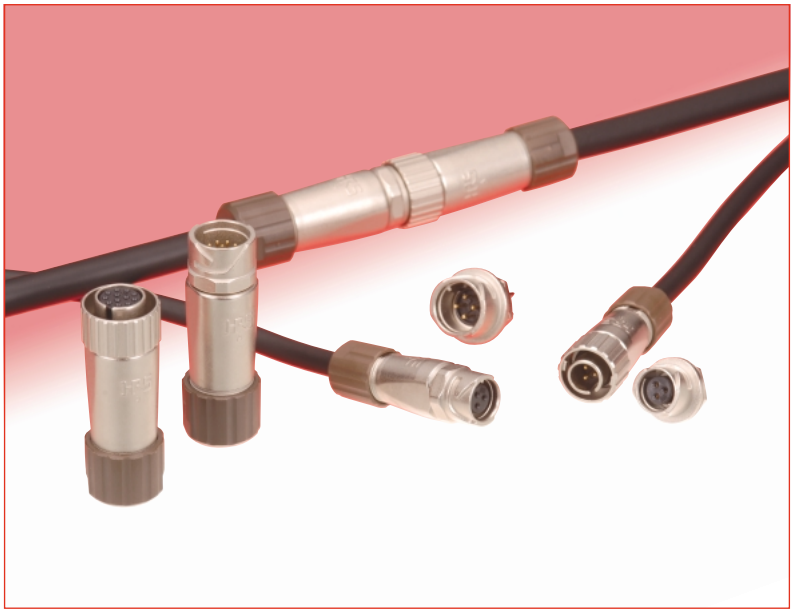
NEW

Miniature Waterproof Shielded Connectors

LF Series



■Features

1. Simple assembly and connection of shielded cable

All components are self-aligning and do not require complex assembly tooling. The shield of the cable is connected with the metal housing of the connector using simple grounding clamp, supplied with the connector.

2. Water and dust protected

IP67 protection rating. Complete protection against dust penetration and against water penetration when mated assembly is submerged at the depth of 1.8 meter for 48 hours.

3. Bayonet lock

Short turn bayonet lock assures secure vibration resistant mating of the connectors.

4. High current carrying capacity

Three contact connectors meet 5A current rating.

5. Safety standards compliance

UL/CSA certification pending. (3 pos.)

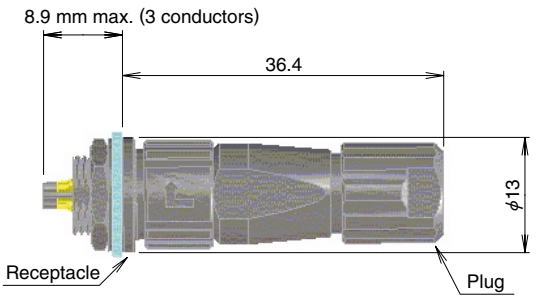
6. Environmental considerations

Connectors comply with the environmental requirements of RoHS directives.

■Applications

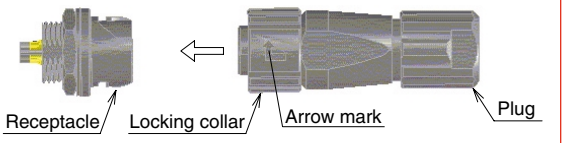
Sensors, robots, injection molding machines, NC, factory automation equipment, surveying instruments, measuring instruments, medical equipment, surveillance cameras and base stations.

Mated View

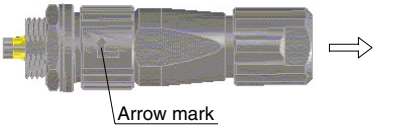


Short turn bayonet lock

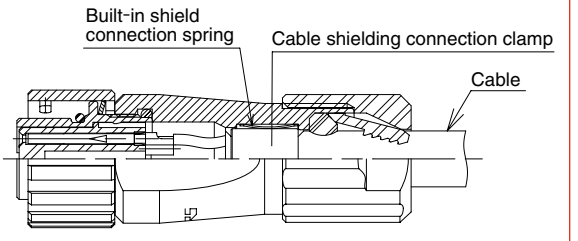
Mating:
Insert the plug, and then turn the locking collar clockwise, as indicated by the arrow mark.



Un-mating:
Turn the locking collar counter-clockwise than pull off the plug.



Shielding Connection - Plug



■Product Specifications

Rating	Voltage rating	125V AC, 175V DC (3 pos.) 125V AC, 125V DC (4 pos.) 30V AC, 42V DC (6 pos.12pos.)
	Current rating	5A max. (3 pos.) 10A max. (4 pos.) 2A max. (6 pos.12pos.)
	Operating temperature range	−25℃ to +85℃ (Note 1)
	Storage temperature range	−25℃ to +85℃ (Note 2)

Item	Specification	Conditions
1.Contact resistance	15 mΩ max. (3, 6, 12 pos.) 5 mΩ max. (4 pos.)	1A DC
2.Insulation resistance	1000 MΩ min.	500V DC (3, 4 pos.) 100V DC (6, 12 pos.)
3.Withstanding voltage	No flashover or insulation breakdown.	1250V AC/one minute (3, 4 pos.) 300V AC/one minute (6, 12 pos.)
4.Vibration	No electrical discontinuity for 10μs max.	Frequency: 10 to 500Hz, single amplitude of 0.75mm, acceleration of 98 m/s² for 3 hours in 3 axis.
5.Shock	No electrical discontinuity for 10μs max.	Acceleration of 490m/s², 11ms duration, sine half-wave waveform, 3 cycles in each of the 3 axis.
6.Durability (Mating/un-mating)	30 mΩ max. (3, 6, 12 pos.) 5 mΩ max. (4 pos.)	1000 cycles
7.Temperature cycle	Insulation resistance: 100 MΩ min.	Temperature: -55℃ → Room temperature → +125℃ → Room temperature Time: 30 → 10 to 15 → 30 → 10 to 15 (minutes) 5 cycles
8.Humidity	Insulation resistance: 10 MΩ min. (When temperature high) Insulation resistance: 100 MΩ min. (Dray state)	96 hours at temperature of 40℃ and humidity of 90% to 95%.
9.Water / dust protection	When mated with corresponding connector.	Complete dust protection. No water penetration when submerged for 48 hours at the depth of 1.8 meter.

Note 1: Includes temperature rise caused by the current flow.
Note 2: The term “storage” refers to products stored for long period of time prior to mounting and use. Operating temperature range and humidity range covers non-conducting condition of installed connectors in storage, shipment or during transportation.

■Materials / Finish

Components	Material	Finish / Color	Remarks
Body / back shell	Zinc alloy	Nickel plated	————
Insulator	PPS	Black	UL94V-0
Contacts	Copper alloy	Gold plated	————
Gasket	Chloroprene rubber	Black	————

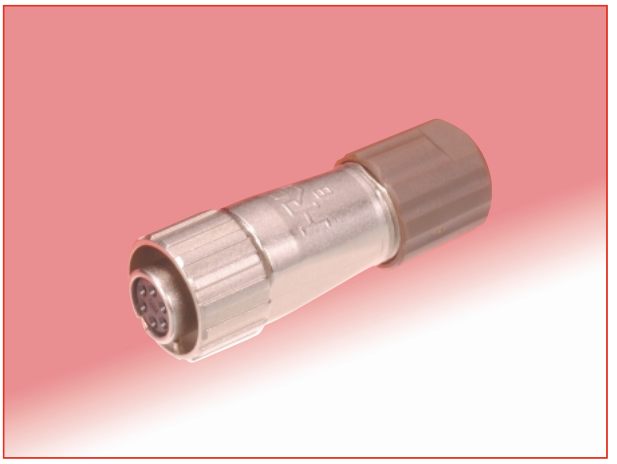
Note: RoHS (Restriction of Hazardous Substances) compliant materials

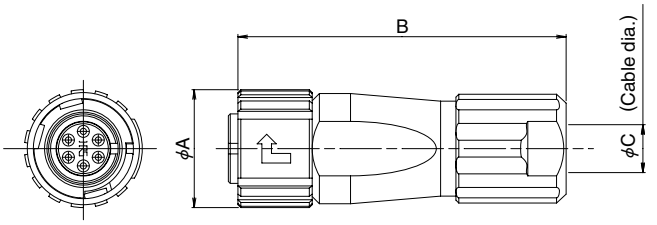
■Ordering Information

LF 07 - W B P - 6 S
❶ ❷ ❸ ❹ ❺ ❻ ❼

❶ Series name		: LF
❷ Shell size	07	: 10.3 mm
	10	: 12.8 mm
❸ Waterproof	W	: Waterproof type
❹ Lock Mechanism	B	: Bayonet lock
❺ Connector type	P	: Plug
	R	: Receptacle
	J	: Jack
❻ Number of contacts		: 3, 4, 6, 12
❼ Contact type	P	: Male contact
	S	: Female contact

■Plugs



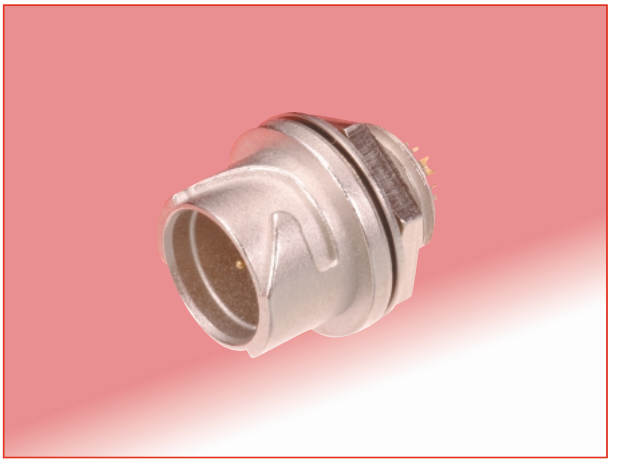


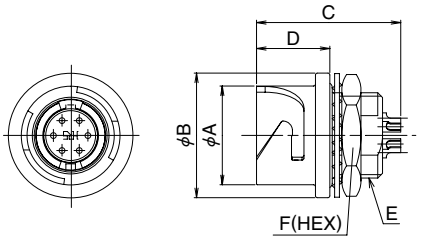
(Shown one example)

Unit:mm

Part number	CL No.	Number of contacts	φA	B	φC	Weight
LF07WBP-3S	136-0003-7	3	12.3	35.3	5	11g
LF07WBP-3P	136-0004-0	3	12.3	35.3	5	11g
LF07WBP-6S	136-0001-1	6	12.3	35.3	5	11g
LF07WBP-6P	136-0002-4	6	12.3	35.3	5	11g
LF10WBP-4S	136-0005-2	4	14.8	41.8	7.3	17g
LF10WBP-4P	136-0006-5	4	14.8	41.8	7.3	17g
LF10WBP-12S	136-0007-8	12	14.8	41.8	7.3	17g
LF10WBP-12P	136-0008-0	12	14.8	41.8	7.3	17g

■Receptacles





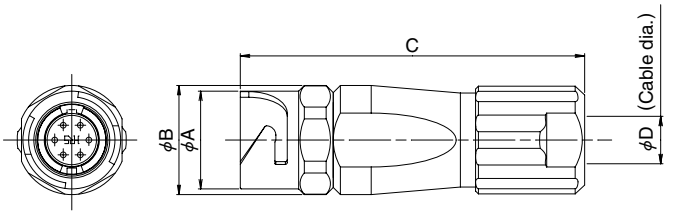
(Shown one example)

Unit:mm

Part number	CL No.	Number of contacts	φA	φB	C	D	E	F	Weight
LF07WBR-3P	136-1003-2	3	10.3	13	15.15	7.65	M9×0.75	11	4g
LF07WBR-3S	136-1004-5	3	10.3	13	15.15	7.65	M9×0.75	11	4g
LF07WBR-6P	136-1001-7	6	10.3	13	15.05	7.65	M9×0.75	11	4g
LF07WBR-6S	136-1002-0	6	10.3	13	15.25	7.65	M9×0.75	11	4g
LF10WBR-4P	136-1005-8	4	12.8	15.3	19.05	7.75	M11×0.75	13	6g
LF10WBR-4S	136-1006-0	4	12.8	15.3	19.05	7.75	M11×0.75	13	6g
LF10WBR-12P	136-1007-3	12	12.8	15.3	17.25	7.75	M11×0.75	13	5g
LF10WBR-12S	136-1008-6	12	12.8	15.3	17.25	7.75	M11×0.75	13	6g

Note: Recommended hex nut tightening torque: 1 to 2 N·m.

■Jacks



(Shown one example)

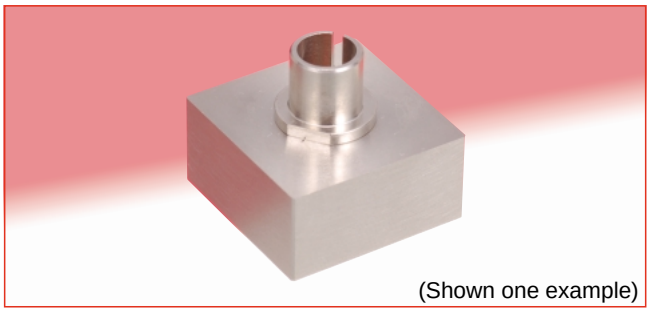
Unit:mm

Part number	CL No.	Number of contacts	φA	φB	C	φD	Weight
LF07WBJ-3P	136-2003-8	3	10.3	11.5	36.3	5	11g
LF07WBJ-3S	136-2004-0	3	10.3	11.5	36.3	5	11g
LF07WBJ-6P	136-2001-2	6	10.3	11.5	36.3	5	11g
LF07WBJ-6S	136-2002-5	6	10.3	11.5	36.3	5	11g
LF10WBJ-4P	136-2005-3	4	12.8	13.8	42.4	7.3	16g
LF10WBJ-4S	136-2006-6	4	12.8	13.8	42.4	7.3	16g
LF10WBJ-12P	136-2007-9	12	12.8	13.8	42.4	7.3	16g
LF10WBJ-12S	136-2008-1	12	12.8	13.8	42.4	7.3	16g

■Applicable tools

Description	Part number	CL No.	Applicable cable dia.
Manual cable clamp crimp	HR10A-TC-02	150-0041-2	5mm · 7mm
	LF-TC-01	150-0234-6	7.3mm · 8.7mm

■Solder termination fixture

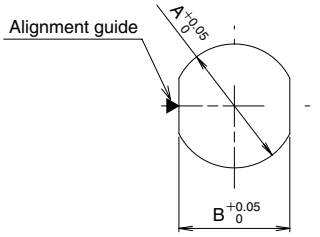


(Shown one example)

(Shown one example)

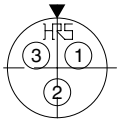
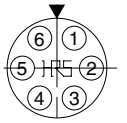
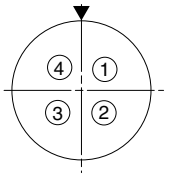
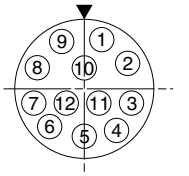
Part number	CL No.	Applicable connectors
LF07BP-T01	150-0232-1	LF07WBP-6S,6P,3S,3P
LF07BJ-T01	150-0233-3	LF07WBJ-6S,6P,3S,3P
LF10BP-T01	150-0235-9	LF10WBP-4S,4P,12S,12P
LF10BJ-T01	150-0236-1	LF10WBJ-4S,4P,12S,12P

■Panel Cutout



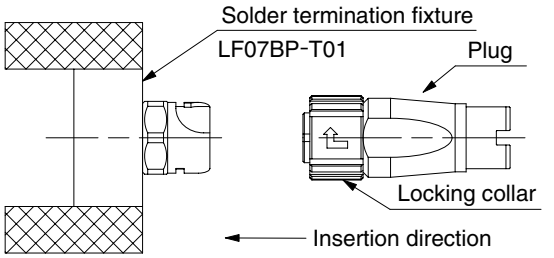
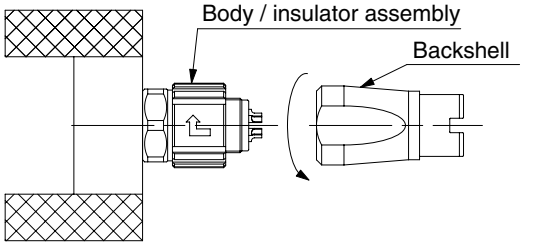
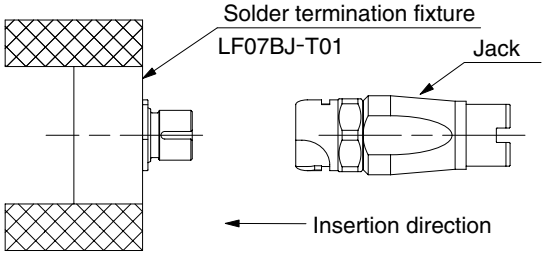
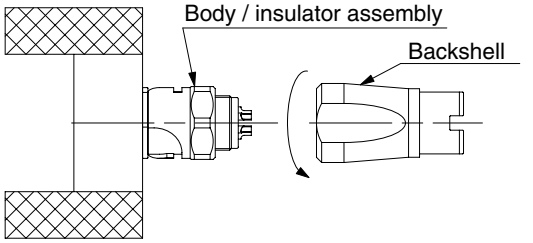
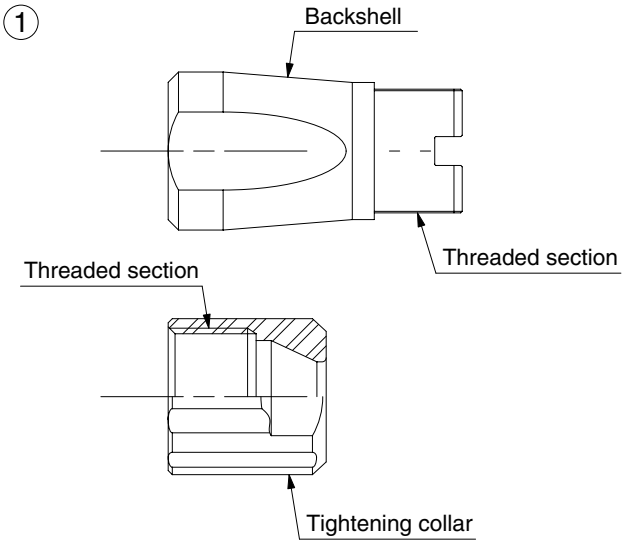
Shell size	A	B	Panel thickness unit (mm)
LF07	ϕ9.05	8.1	0.5~2
LF10	ϕ11.05	10.2	0.7~2

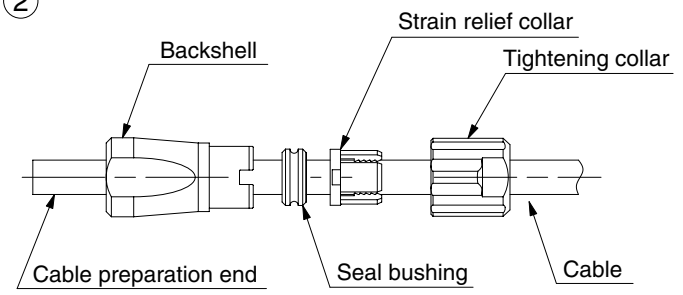
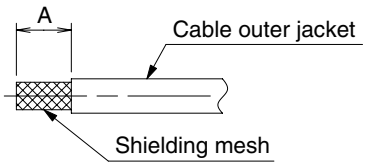
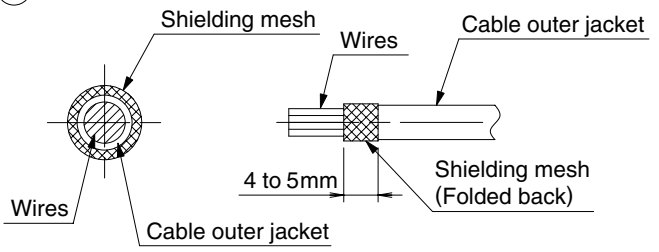
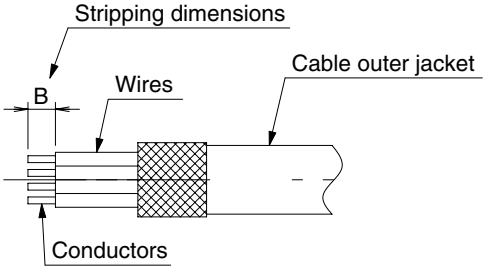
■Contact position arrangement and specifications

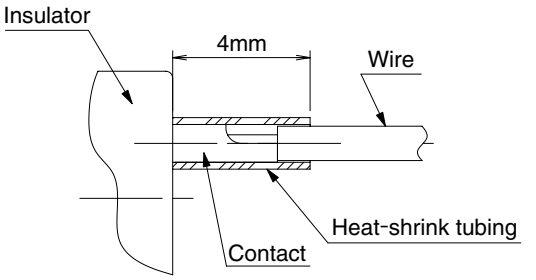
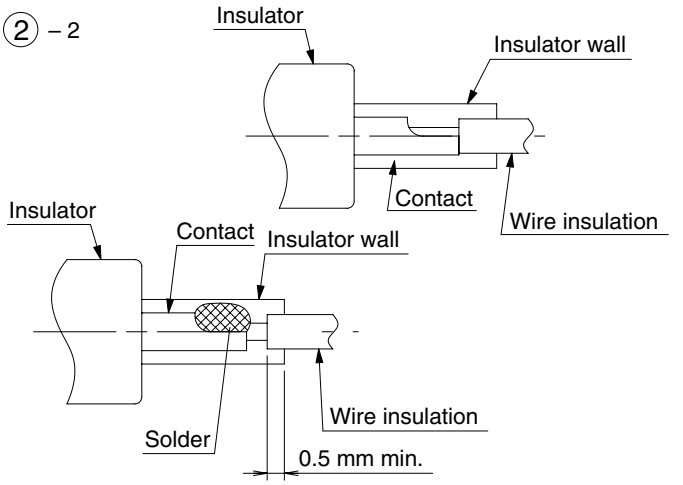
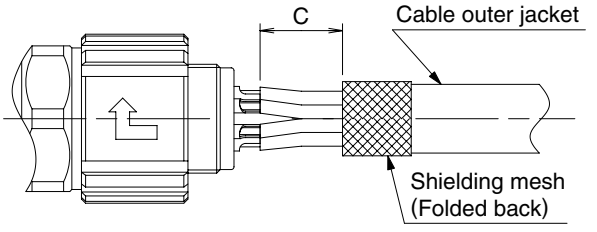
Shell size	LF07		LF010	
Contact configuration				
Number of contacts	3	6	4	12
Withstanding voltage	1250V AC	300V AC	1250V AC	300V AC
Current rating	5A	2A	10A	2A
Insulation resistance	1000MΩ		1000MΩ	1000MΩ
Contact resistance	15mΩ		5mΩ	15mΩ
Solder pot inner diameter	1.15mm	0.8mm	1.7mm	0.8mm

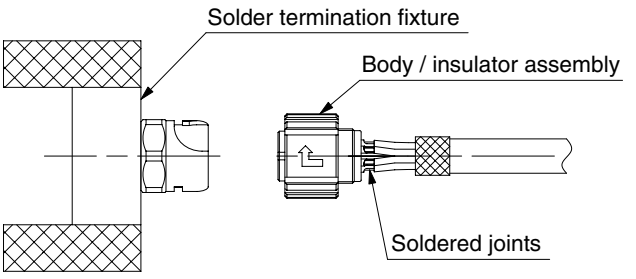
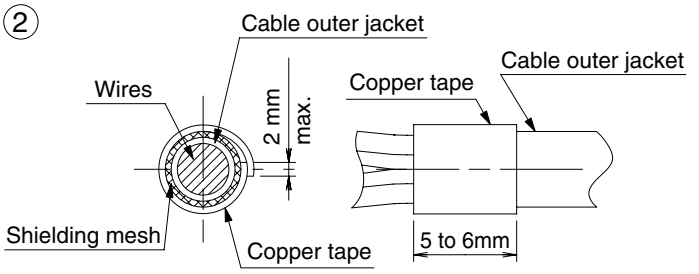
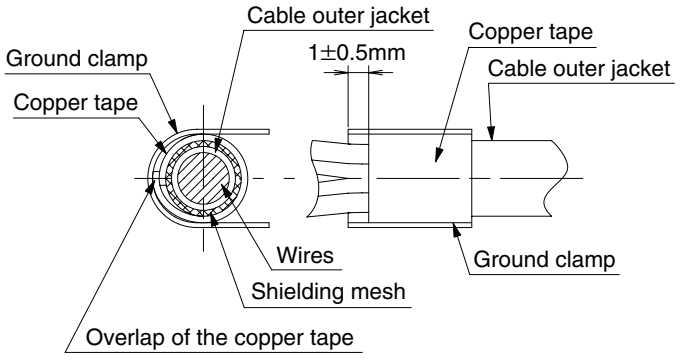
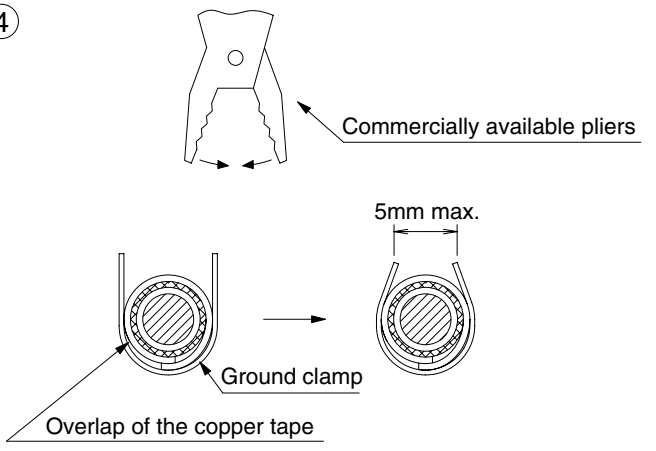
Note 1: The contact configuration as viewed from the female mating side.
Note 2: The ▼ symbol indicates the mating guide position.
Note 3: Withstanding voltages are test voltage values.

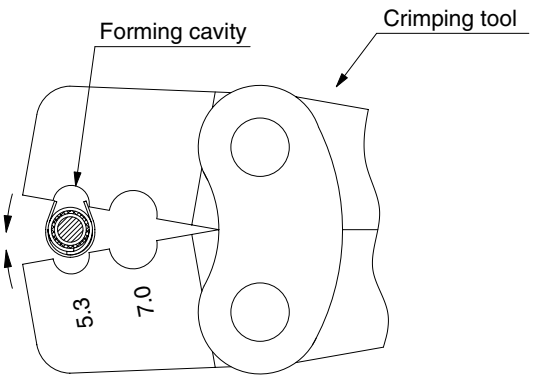
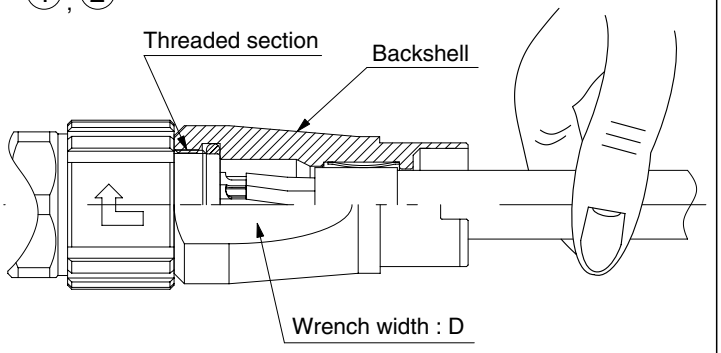
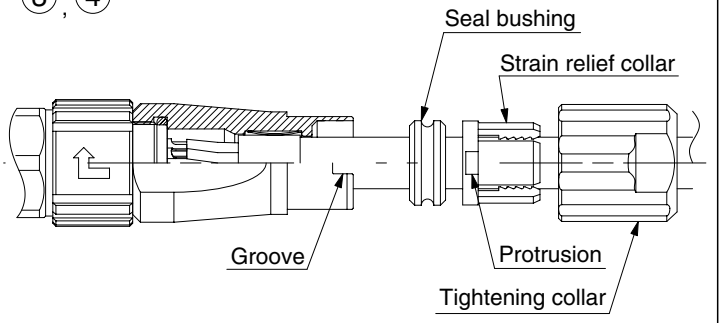
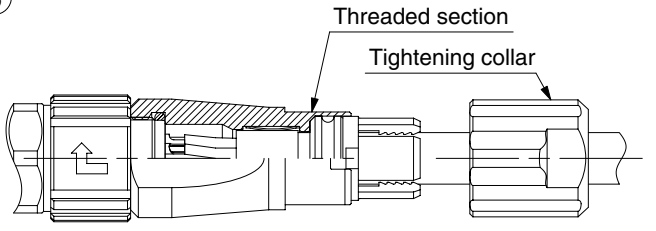
■Termination and Assembly Instructions

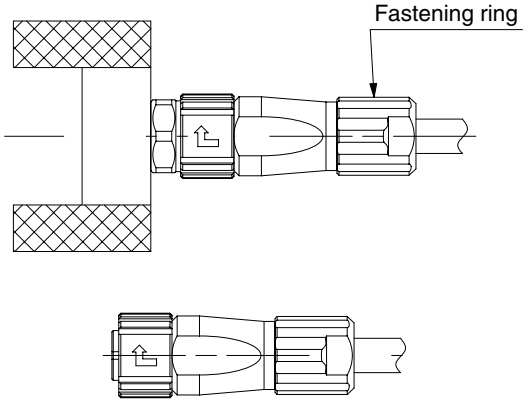
No.	Illustration	Operation
1	① 	**Plug disassembly** ① Insert the plug into securely held solder termination fixture as shown. Part No. / Application conector LF07BP-T01 / LF07WBP-** LF10BP-T01 / LF10WBP-**
	② 	② Loosen the backshell turning it counter clockwise and remove it from the body/ insulator assembly.
	① 	**Jack Disassembly** ① Insert the jack into the securely held solder termination fixture as shown. Part No. / Application conector LF07BJ-T01 / LF07WBJ-** LF10BJ-T01 / LF10WBJ-**
	② 	② Loosen the backshell turning it counterclockwise.
2	① 	**Connector Assembly** ① Apply a coating of Loctite 7649 (Manufactured by Henckel Japan, Ltd,) primer to the threaded sections of the backshell and the tightening collar. Completely dry the coated surfaces. Note (1) Drying time at room temperature is approximately 30 to 70 seconds. (2) Ensure sufficient ventilation of the area at time of drying. (3) Take necessary steps to protect the coated surfaces from contamination.

No.	Illustration	Operation
2	②  	② Thread the tightening collar, strain relief collar, seal bushing and the backshell over the cable as illustrated.
3	①  Table 1. Stripping Dimensions Number of Conductors / A mm 3, 6 / 8 to 9 4 / 13 to 14 12 / 14 to 15	Cable preparation ① Strip the cable's outer jacket to the dimensions illustrated in the table 1. Note (1) Exercise caution not to damage the shielding mesh. (2) Any damage to the cable's outer jacket may affect the waterproof performance of the assembled connector.
	②  	② Fold back the shielding mesh over the cable's outer jacket assuring that it is uniform on its diameter.
	③  Table 2. Stripping Dimensions Number of Conductors / B mm 3 / 2.5±0.5 6 / 2±0.5 4 / 3±0.5 12 / 2±0.5	③ Strip the wires to the dimensions illustrated in the Table 2. Note When stripping the wires exercise caution not to damage it's insulation, folded over shielding mesh or cable's outer jacket.

No.	Illustration	Operation
4		**Soldering** ① Soldering conditions Soldering iron tip temperature: 350±10℃ Soldering time: within 5 sec. Note (1) Assure that the solder compound is sufficiently melted on the soldering iron tip. (2) When applying, make sure that the solder will flow correctly at all the contact surfaces between the conductor and the contact.
	② – 1  	② – 1 6, 12 Conductors (1) Place a 4 mm length of heat-shrink tubing (inside diameter of 1.1 mm min.) over every other wire. (2) Perform the soldering of the contact and the conductor, with the wire's insulation touching the contact as shown. (3) After soldering, slide the heat shrink tubing over the soldered joint and shrink it. The tubing should touch the insulator as shown.
	② – 2  	② – 2 3, 4 Conductors (1) Perform the soldering of the contact and the conductor, with the wire's insulation touching the contact as illustrated. (2) When soldering, to maintain the insulation between adjacent contacts. Make sure that the wire's insulation remains below the edge of the insulator's wall 0.5 mm min., as illustrated.
	③  Table 3. Wire Dimensions Number of Conductors / C mm 3 / 6 to 7 6 4 / 10 to 14 12	③ After the soldering, keep a distance of 6 to 7mm between the contact end and the cable's outer jacket as illustrated. Note The distance of 6 to 7 mm is required in order to assure correct assembly of the backshell.

No.	Illustration	Operation
5	① 	**Crimping of the Ground Clamp** ① After completion of the soldering operations carefully remove (holding on the locking collar) the body/insulator assembly from the solder termination fixture. Note Exercise caution not to damage or deform the solder joints.
	② 	② Wrap the folded over shielding mesh with 5 to 6 mm wide copper tape to assure that it will not become loose. Apply the copper tape so that the shielding mesh does not protrude from under it. Note After wrapping the copper tape, the tape should overlap itself by 2 mm max.
	③ 	③ Insert the “U” shaped ground clamp over the copper tape as shown on the illustration. It is critical that the overlap of the copper tape is located inside the ground clamp as shown on the illustration. Note When the end of the copper tape wrapping is positioned at the open side of the ground fitting, the end portion of the copper tape wrapping will no longer be covered by the ground fitting when the ground fitting is crimped.
	④ 	④ Using commercially available pliers bend the open ends of the ground clamp as illustrated, assuring that it stays in place. The dimension of 5 mm max. between opposing edges of the ground clamp is necessary to assure correct final crimp.

No.	Illustration	Operation
5	⑤  	⑤ Both sides of the ground clamp must be placed in the forming cavity of the tool (as shown on the illustration) and crimped over the cable by closing the tool completely. Crimping tool / Forming cavity / Applicable cable diameter / Ground clamp diameter after crimping HR10A-TC-02: 5.3 / 5mm / 5.3mm to 5.5mm 7.0 / — / — LF-TC-01: 7.9 / 7.3mm / 7.9mm to 8.1mm 9.1 / — / —
6	①, ②  Table 5 Shell size / Tightening torque / Wrench width LF07 / 1N·m~1.5N·m / 10mm LF10 / 1N·m~1.5N·m / 13mm	**Connector Assembly** ① Place the body/insulator assembly in the applicable solder termination fixture. For plug assembly: LF07BP-T01 For jack assembly: LF07BJ-T01 ② Coat the thread section of the body/insulator assembly with Loctite 271 compound (manufactured by Henckel Japan, Ltd.) or equivalent, tightening it with a torque illustrated in the table 5. Note It is critical that the cable itself will not turn or twist during this operation.
	③, ④  	③ Slide forward the seal bushing and insert it in the backshell until fully seated. ④ Slide forward the strain relief collar and insert it in the backshell, making sure that the opposing protrusions fit inside the corresponding grooves, as shown on the illustration. Note It is critical that the protrusions are inside the corresponding grooves.
	⑤  	⑤ Verify that the Locktite 7649 primer (or equivalent) on the threaded sections of the backshell and tightening collar are dry. Apply the Locktite 271 compound to the tightening collar's threaded section and attach it to the backshell. The tightening torque must be 0.8 N·m to 0.9 N·m.

No.	Illustration	Operation
6	⑥  	⑥ Remove the connector from the solder termination fixture, holding it by the locking collar. Do not pull on the cable. Shell size / Tightening torque / Wrench width LF07 / 0.8N·m～1N·m / 10mm LF10 / 0.7N·m～1N·m / 13mm
7		Waterproof Performance Check After the connector assembly has been completed, apply air pressure of 17.6 k Pa for 30 seconds from the mating side of the connector. Check that air bubbles do not leak from the inside of the connector.

■Cable Specifications (Reference)

No. of contact		3 pos.	4 pos.	6 pos.	12 pos.
Conductor	Material	Soft copper wire	Soft copper wire	Soft copper wire	Soft copper wire
	Size (mm)	ϕ0.18	ϕ0.26	ϕ0.16	ϕ0.16
	Construction	10 /ϕ0.18 mm dia.	20 /ϕ0.26 mm dia.	7 /ϕ0.16 mm dia.	7 /ϕ0.16 mm dia.
	Size (AWG)	AWG #20	AWG #16	AWG #26	AWG #26
	Sectional area	————	1.25	————	0.14
	Diameter (mm)	ϕ0.98	ϕ1.5	ϕ0.48	ϕ0.48
Insulator	Diameter (mm)	ϕ1.5 (Standard)	ϕ2.1 (Standard)	ϕ0.88 (Standard)	ϕ0.9 (Standard)
	Thickness (mm)	0.26	0.3	0.2	0.21
	Material	Flexible polyvinyl chloride	Flexible polyvinyl chloride	Flexible polyvinyl chloride	Flexible polyvinyl chloride
	Color	White, yellow, orange	White, yellow, orange, blue	Brown, red, orange, yellow, green, blue	White, yellow, orange, blue, green, red, brown, black, grey, pink, purple, skyblue
Twist	Diameter (mm)	ϕ3.2	ϕ5.1	ϕ2.6	ϕ3.8
	Tape	Japanese paper tape	Japanese paper tape	Japanese paper tape	Japanese paper tape
Shield	Material	Soft copper wire	Soft copper wire	Soft copper wire	Soft copper wire
	Size (mm)	ϕ0.1	ϕ0.1	ϕ0.18	ϕ0.1
	Density	85%	80%	85%	80%
	Diameter (mm)	ϕ3.6	ϕ5.5	ϕ3.4	ϕ4.2
Jacket	Diameter (mm)	ϕ5±0.2	ϕ7.3±0.2	ϕ5±0.2	ϕ7.3±0.2
	Thickness (mm)	0.65	0.9	0.7	1.5
	Material	Flexible polyvinyl chloride	Flexible polyvinyl chloride	Flexible polyvinyl chloride	Flexible polyvinyl chloride
	Color	Matte-black	Matte-black	Matte-black	Matte-black
Characteristic	Conductor resistance	42Ω /km max. at 20℃	15Ω /km max. at 20℃	143Ω /km max. at 20℃	150Ω /km max. at 20℃
	Insulation resistance	10MΩ·km min.	5MΩ·km min.	5MΩ·km min.	5MΩ·km min.
	Withstanding voltage	1000V AC / One minute	1000V AC / One minute	500V AC / One minute	500V AC / One minute
	Remarks	UL	UL	UL	UL

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