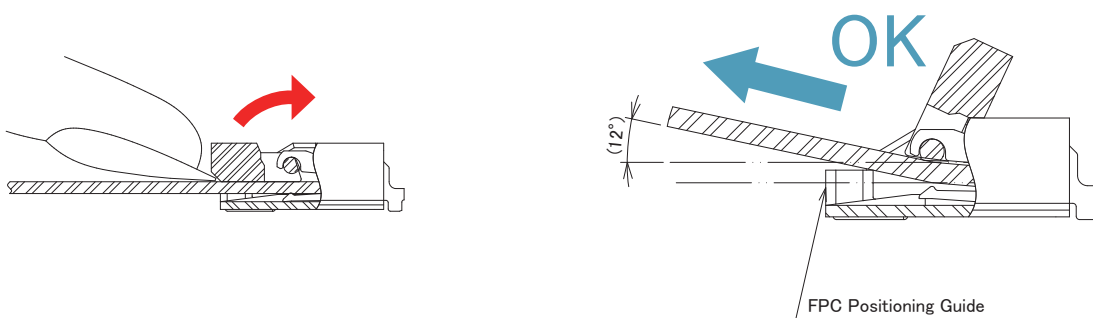


- ③ Rotate the actuator downwards to secure the FPC. When FPC is half inserted or insertion is significantly misaligned, remove the FPC according to the extraction method of 2-① and operate it again from 1-②. Fix the connector at the time of locking.



## 2. FPC Extraction Method

- ① To remove the FPC, lift the actuator, release lock, and gently pull the FPC out. As there is the FPC position guiding tab, extract the FPC at an angle of approx. 12° against the PCB surface.



### [Precautions on Use]

Ensure careful handling of the connector and review the following points before use. Precaution values may differ from the product specifications.

#### [Precautions at Time of Mounting on PCB]

- ◆ PCB Warpage  
Minimize PCB warpage to avoid mounting failures. Although the coplanarity of this connector is 0.1mm or less, mounting failure may occur with an excessive amount of warpage.
- ◆ Load to Connector  
Avoid placing external loads over 1N on the connector prior to mounting, during packaging removal, or when absorbing from the packaging. Handling the connector improperly, inserting FPC or operating connector before mounting may lead to breakage.

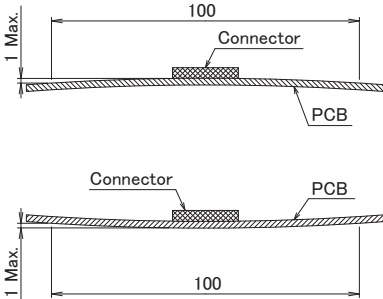
**[Precautions when Handling PCB after Mounting]**

◆ Load to PCB

Do not place excessive loads on the PCB during assembly to avoid connector breakage when cutting large PCBs into smaller ones or attaching with screws.

◆ Board Bending

For a board width of 100mm, do not bend the board more than a MAX of 1mm (See the diagram below). Bending the board more than 1mm may impose that load to the connector and result in breakage.

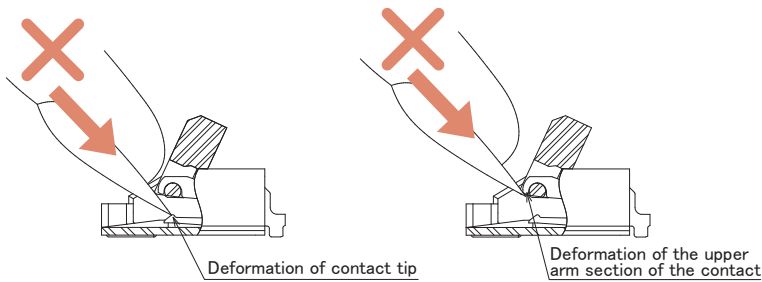


**[Precautions when Inserting or Mating the FPC]**

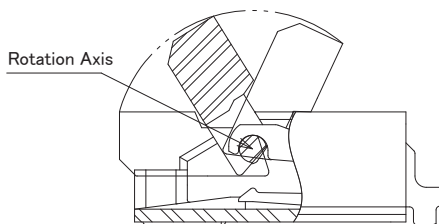
Please pay attention to the following points at the time of FPC insertion and mating.

① Actuator Operation

When opening the actuator from its initial state (FPC non-insertion state), please pay attention not to place an excessive amount of force on the actuator. Please see the diagram below to prevent deformity of the actuator through finger nail damage.



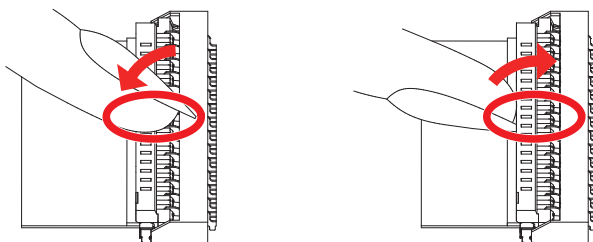
② As the actuator rotates centering around the shaft as shown in the diagram below, operate it in a rotational manner.



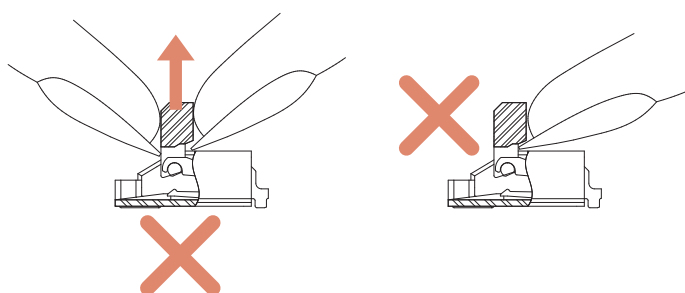
③ The actuator does not open beyond 115°. Applying force to rotate it further can disengage or damage the actuator.



- ④ Operate the actuator in its center area. When closing the actuator while FPC is inserted, operating it at its edge may result in breakage of the actuator or incomplete mating.



- ⑤ Do not lift or manipulate the actuator by clipping or picking it up, as shown in the diagrams. Only perform the rotational actions specified in ④ diagram to prevent actuator breakage.

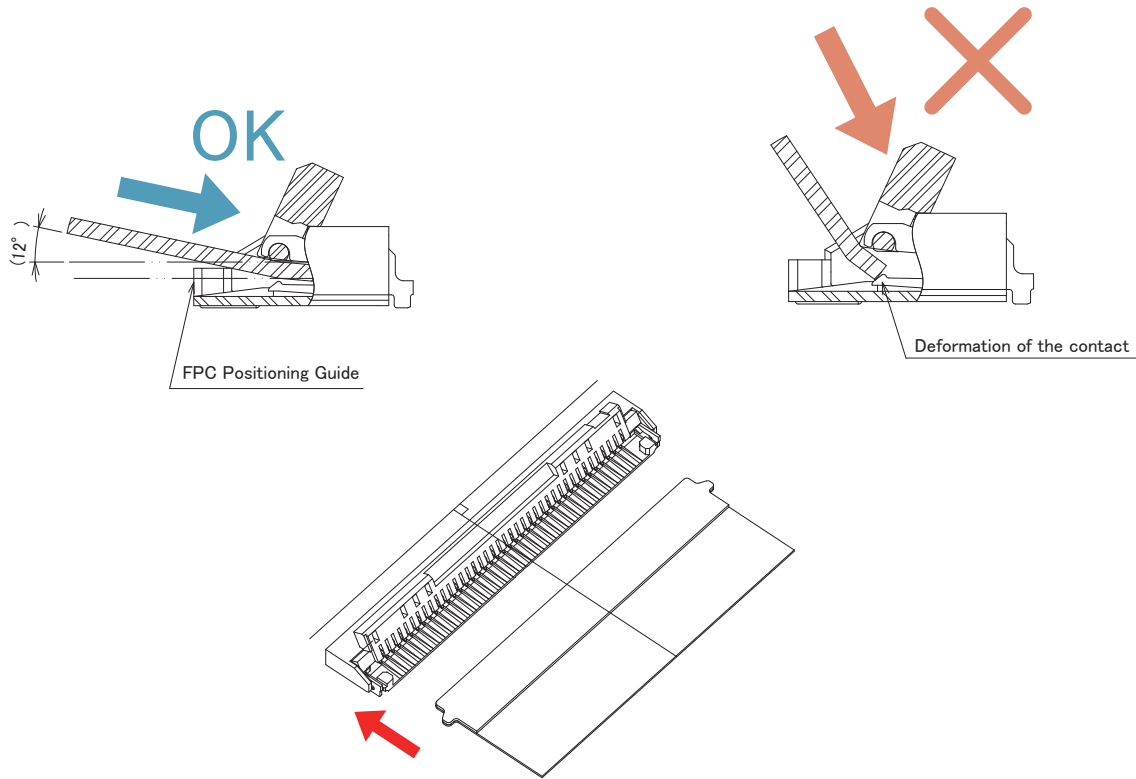


◆ Contact Point Direction

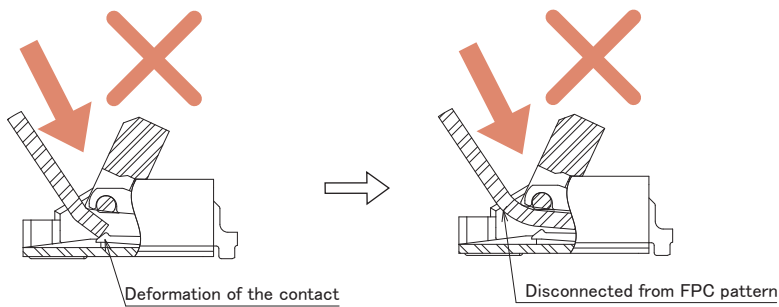
The contact point on this connector is on the bottom; therefore insert the FPC with the conductor exposed surface facing down.

◆FPC Insertion

① There is a FPC position guiding tab. Make sure to completely insert FPC at an angle of approx. 12° against the PCB surface and vertically to the connector. If FPC is inserted at a slant angle, it may result in short circuit failure due to pitch misalignment or contact deformation with the FPC corner getting caught at contacts.



② Avoid inserting the FPC at a steep angle from above. Misaligned insertion can bend the FPC and damage its pattern, potentially leading to connection failures.

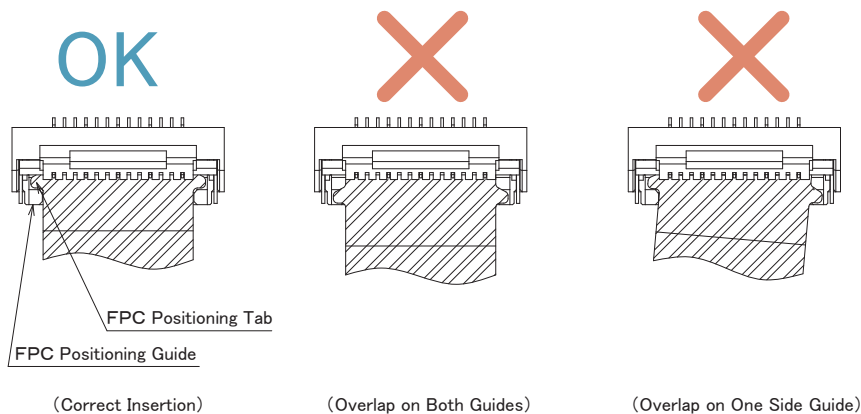


\*In order to prevent slant insertion of FPC, make sure to secure sufficient space for FPC insertion at the time of layout designing. Insertion will become difficult if FPC is too short, therefore, please design appropriate part layout.

\*Please confirm details of the flexion and wire breakage of FPC with your FPC manufacturer.



③ After FPC insertion, make sure that the FPC position guiding tab is not on top of the FPC position guide on both sides of the connector. Contact failure may occur if the actuator is locked while the FPC position guiding tab is still on top of the FPC position guide.



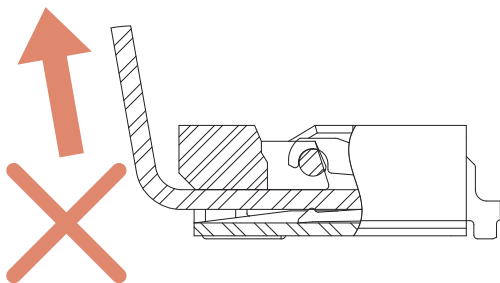
◆ Lock State Confirmation

At the time of locking, make sure that the actuator is parallel to the PCB surface. However, when the actuator gets close to 0°, make sure you use the appropriate amount of force as the use of excessive force, may result in contact deformation (1N or less).

**[Precautions when Routing FPC after FPC Insertion]**

◆ About the Load on the FPC

After the FPC has been inserted, ensure that no load will be applied to the FPC. Bending the FPC at a position near the connector may cause contact failure or FPC lead breakage/damage. In particular, fix the FPC when load is continuously applied to it. Do not bend the FPC sharply near the FPC insertion slot at the time of routing the FPC.



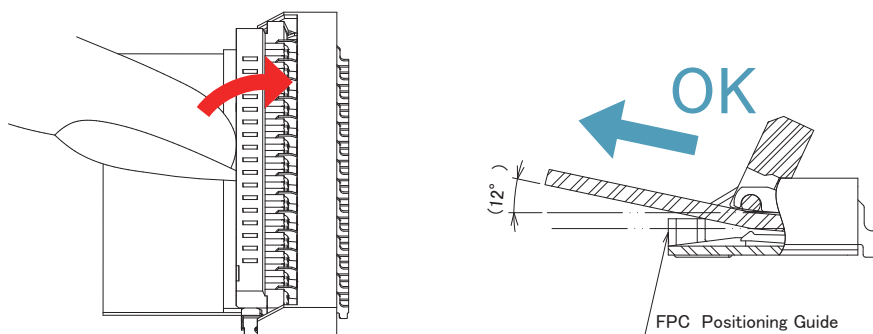
**[Precautions when Removing FPC]**

◆ Operate the actuator at the center area when releasing it.

If you operate the actuator at its edge when releasing the lock while the FPC is inserted, it may result in actuator breakage.

◆ Extracting the FPC while the actuator is unlocked.

Since these connectors have FPC position guiding tabs, extract the FPC at an angle of 12° against the PCB.



## 【Other Precautions】

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### ◆ Hand Soldering Precautions

When hand soldering for repair, etc.:

- ① Do not perform reflow or hand soldering with the FPC inserted in the connector.
- ② Do not apply excessive heat and make sure that the soldering iron does not touch anywhere other than the connector lead. It may result in connector deformation or melting.
- ③ Do not supply excessive solder (flux).

If an excessive amount of solder (flux) is supplied to the contact, solder or flux may adhere to the contact points or the shaft of the actuator and can result in contact failure or rotational performance failure of the actuator.

## While Taking into Consideration

Specifications mentioned in this catalog are reference values.

When considering to order or use this product, please review the Drawing and Product Specifications sheets.

Use an appropriate cable when using the connector in combination with cables.

If considering usage of a non-specified cable, please contact your sales representative.

If assembly process is done by jigs & tools which are not identified by Hirose, the warranty of the product may be affected.

If considering usage for below mentioned applications, please contact your sales representative.

In cases where the application will demand a high level of reliability, such as automotive, medical instruments, public infrastructure, aerospace/defense etc. Hirose must review before assurance of reliability can be given.