

Ethernet Connection System Selection and Application Guidelines

1 Ethernet Connection System Overview

Ethernet Connection System offers an easy system which integrates RJ-45, USB, RJ11 or other network data ports into a standard circular connector to improve reliability, environment-resistance, and vibration and shock resistance of network transmission, also with other benefits such as quick connection, mounting and cabling. The system is especially applicable for data transmission between networks, network and PC, PC and digital equipments under harsh environment.

Ethernet Connection System includes RJ-45, USB and RJ11 electrical connectors which are generally designated as FB Series connectors.

RJ-45 electrical connectors are applied in Class D Ethernet/Cat.5e connection (10 Base T, 100 Base TX, 1000 Base T networks) under harsh environment.

USB electrical connectors are applied in standard USB2.0 connection under harsh environment.

RJ11 electrical connectors are applied in telephone ports connection under harsh environment to realize sound signal transmission.

RJ-45 and RJ11 electrical connectors use bayonet coupling; USB electrical connectors use tri-start thread coupling and bayonet coupling. Receptacles have termination and adaptation types, in which termination type has many styles such as straight PCB soldering, right angle PCB soldering, wire soldering and crimping.

2 Main Configuration Features

Coupling methods: tri-start thread coupling and bayonet coupling.

Build in RJ45, USB, RJ11 or 1394 port as required.

Termination types: wire soldering, crimping and PCB soldering.

Receptacles have termination and adaptation types, in which adaptation type has single bayonet (single thread) and double-bayonet.

Contact is gold plated.

Interface mounting dimensions are compliant with MIL-C-26482(R253) and R255

Characteristic parameters are compliant with R253 and TIA/EIA-568.

3 Electrical Connectors Selection Guidelines

1) FB Series connectors (RJ45、RJ11)

(1) Applicable for data transmission between networks under harsh environment.

(2) Mounting dimensions are compliant with 15# shell size of R255 and compatible with 14#

shell size of MIL-C-26482.

(3) Class F (electroless nickel)——conductive shells with EMI protection function; Class B(cadmium plating)——corrosion resistance shells; Class E(stainless steel passivation)——shells resistant to harsh environment

2) FB Series connectors (USB、1394)

(1) Applicable for data transmission between network and PC, PC and digital equipments under harsh environment.

(2) Mounting dimensions are compliant with 13# shell size of R255

(3) Class F (electroless nickel)——conductive shells with EMI protection function; Class B(cadmium plating)——corrosion resistance shells; Class E(stainless steel passivation)——shells resistant to harsh environment

3) Metallic dust covers shall be ordered separately.

4 Ethernet Connection System Selections

Product brief introduction

- Build in RJ-45, USB, RJ11 or other network data ports into a standard circular connector
- Coupling methods: tri-start thread coupling and bayonet coupling.
- Main and minor guide keyways with anti-mismatching function
- High reliability, environment resistance, vibration and shock resistance
- IP68 water protection degree after plug and receptacle mating achieves IP68
- Applicable for data transmission between Ethernets, Ethernets and PC, PC and digital devices in harsh environment.
- Applied enterprise standard: Q/21EJ776



Main technical performances

[Mechanical] —Vibration: 10~

2000Hz, acceleration 147 m/s²

—Shock: 490m/s²

—Durability: 500 cycles —Transmission: RJ-45
attenuation: 0.3dB(100MHz)

[Environmental]

—Operating temperature: -55℃~+125℃

—RH: 40±2℃ 90%~95%

—Corrosion resistance: 48h (Class F) / 500h (Class B)

1000h (Class E)

[Electrical]

	Voltage rating	Current rating	Contact resistance (normal)	Voltage withstanding	attenuation	Insulation resistance (normal temperature)	crosstalk	characteristic impedance	transmission data rate
RJ-45	150V	1.5A	≤0.02Ω	1000V	0.3dB (100MHz)	≥5000MΩ	40dB(100MHz)	100Ω	1000Mbps
USB	30V	1A	≤0.03Ω	500V	USB meets requirements in standard USB2.0				



Part number designation

[Connector designation]

Series	FB	1	10	F	01	S1	-01
Coupling method	1 –bayonet coupling 3 –tri start threads						
Connector type	10 –straight plug 20 –flange mounting receptacle 21 –single bayonet/single thread coupling flange mounting adaptor 22 –double bayonets coupling flange mounting adaptor 23 –nut mounting receptacle 24 –single bayonet/single thread coupling nut mounting adaptor						
Finishes	F –electroless nickel plating B –cadmium plating E –stainless steel passivation						
Build-in interface style	01 – RJ-45 02 – USB type A 05 – RJ11						
Types of termination	B –straight PCB soldering W –right angle PCB soldering S1 –wire soldering none-crimp						
Backshell types	01 –with straight spring protection wire sealing backshell 02 –with straight heat shrink tube sealing backshell none-without backshell						

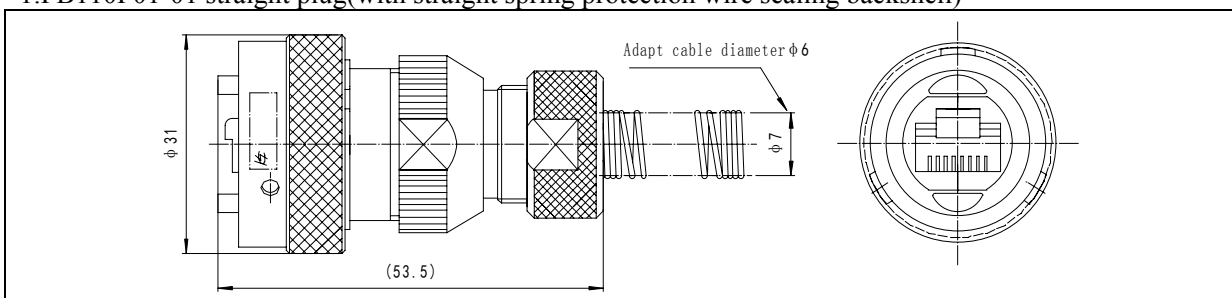
[Metallic dust cover designation] (ordered separately)

Series	FB	1	1	F	01	- L	- O
Coupling style	1 –bayonet coupling 3 –tri start threads						
Dust cover types	1 –plug dust cover 2 –receptacle dust cover						
Finishes	F –electroless nickel plating B –cadmium plating E –stainless steel passivation						
Build-in interface style	01 – RJ-45 02 – USB type A						
Chain types	L –metallic chain none-nylon rope						
mounting style	O –fixed ring none-fixed hole						

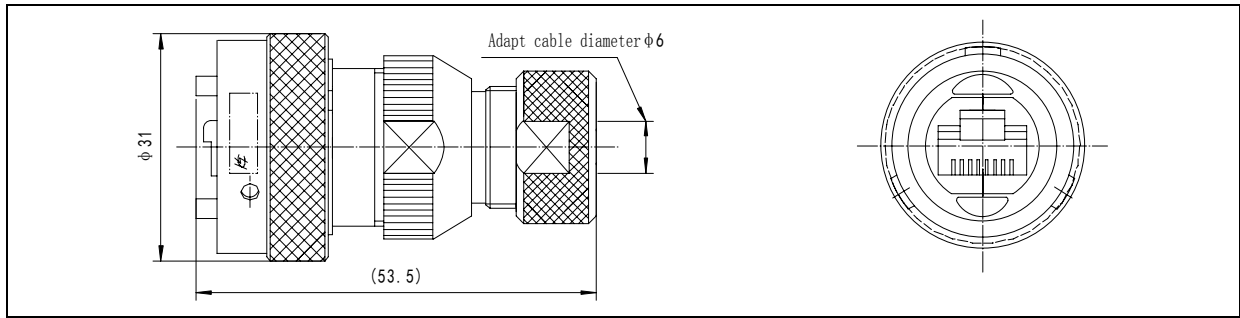
Outline dimensions (Part numbers below are exemplified by F class finish)

[RJ-45 bayonet coupling electrical connector]

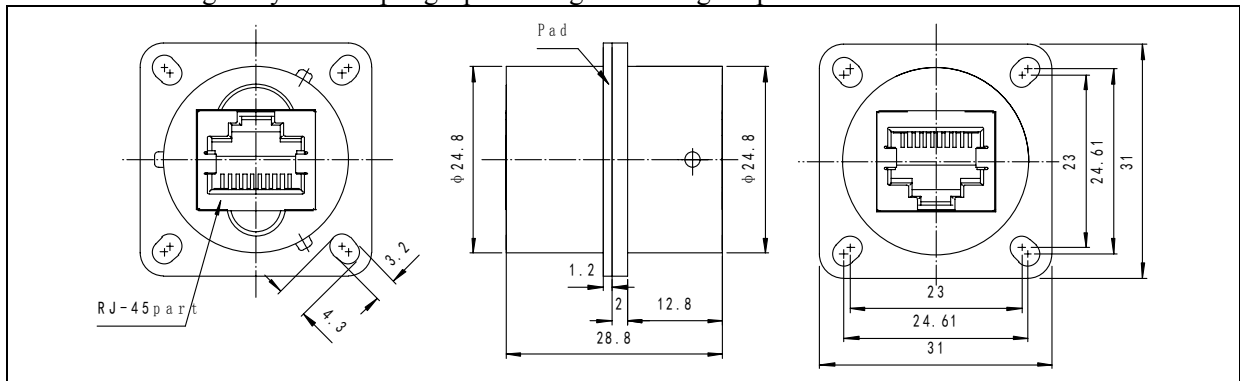
1.FB110F01-01 straight plug(with straight spring protection wire sealing backshell)



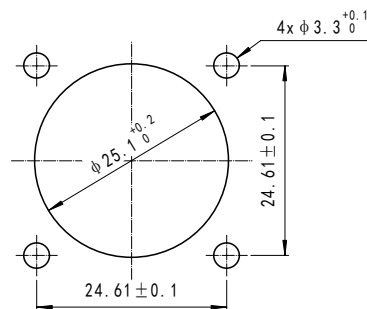
2.FB110F01-02 straight plug(with straight heat shrink tube sealing backshell)



3.FB121F01 single bayonet coupling square flange mounting adaptor

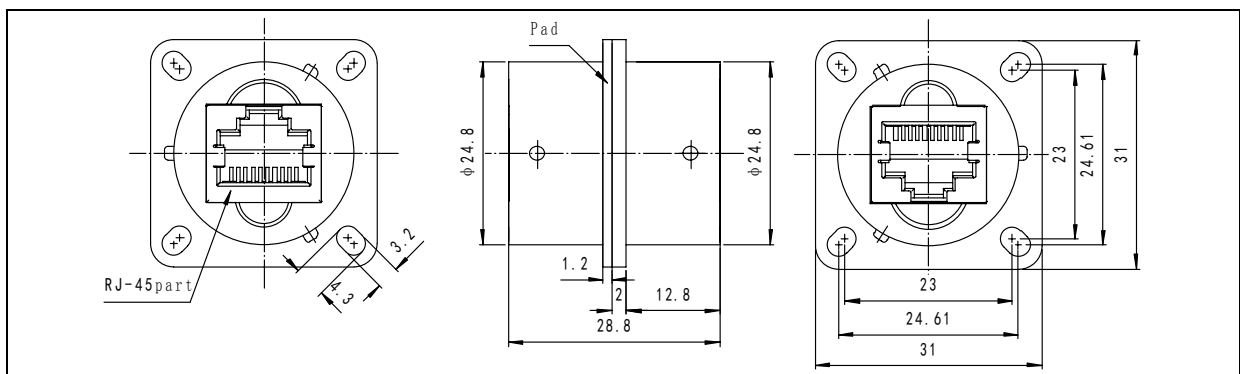


Recommended panel cutout

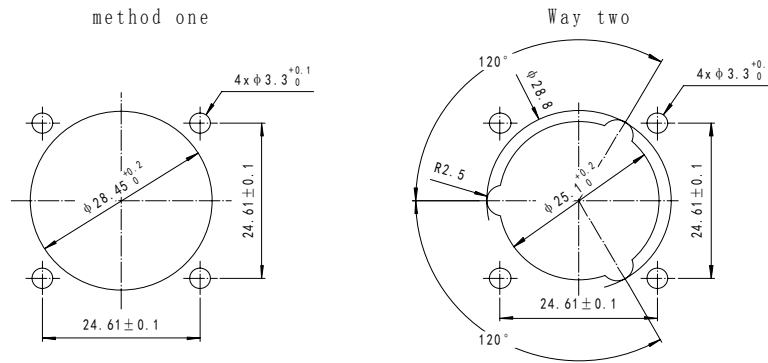


Note: right end of the receptacle connects with FB Series plug or crystal head cable assembly, left end with crystal head cable assembly (see the figure above)
Caution: This type receptacle mating with uncrimped crystal plug is strictly prohibited to protect RJ-45 hardware in receptacle.

4.FB122F01 double bayonets coupling square flange mounting adaptor

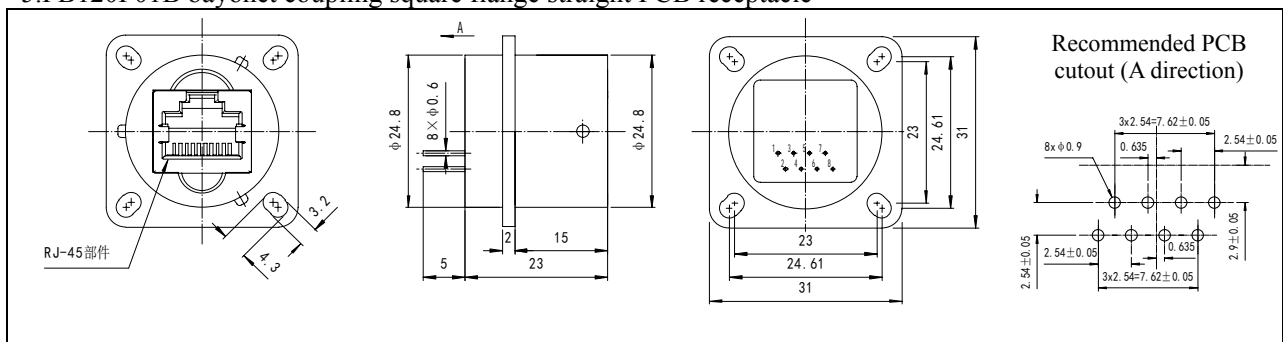


Recommended panel cutout



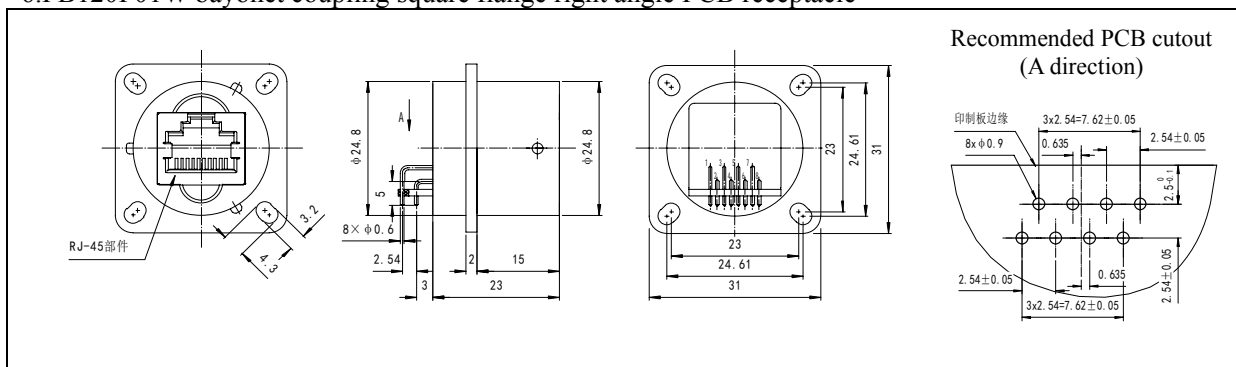
Note: each end of the receptacle connects with FB Series plug or crystal head cable assembly
Caution: This type receptacle mating with uncrimped crystal plug is strictly prohibited to protect RJ-45 hardware in receptacle.

5.FB120F01B bayonet coupling square flange straight PCB receptacle



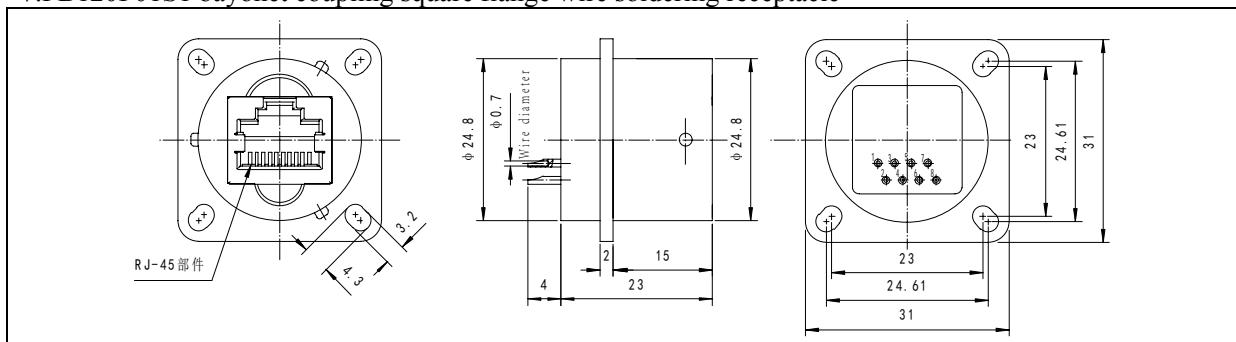
Caution: This type receptacle mating with uncrimped crystal plug is strictly prohibited to protect RJ-45 hardware in receptacle.

6.FB120F01W bayonet coupling square flange right angle PCB receptacle



Caution: This type receptacle mating with uncrimped crystal plug is strictly prohibited to protect RJ-45 hardware in receptacle.

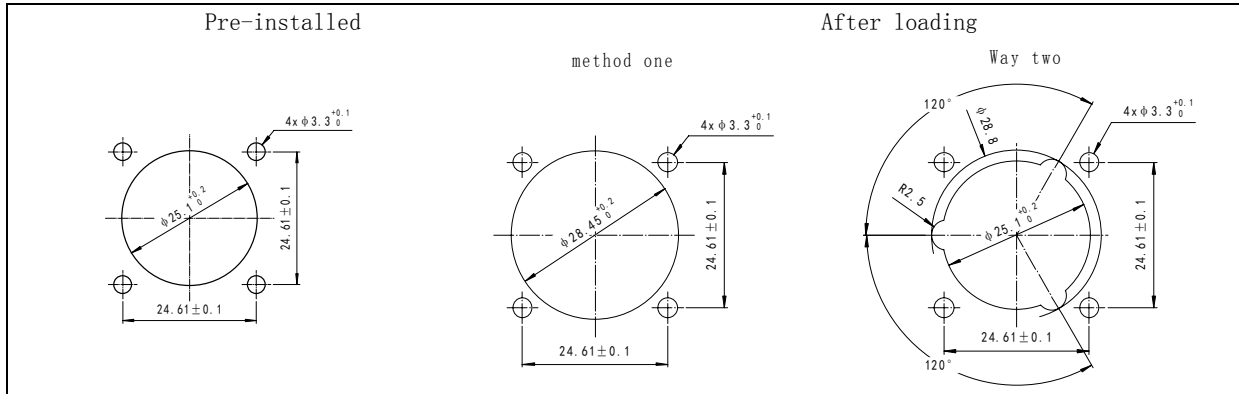
7.FB120F01S1 bayonet coupling square flange wire soldering receptacle



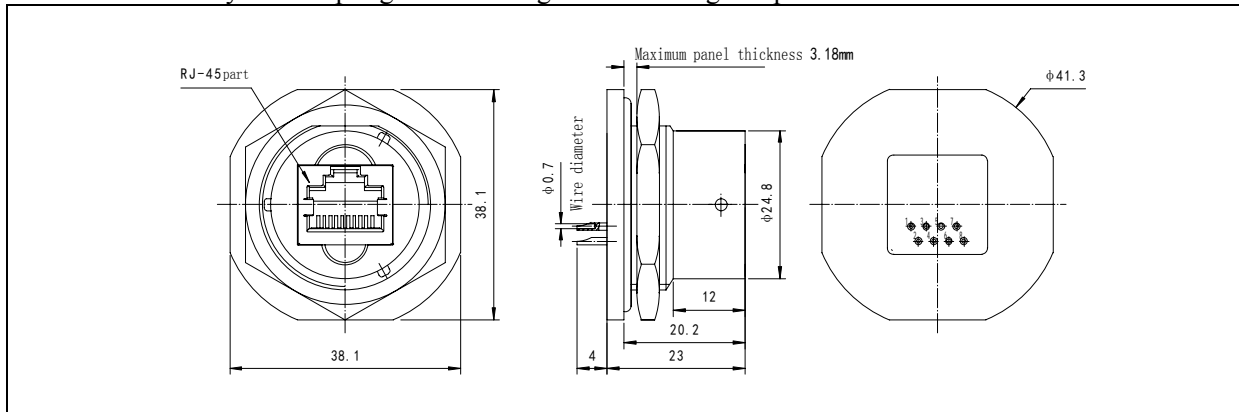


Caution: This type receptacle mating with uncrimped crystal plug is strictly prohibited to protect RJ-45 hardware in receptacle.

Square flange mounting receptacle recommended panel cutout

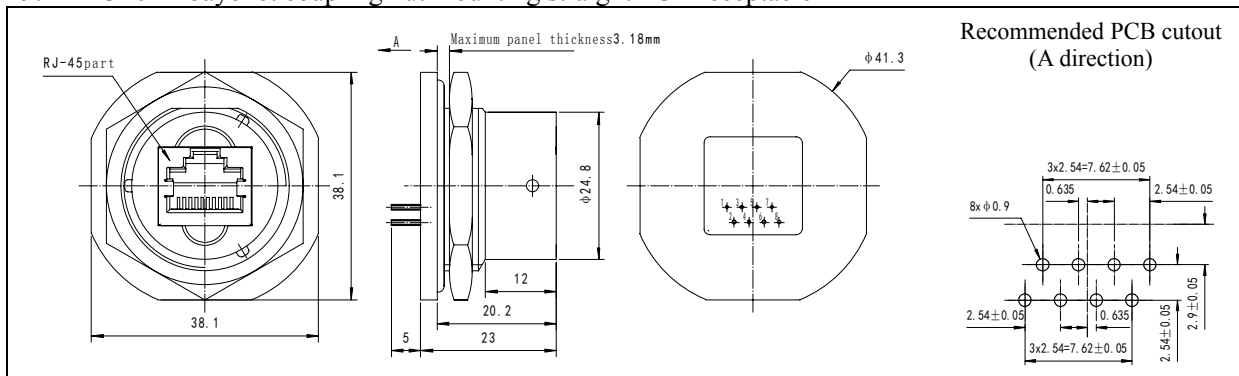


8.FB123F01S1 bayonet coupling nut mounting wire soldering receptacle



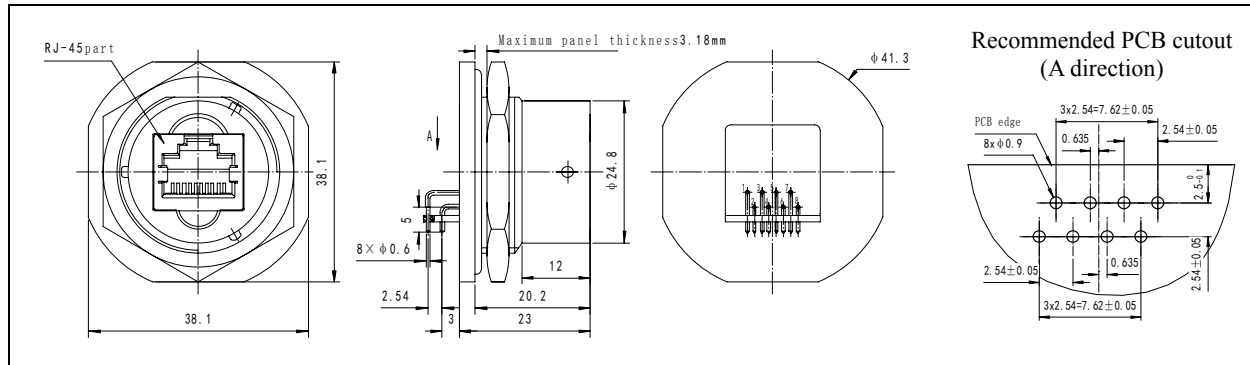
Caution: This type receptacle mating with uncrimped crystal plug is strictly prohibited to protect RJ-45 hardware in receptacle.

9.FB123F01B bayonet coupling nut mounting straight PCB receptacle



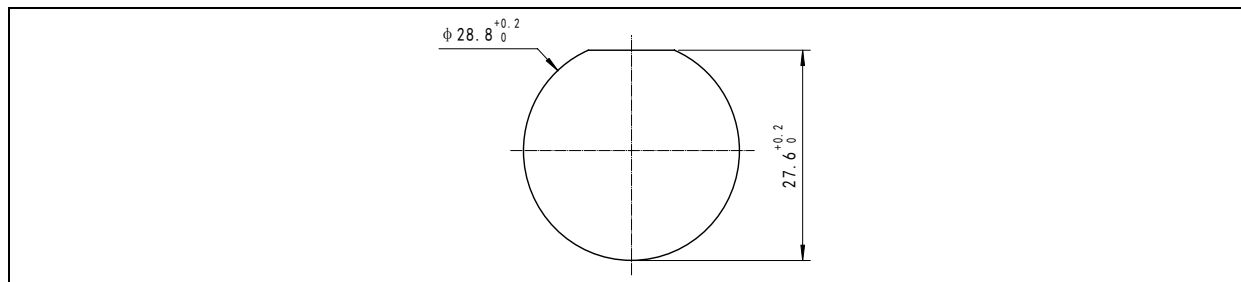
Caution: This type receptacle mating with uncrimped crystal plug is strictly prohibited to protect RJ-45 hardware in receptacle.

10.FB123F01W bayonet coupling nut mounting right angle PCB receptacle



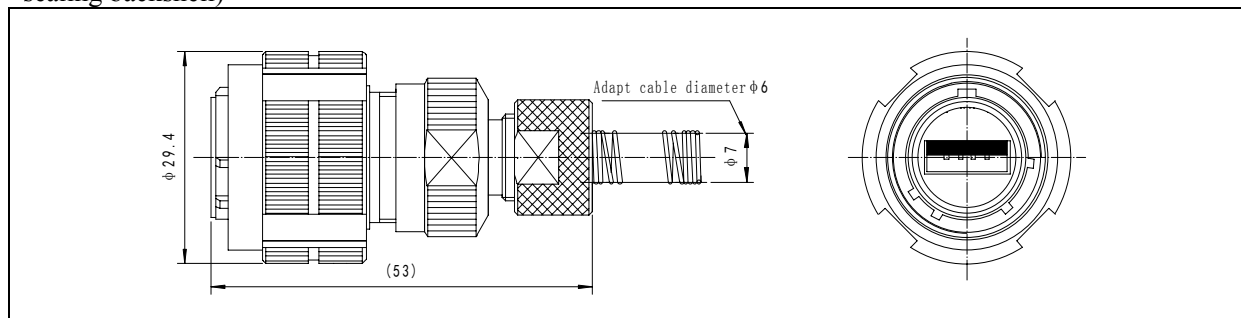
Caution: This type receptacle mating with uncrimped crystal plug is strictly prohibited to protect RJ-45 hardware in receptacle.

nut mounting receptacle recommended panel cutout

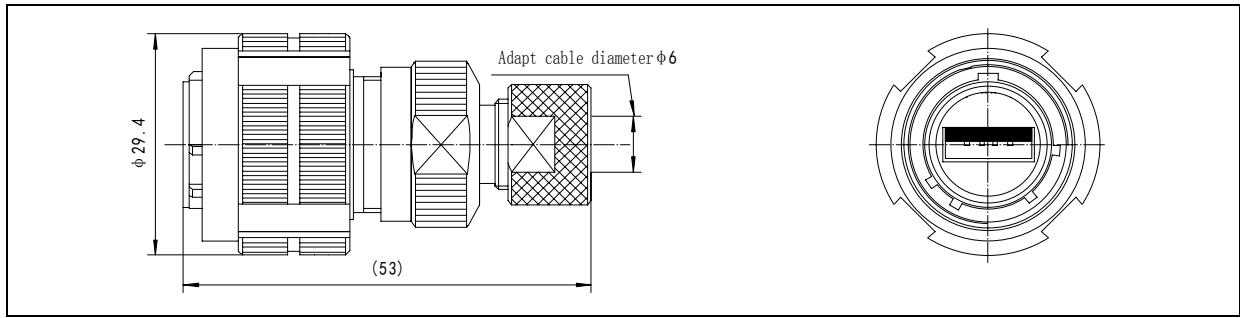


[USB tri start thread coupling electrical connectors]

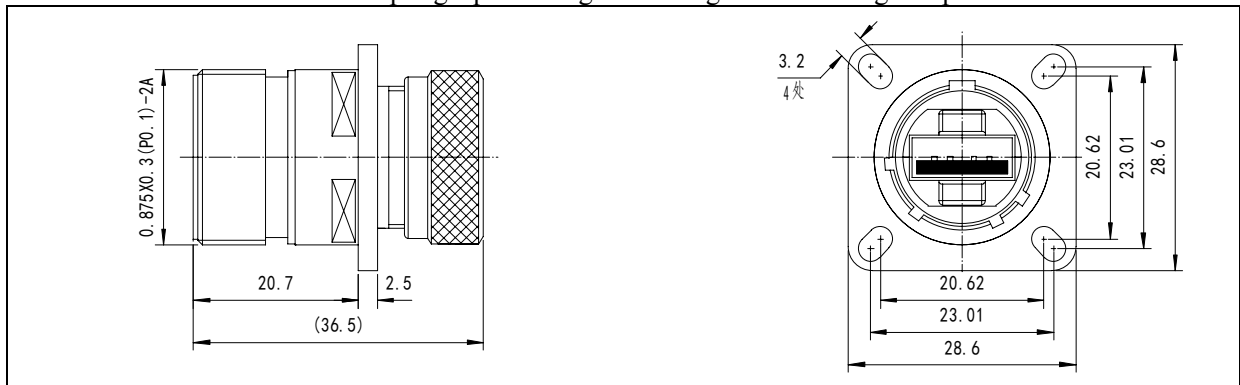
1.FB310F02S-01 tri start thread coupling wire soldering straight plug(with straight spring protection wire sealing backshell)



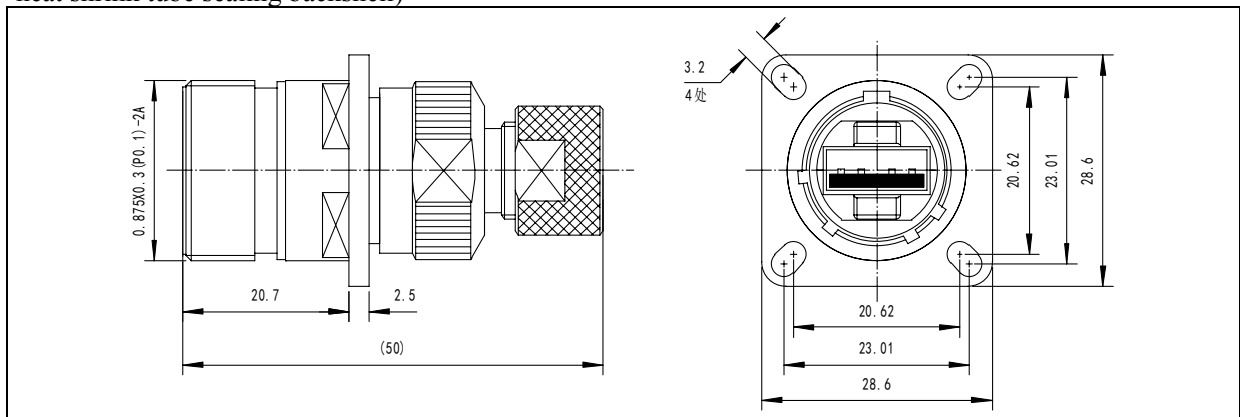
2.FB310F02S-02 tri start thread coupling wire soldering straight plug(with straight heat shrink tube sealing backshell)



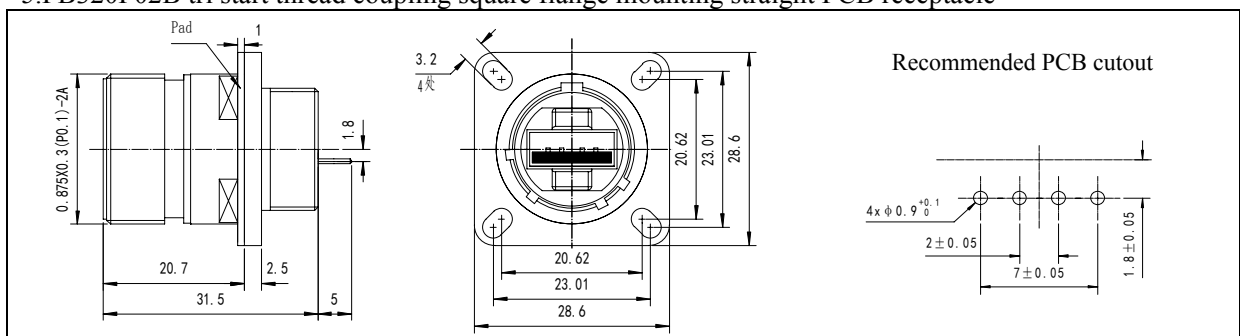
3.FB320F02S tri start thread coupling square flange mounting wire soldering receptacle



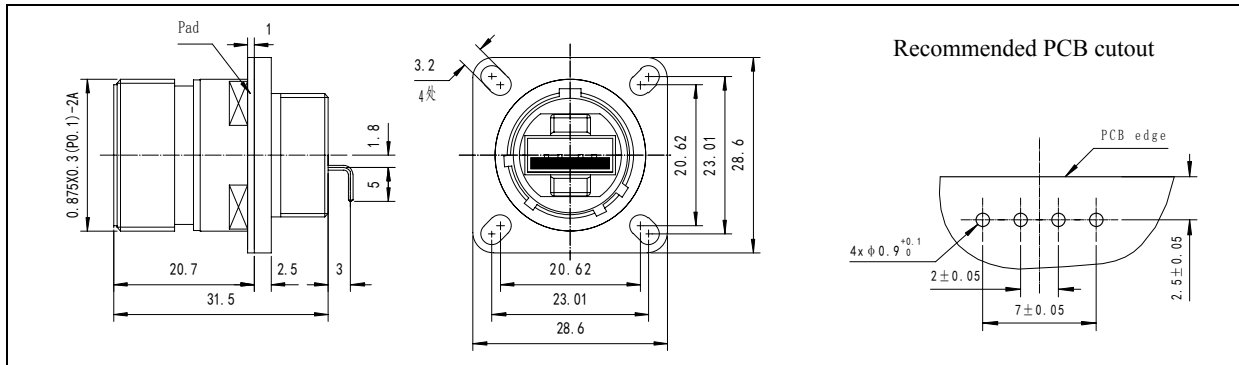
4.FB320F02S-02 tri start thread coupling square flange mounting wire soldering receptacle(with straight heat shrink tube sealing backshell)



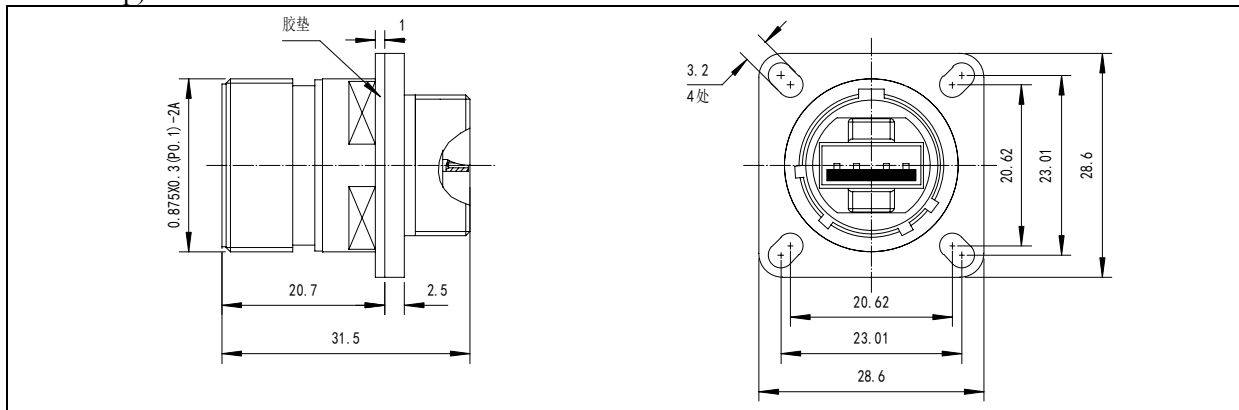
5.FB320F02B tri start thread coupling square flange mounting straight PCB receptacle



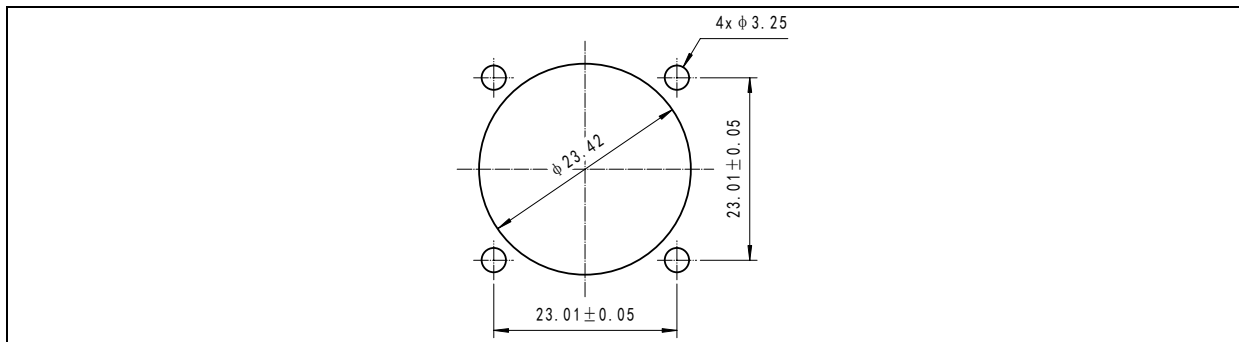
6.FB320F02W tri start thread coupling square flange mounting right angle PCB receptacle



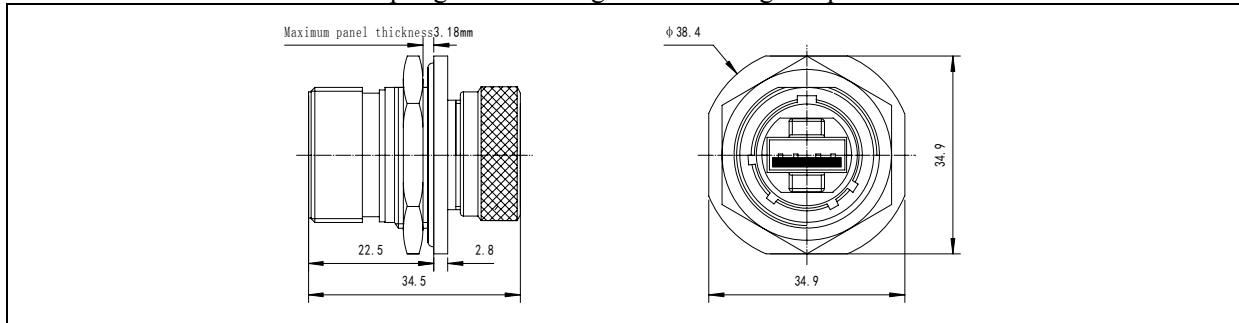
7.FB320F02S1 tri start thread coupling square flange mounting wire soldering receptacle(with adapted solder cup)



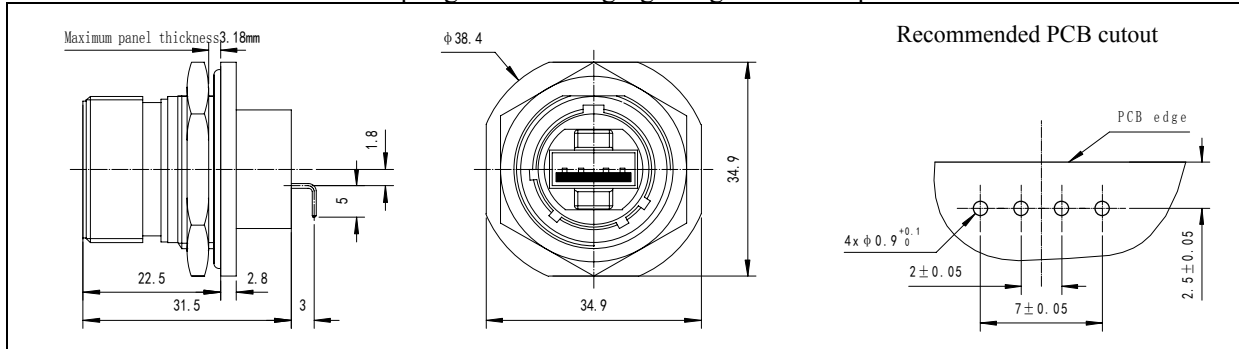
Tri start thread coupling square flange mounting receptacle recommended panel cutout



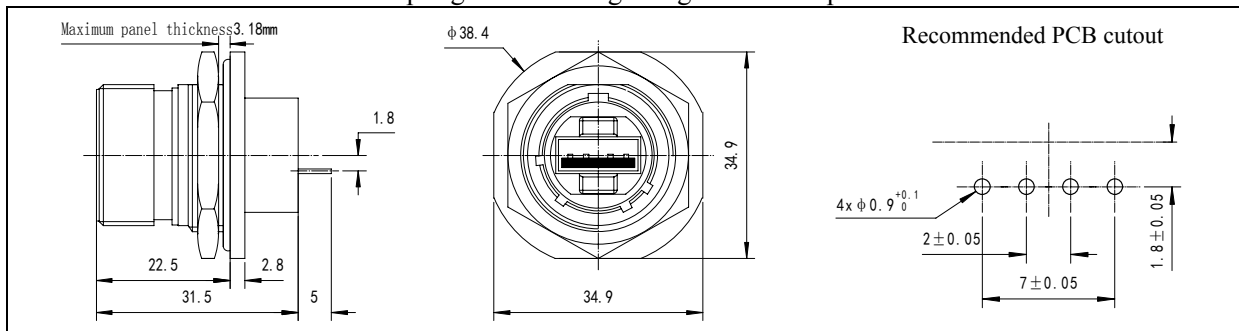
8.FB323F02S tri start thread coupling nut mounting wire soldering receptacle



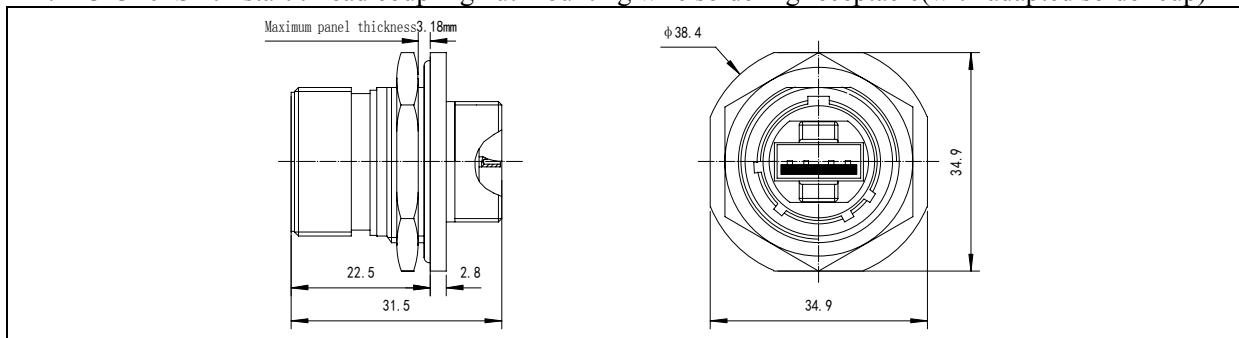
9.FB323F02W tri start thread coupling nut mounting right angle PCB receptacle



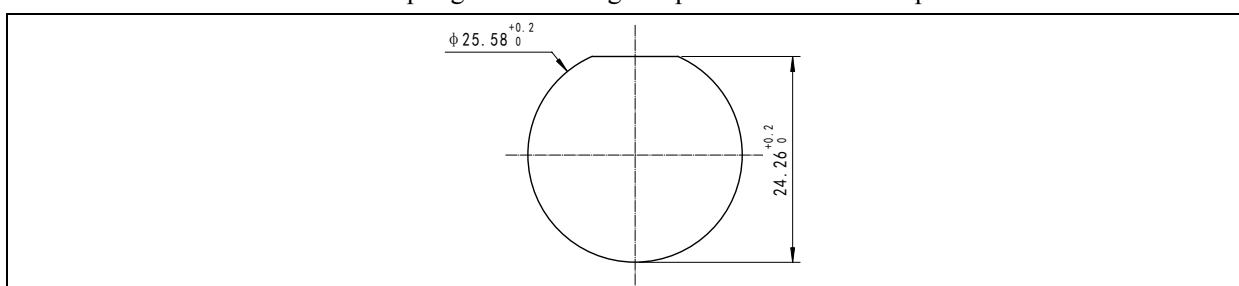
10.FB323F02B tri start thread coupling nut mounting straight PCB receptacle



11.FB323F02S1 tri start thread coupling nut mounting wire soldering receptacle(with adapted solder cup)

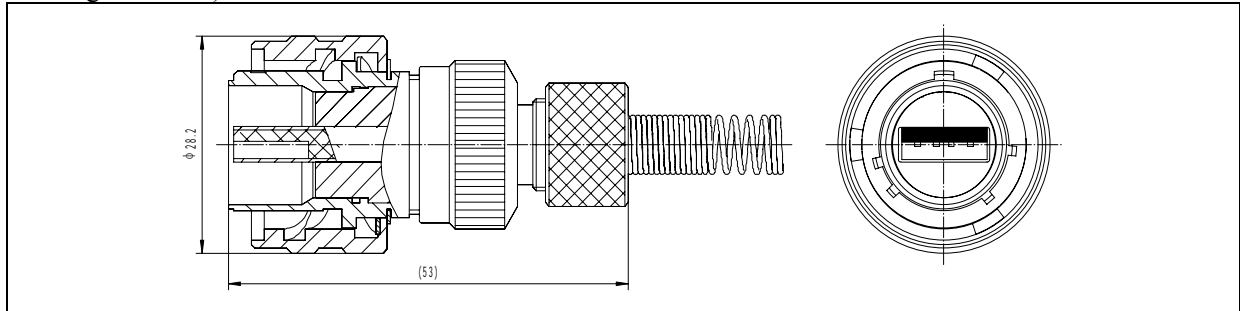


Tri start thread coupling nut mounting receptacle recommended panel cutout

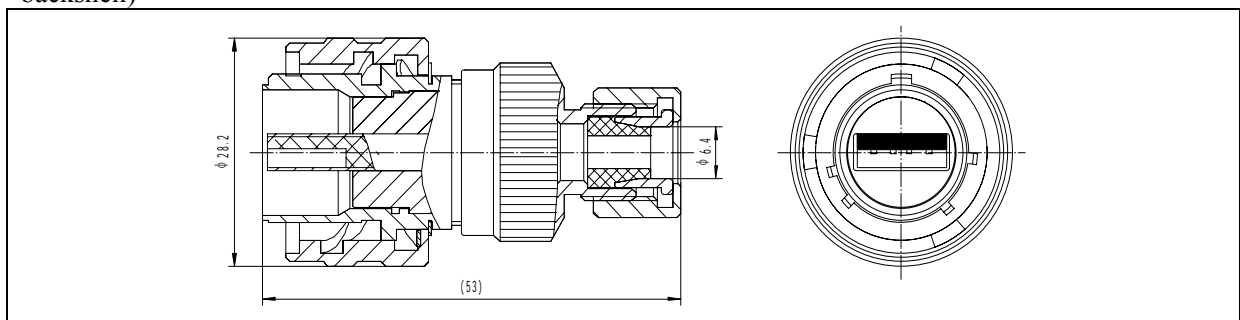


[USB bayonet coupling electrical connectors]

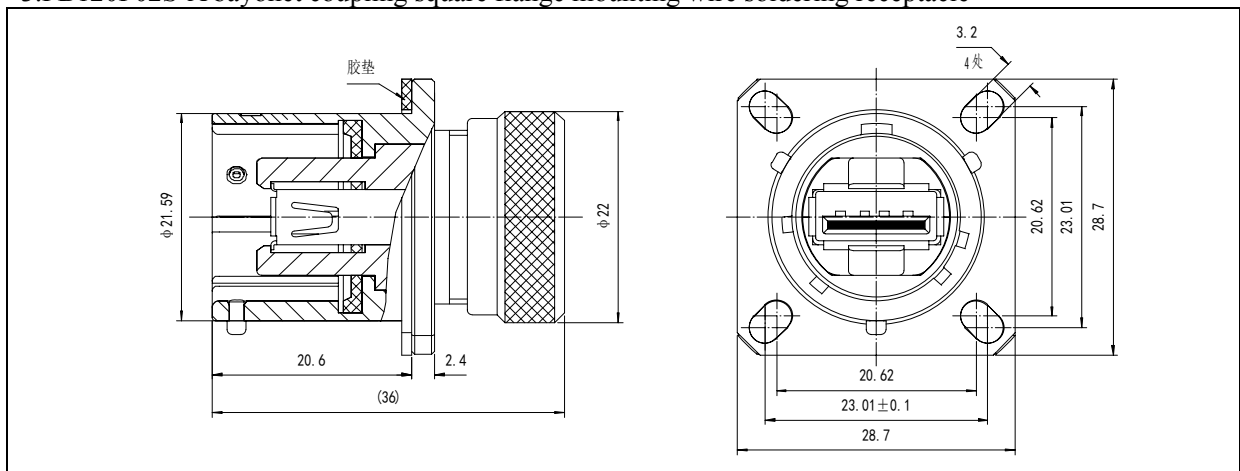
1.FB110F02S-01 bayonet coupling wire soldering straight plug(with straight spring protection wire sealing backshell)



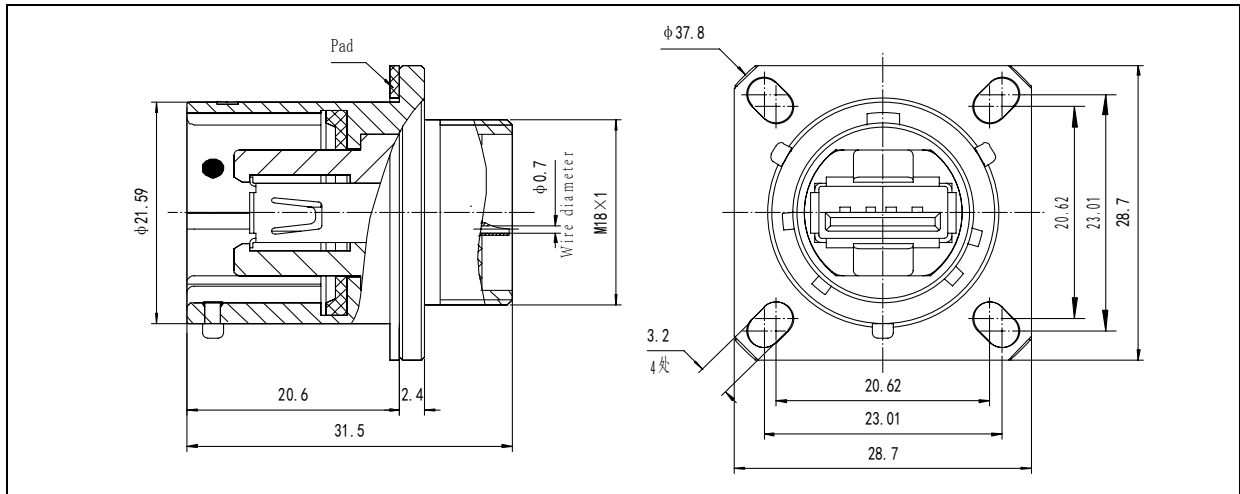
2.FB110F02S-02 bayonet coupling wire soldering straight plug(with straight heat shrink tube sealing backshell)



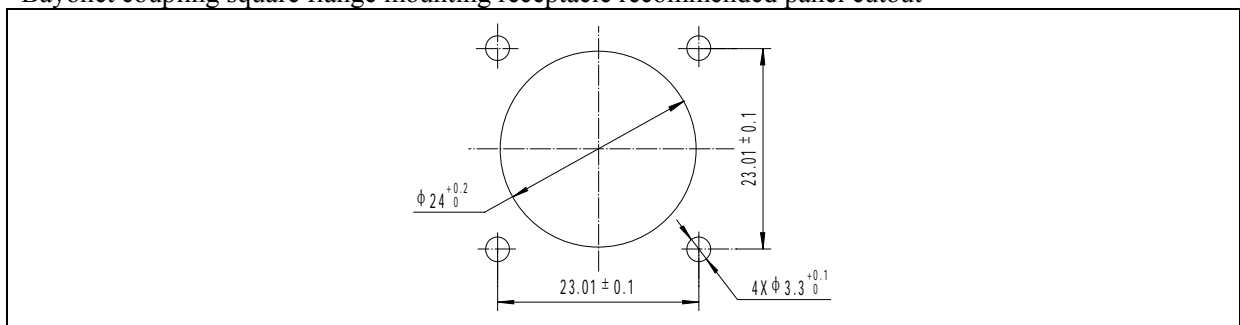
3.FB120F02S-A bayonet coupling square flange mounting wire soldering receptacle



4.FB120F02S1 bayonet coupling square flange mounting wire soldering receptacle
(with adapted solder cup)



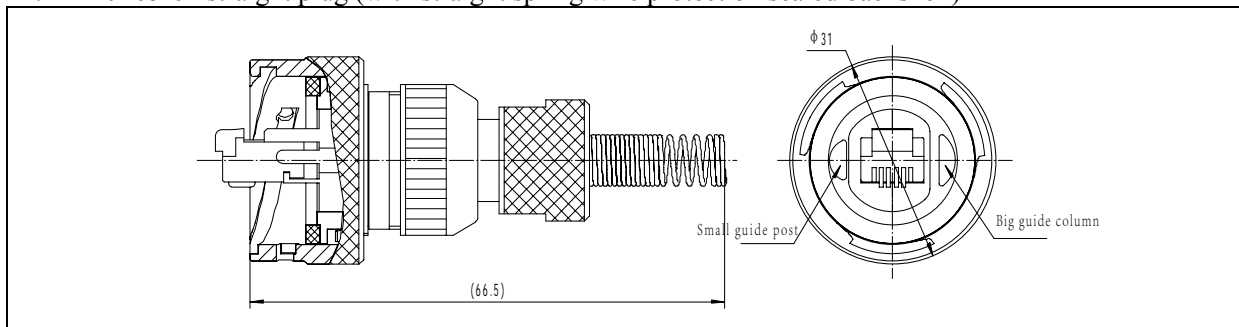
Bayonet coupling square flange mounting receptacle recommended panel cutout



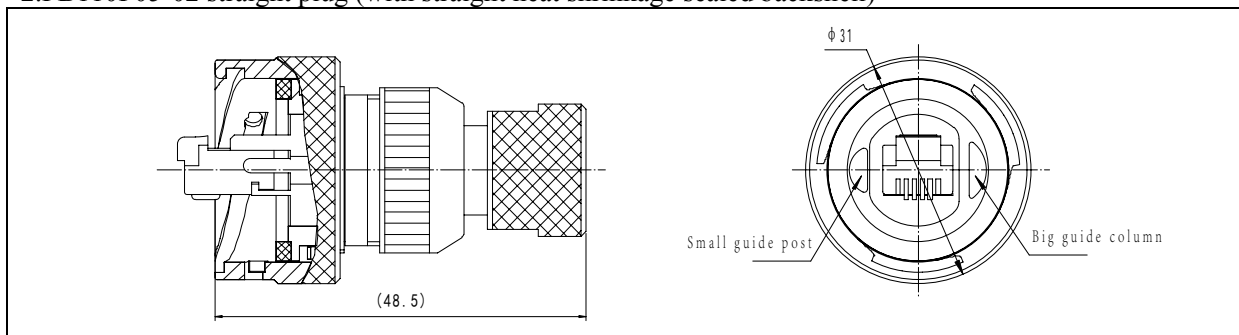


[RJ11 bayonet coupling connector]

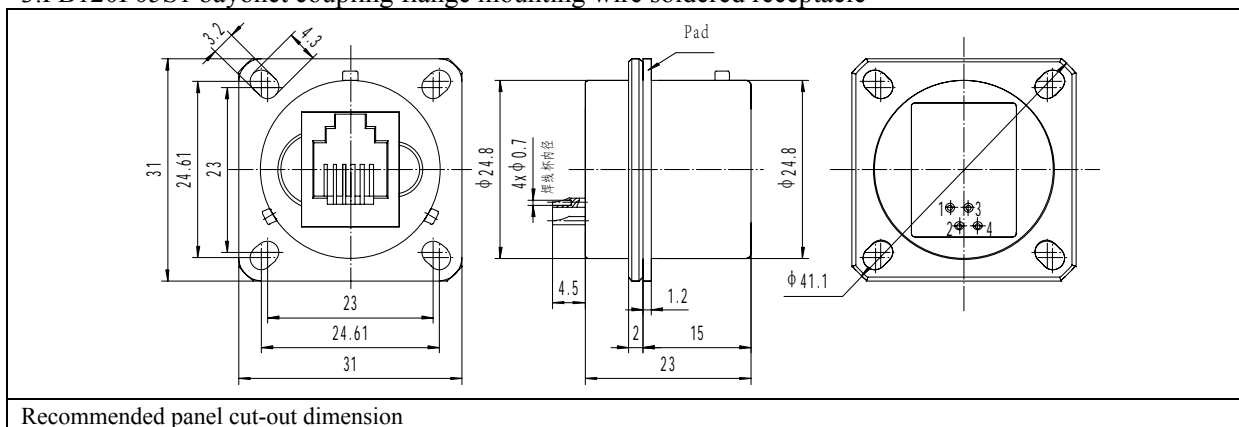
1.FB110F05-01 straight plug (with straight spring wire protection sealed backshell)



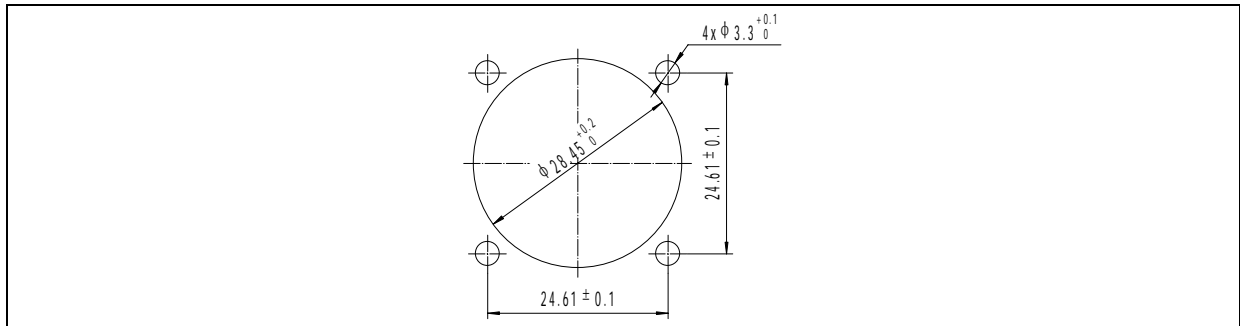
2.FB110F05-02 straight plug (with straight heat shrinkage sealed backshell)



3.FB120F05S1 bayonet coupling flange mounting wire soldered receptacle



Recommended panel cut-out dimension



Warning: Do not mate receptacle with crystal head without being crimped to wire in order to protect RJ11 in receptacle from damage!

[Metal dust cap]

1. Bayonet style (applicable to RJ-45)

Dust cap for plug		Dust cap for receptacle	
FB11F01-L	With fixed hole and stainless steel chain, the length of chain is 80mm	FB12F01-L	With fixed hole and stainless steel chain, the length of chain is 80mm
FB11F01-L-O	With fixed ring and stainless steel chain, the length of chain is 80mm	FB12F01-L-O	With fixed ring and stainless steel chain, the length of chain is 80mm
FB11F01	With fixed hole and nylon wire, the length of wire is 100mm	FB12F01	With fixed hole and nylon wire, the length of wire is 100mm
FB11F01-O	With fixed ring and nylon wire, the length of wire is 100mm	FB12F01-O	With fixed ring and nylon wire, the length of wire is 100mm

2. Three-start screw (applicable to USB)

Dust cap for plug	Dust cap for receptacle
-------------------	-------------------------



FB31F02-L	With fixed hole and stainless steel chain, the length of chain is 80mm	FB32F02-L	With fixed hole and stainless steel chain, the length of chain is 80mm
FB31F02-L-O	With fixed ring and stainless steel chain, the length of chain is 80mm	FB32F02-L-O	With fixed ring and stainless steel chain, the length of chain is 80mm
FB31F02	With fixed hole and nylon wire, the length of wire is 100mm	FB32F02	With fixed hole and nylon wire, the length of wire is 100mm
FB31F02-O	With fixed hole and nylon wire, the length of wire is 100mm	FB32F02-O	With fixed ring and nylon wire, the length of wire is 100mm

5 Notes on Ethernet connector

(1) Before being crimped to wire, the crystal head (crystal head in the plug or single crystal head) can not mate with receptacle

(2) Crimp with the special crimping tool according to the specified procedure during the crimp. 6.02 ± 0.13 mm should be assured after the crimp.

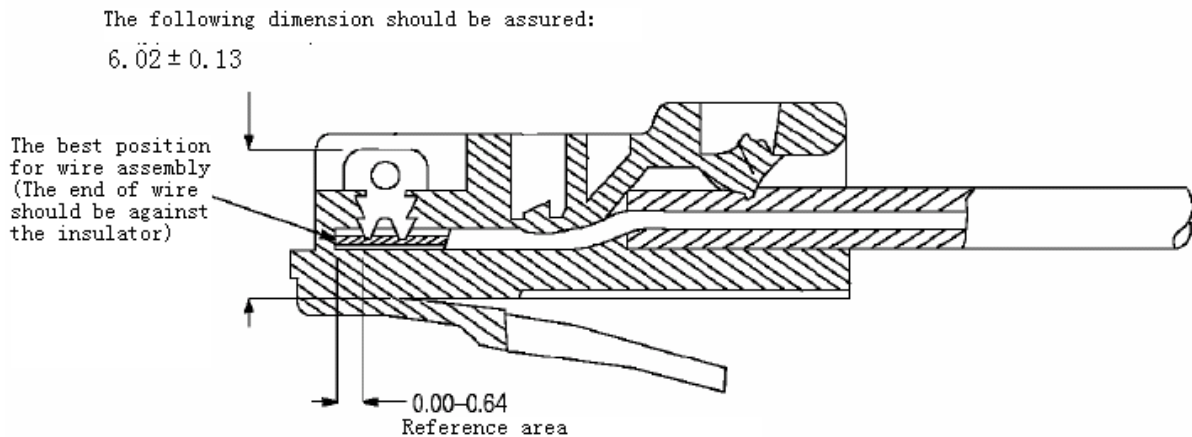


Figure 1 Diagram for crimping the crystal head

6 Maintenance and notes on Ethernet connector

(1) The Plug and receptacle should be maintained at a temperature of $-5 \sim 35^{\circ}\text{C}$, the relative humidity is not more than 80%. Product should be stored in the warehouse without acid, alkaline and corrosive gas. The storage period is 5 years;

(2) Before mating plug and receptacle, open the dust cap for plug and receptacle, wipe the plug, receptacle and inner cavity with the clean cloth. When there is no condensation and dirty, coupling can be made.

(3) When plug and receptacle is separated and not be used, dust cap should be worn.

(4) The service life should be 14 years and the warranty period should be 8 years

7 Operation instructions on Ethernet connector

1) Cat 5e network cable should pass through part 11 to part 5 (see the figure 2) and then be crimped in to part 1 crystal head with special tool. Refer to chapter 5 on crimp notes

2) Crimped crystal head should be assembled with part 3 and part 4 (see figure 3) and be installed between part 3 and part 4 (two half of circular metal block), then the assembly should be installed in part 2. At this time pay attention to the encase direction, one side of the grip of crystal head should be toward guided slot in part 2

3) After the assembly, tighten the back shell as shown in the following figure, which can clamp the cable, meet the requirement of seal and complete the product assembly

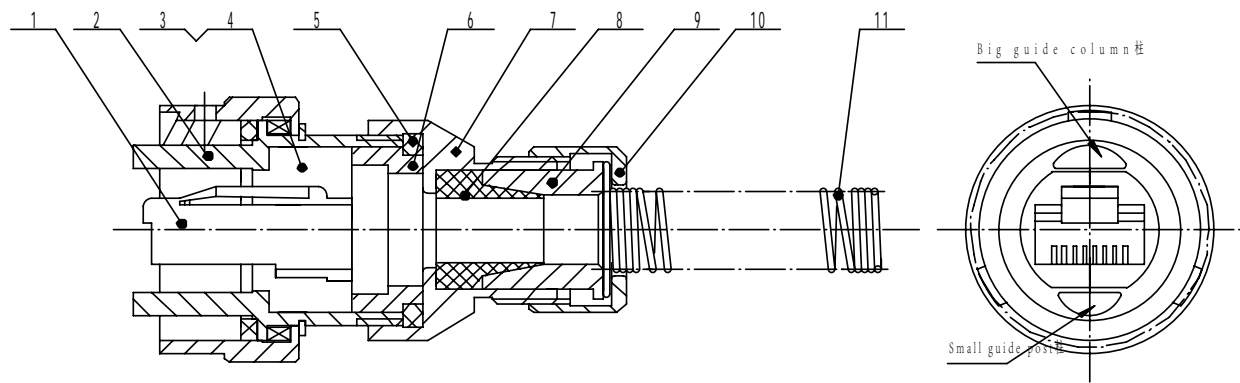


Figure 2 Schematic diagram for assembly of FB series plug

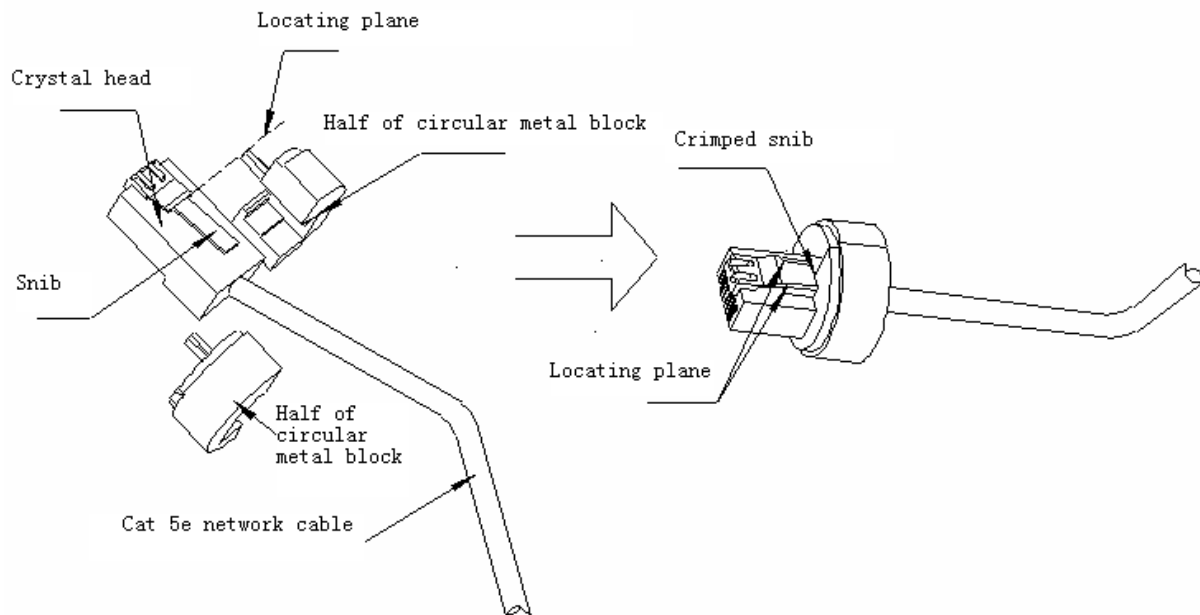


Figure 3 Assembly diagram for part 3, part 4 and crystal head

8 Crimp for crystal head (The following pictures are for reference on crimp instruction)

1) Crimp the crystal head with the special tool. The crimping tool should be in good condition before the crimp with good crimping teeth, reliable position and flexible movement and without uneven in surface

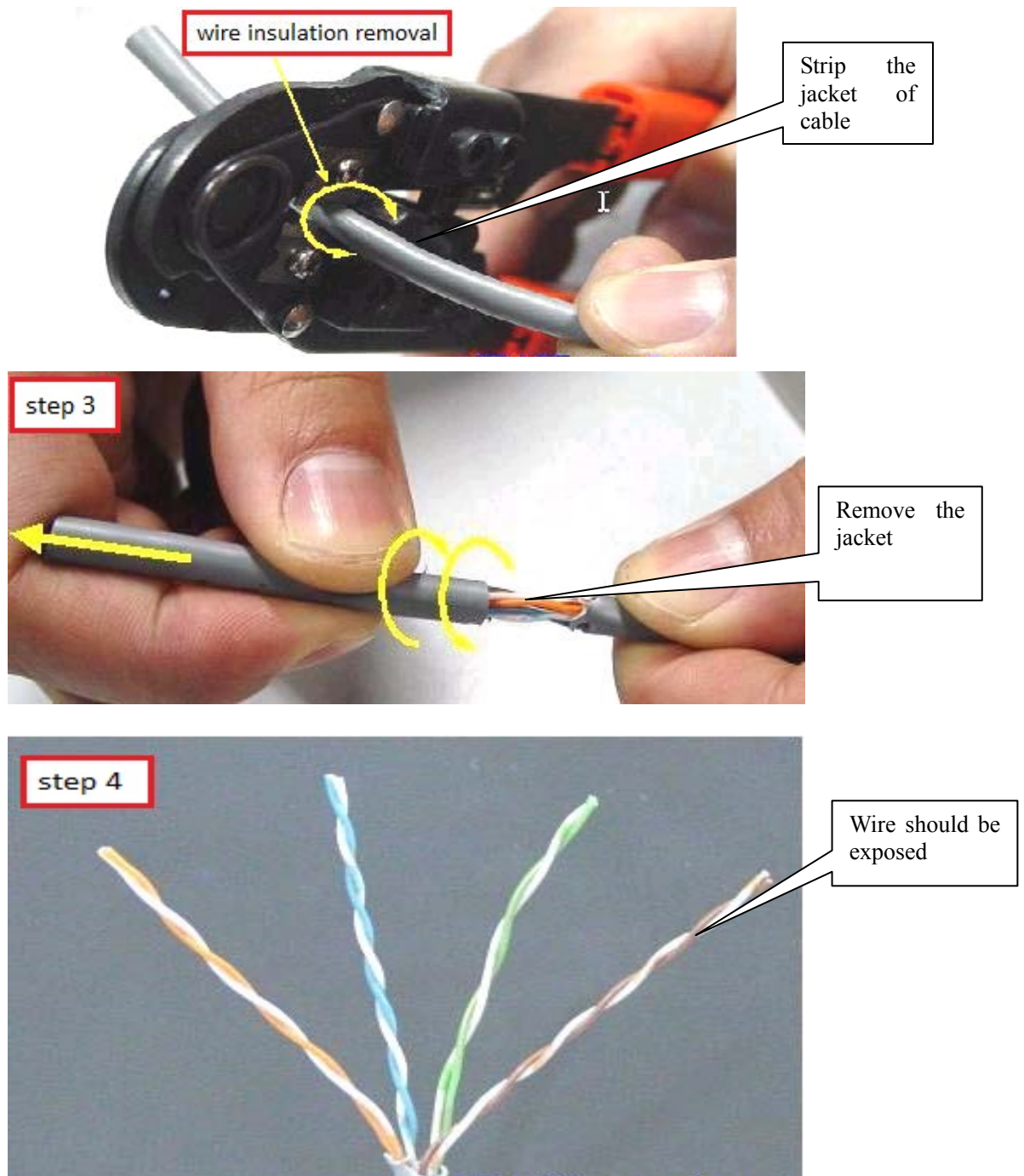


2) Enhanced category 5 (CAT.5E or CAT.6). The two kinds of network cable or optical fiber jumper should be used on Gigabit Ethernet. Examine 4 twisted pairs wires before stripping the wire. The color of twisted pair wire should be as follows: white-orange is twisted with orange, white-green twisted with orange,

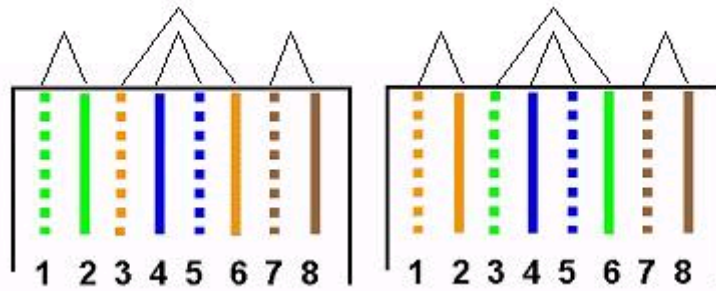


white-blue twisted with blue, white-brown twisted with brown

3) Wire strip. Strip 20mm from one end of the network cable. The inner wire can not be damaged



4) Laying. Lay the 8 wires in accordance with EIA/TIA-568A or EIA/TIA-568B, wires should be straight and in order.



EIA/TIA-568A connection method

EIA/TIA-568B connection method

The above figure designates the connection between two pins is a twisted pair.

EIA/TIA-568A connection method:

- 1——white-green (The outer surface of white wire is green, which means white wire and green wire are twisted pair wires)
- 2——green
- 3——white-orange (The outer surface of white wire is orange, which means white wire and orange wire are twisted pair wires)
- 4——blue
- 5——white-blue (The outer surface of white wire is blue, which means white wire and blue wire are twisted pair wires)
- 6——orange
- 7——white-brown (The outer surface of white wire is brown, which means white wire and brown wire are twisted pair wires)
- 8——brown

EIA/TIA-568B connection method:

- 1——white-orange (The outer surface of white wire is orange, which means white wire and orange wire are twisted pair wires)
- 2——orange
- 3——white-green (The outer surface of white wire is green, which means white wire and green wire are twisted pair wires)
- 4——blue
- 5——white-blue (The outer surface of white wire is blue, which means white wire and blue wire are twisted pair wires)
- 6——green
- 7——white-brown (The outer surface of white wire is brown, which means white wire and brown wire are twisted pair wires)
- 8——brown



It is worth paying special attention that the wire order can not be changed at will. As shown in the above figure, 1 and 2 are a twisted pair, 3 and 6 are a twisted pair. If we disarrange the specified wire order and arrange 1 and 3 as a twisted pair for transmitting and 2 and 4 as twisted pair for receiving, the ability of interference immunity will be lowered and the error rate will be increased, therefore Ethernet can not normally work.

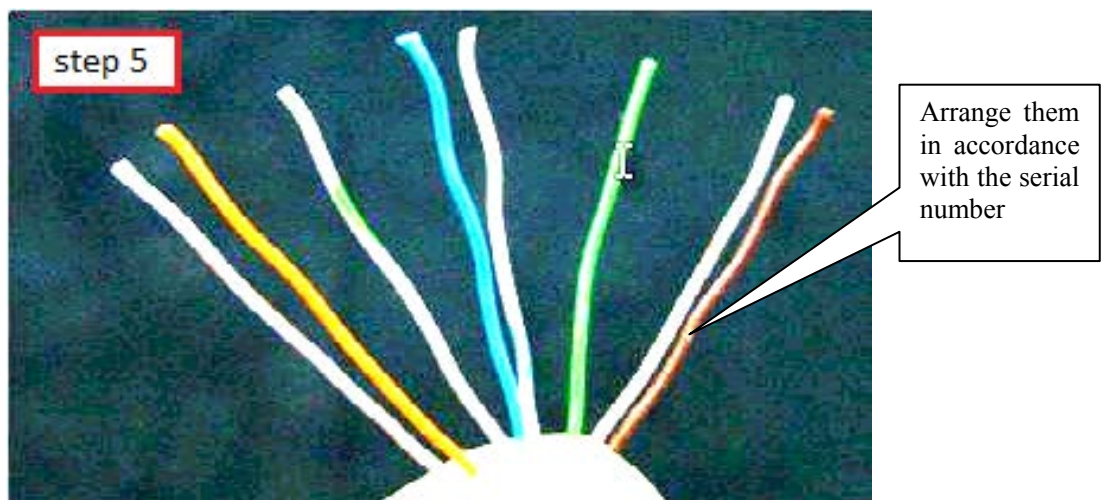
For laying method selection, there are the following principles:

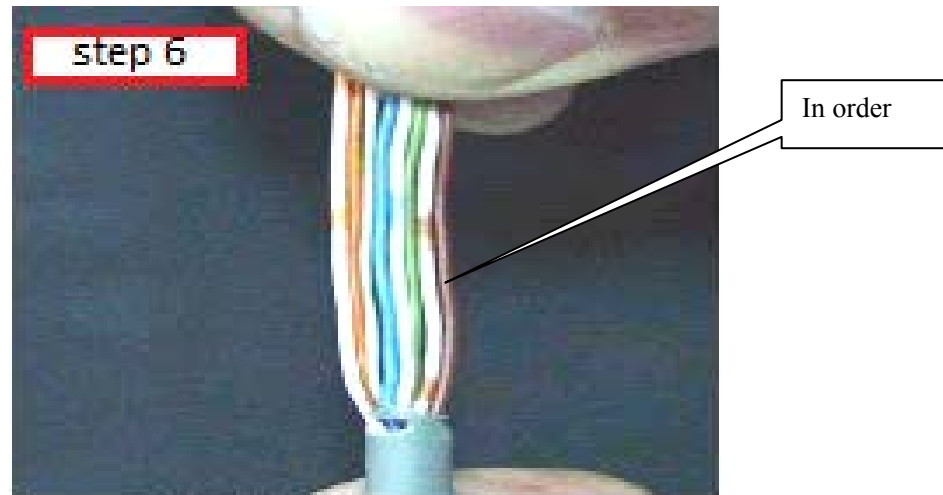
Parallel line: connect the both end in accordance with T568B

Crossing-line: connect one end in accordance with T568A and connect the other end in accordance with T568B

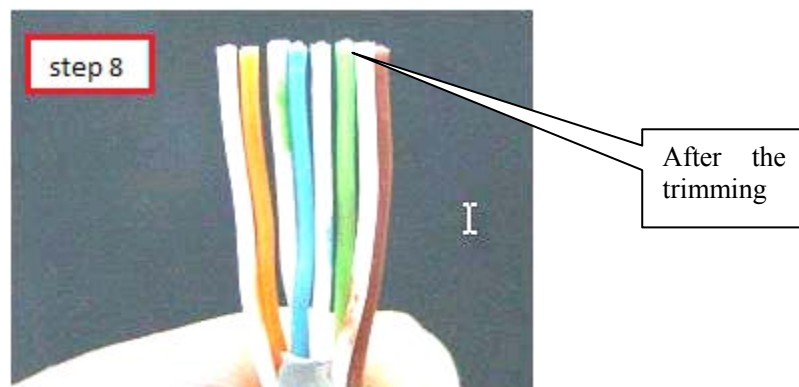
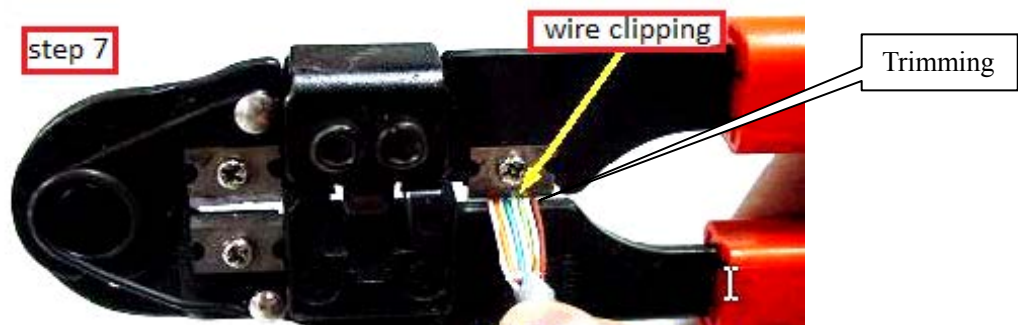
Specific connection and the laying selection method:

- 1) Peer-to-peer (Network cards of two computers are interconnected): Using the crossing-line laying method, the both ends of network cable have the different wiring method.
- 2) Using the parallel line laying method, the both end of network cable have the same wiring method.
- 3) Using the crossing-line laying method, the both ends of network cable have the different wiring method.

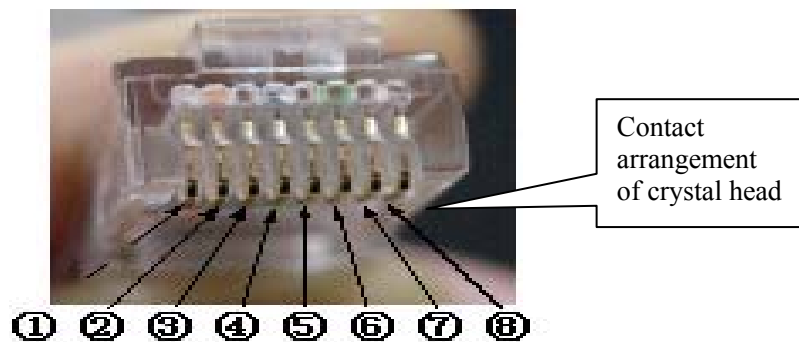




5) Trimming: The eight wires should be trimmed to 15mm, the ends should be even

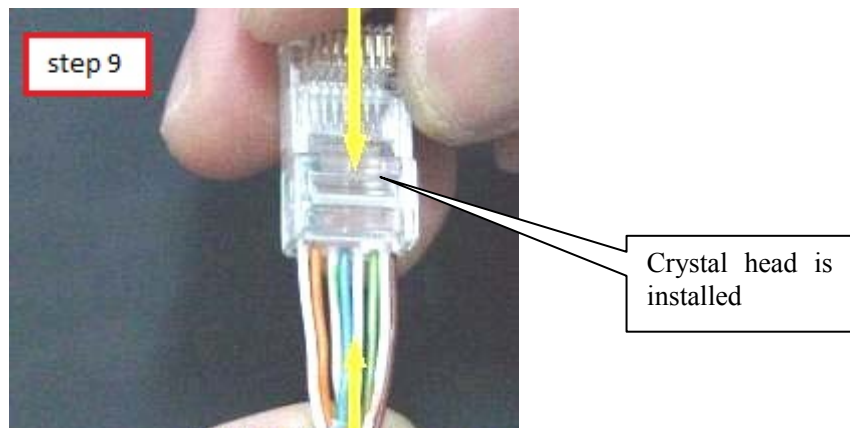


6) Assemble with the crystal head. The trimmed crystal head should be installed in the corresponding shell of the crystal head. Eight wires should be installed in the wire slots according to the contact arrangement

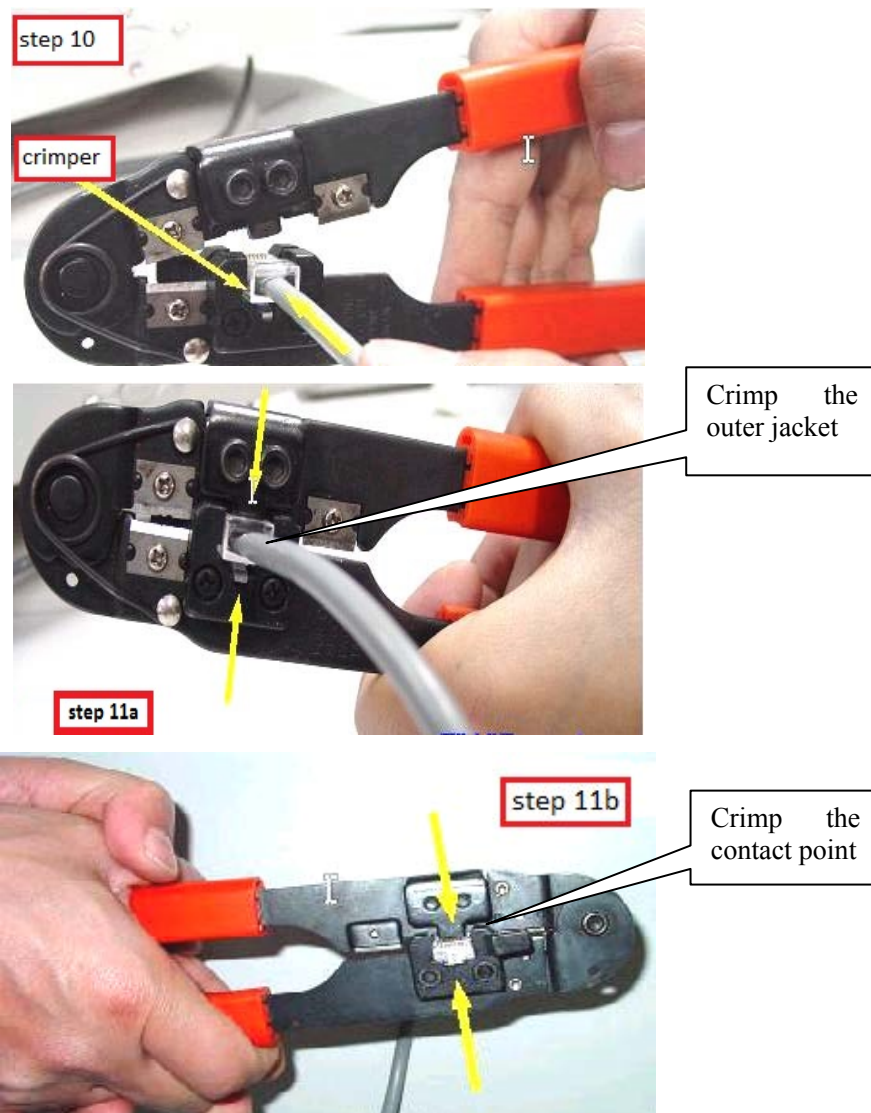


Contact arrangement: the end of plug faces to the eyes, the contact points of the pin is below the plug,

so the left side is ① and the right side is ⑧.



7)Crimp. Crystal head should be crimped in the slot in accordance with the direction of the drawing and be in place. Crimp with the special crimping tool. When an audible click is evident, the crimp is accomplished. When crimping with FB series, the crimp dimension should be in accordance with the requirement of chapter 5.





8) Examination

Examine the crystal head after the crimping

- ① The pin of crystal head should be straight and in order and be free from slope and curvature.
- ② Each crimping hole should be in ON-state and the electricity should be continuous.
- ③ When crystal head is mated with RJ-45, an audible click is evident

