HIROSE ELECTRIC CO., LTD.

TITLE: EF2 Series Guideline		REVISION DATE: 13-Oct.-20 Rev No. 3
OBJECT PRODUCT: EF2 SERIES	Figure No. ETAD-C0387-00	PAGE: 1 OF 36

EF2 Series
Guideline for Design and Handling

Number **Page**

1. Introduction

1.1 Purpose of Hirose's guideline

Before using ZERO SCREW™ Terminal Block (EF2 Series), refer to the following guideline describing precautions on equipment design and work. Note that photos and illustrations in this document refer to our representative product and differ depending on the product.

The guideline information is subject to change.

2. Precautions

To use the product correctly, read the following **Prohibitions/Cautions** described in the guideline before use. In this EF2 Series Guideline, safety precautions rankings are classified as "Prohibition" and "Caution".

■ Meanings of prohibitions and cautions

Prohibition	Indicates **actions that must not be performed because** incorrect handling **may immediately result in death or serious injury to the user.**
Caution	Indicates incorrect handling that **may result in property damage**.

Be sure to observe the following Prohibitions/Cautions.

⚠ Prohibitions

- Always turn off the power before using the product. Failure to do so may result in an electric shock or damage.
- Do not touch the metallic parts. Touching the metallic parts this may result in an electric shock.
- Do not use the product at power-supply voltage and currents exceeding the rating. This may result in a fire or an electric shock.
- Do not use terminals other than the specified ones. Doing so may result in a contact failure or ignition.
- As for crimp contacts, keep the insulating distance with insulating tubes so that live parts are not exposed in order to prevent an electric shock or a short circuit.
- Do not use crimp contacts that are deformed or largely scratched. Using unsuitable crimp contacts may result in a contact failure or an ignition.

⚠ Cautions

- When using a crimp contact that was previously used for the terminal block, check it for deformations and large scratches before use. Do not use a crimp contact with deformations or large scratches.

  Replace it with a new crimp contact before use.

- Do not expose the product to vibrations or shocks exceeding the product specifications.
- Do not use our products outdoors because they are designed for indoor applications.
- Remove the edge of the DIN rail end face. Not doing so will cause difficulty in mounting the product because it gets caught on the edge.
- Do not store or use our products under conditions with corrosive materials that may cause the physical deterioration of plastic and metal rust.
- If solvent is applied to the product by necessity for improved insulation strength or protection, check that it will not cause physical deterioration of the plastic before use.
- Salt damage countermeasures are not implemented for our products.
- Use the specified crimp contacts and check them for deformations and contamination, including oil and contact resistance failure, before use.
- Use the tinned crimp contacts. Check them for abnormalities in inserting/removing force and contact resistance before use.
- Do not store or use our products in a place close to the sea or under conditions of salt exposure. If metal rust or significant discoloration is found, replace it with a new one.
- Store and use our products at an altitude of 2000 m or less and within the operating temperature range, operating humidity range, and storage temperature range described in this catalog store and use products so that no freezing or condensation occurs.

*Please check the product standards of Our Company on our website.
Company Homepage: https://www.hirose.com/

3. Product Number Structure and Outer Dimensions

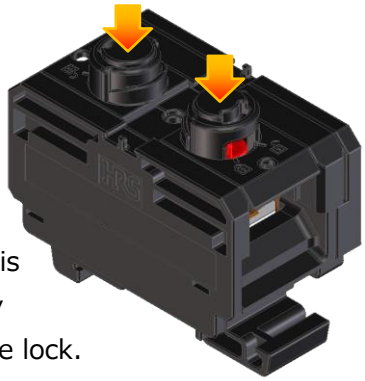
3.1 Product Number Structure

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.

EF2 - D H 150 B – 1 (01)
① ② ③ ④ ⑤ ⑥ ⑦

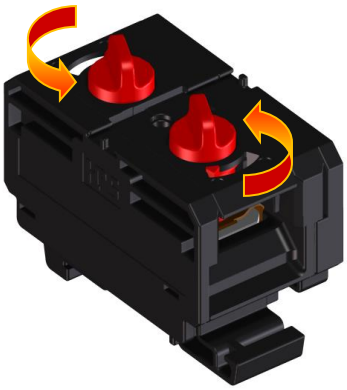
① Series name	EF2 = Push Type EF2A = Twist Type
② Mount type	D = DIN rail mount
③ Connection Type	Blank = One Action on Both Sides H = One-Sided Screw Type
④ Current capacity sign	30, 60, 150, 200, 250, 400
⑤ Protection Design	Blank = No Protection Design B = With Protection Design
⑥ Linked quantity	(D150 type only)
⑦ Other specifications	Additional product specifications will be identified by the addition of (01), (02), etc., as needed.

EF2 Series



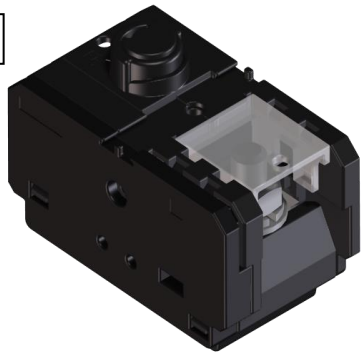
EF2 Series is released by pressing the lock.

EF2A Series



EF2A Series released by twisting the lock.

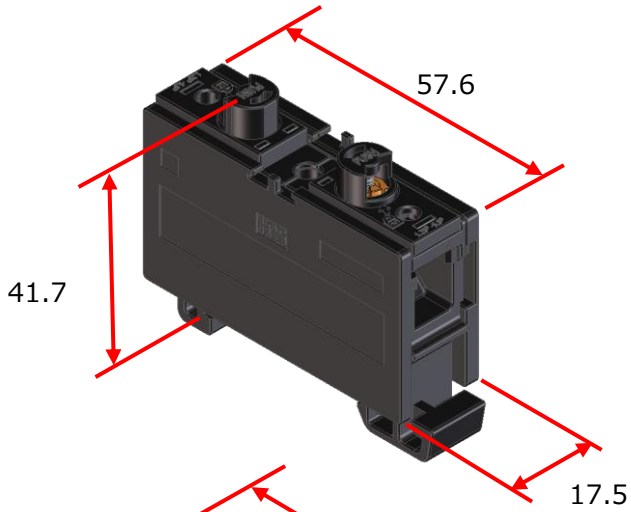
One-Sided Screw Type



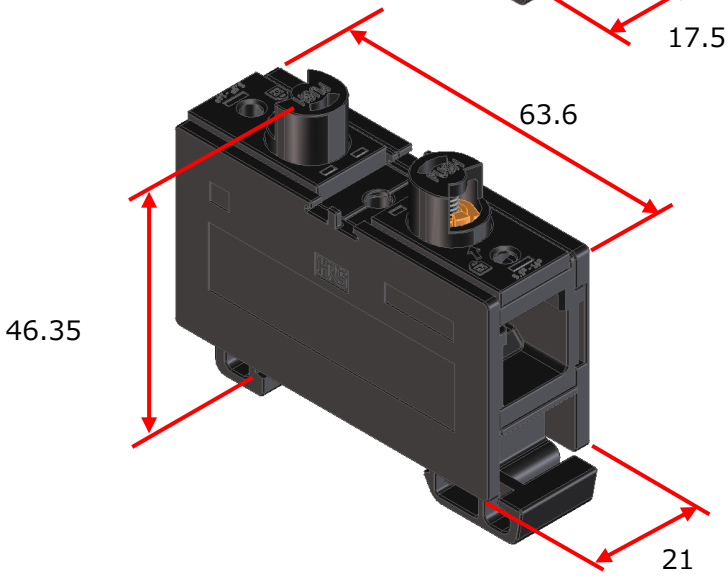
3.2 Outer dimensions

Caution: - All height dimensions shall be measured from the DIN rail.
- Width dimensions in linkage are based on Section 5.5.1: Width dimension in connecting housing.

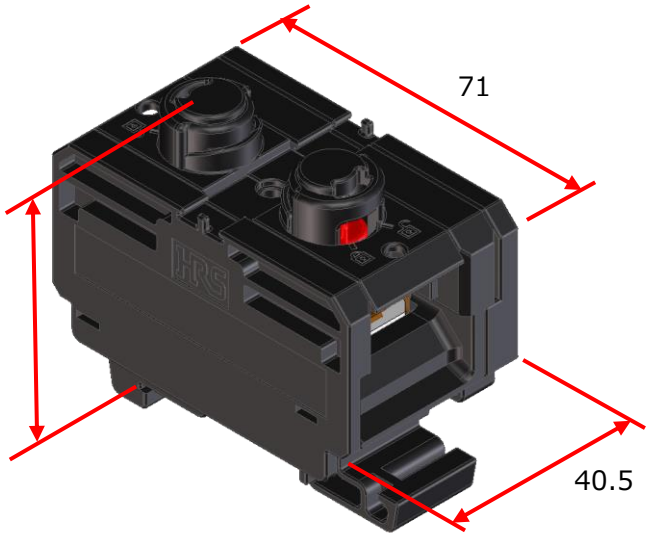
E F 2 – D 3 0 – 1



E F 2 – D 6 0 – 1

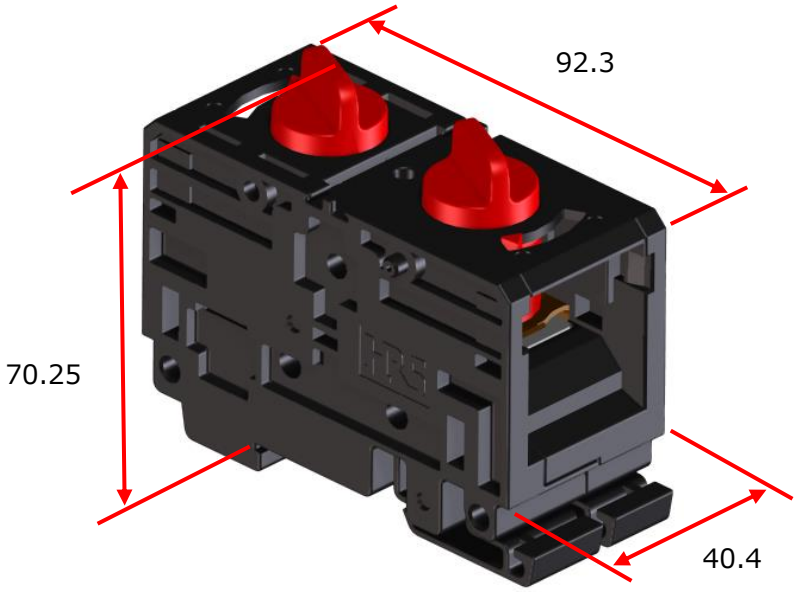


E F 2 – D 1 5 0 – 1

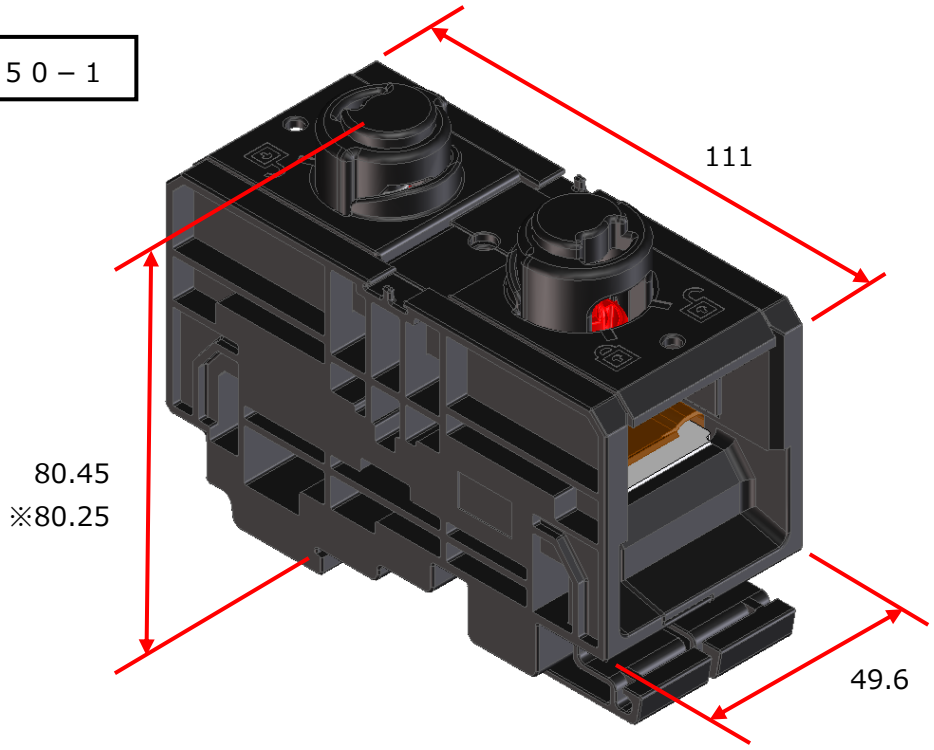


※ Twisting type

EF2A-D200-1

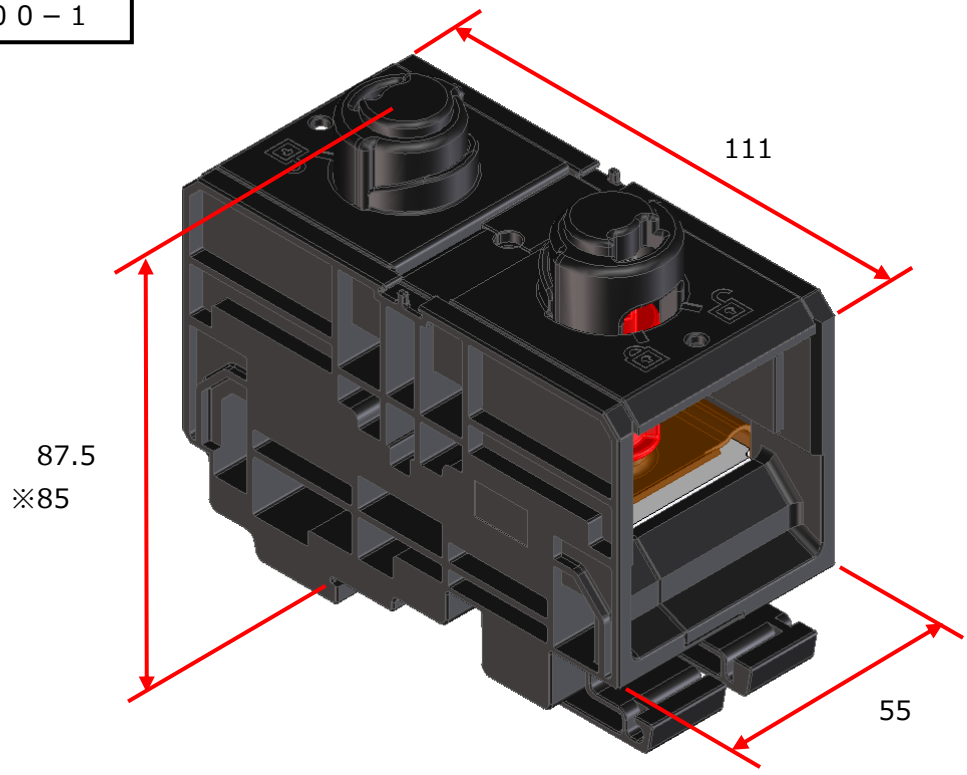


EF2-D250-1



※ Twisting type

E F 2 – D 4 0 0 – 1



※ Twisting type

4. Materials and Characteristics of Product

4.1 Series specification matrix

・Materials / Finish

Component	Materials	Finish
Housing	m-PPE	UL94V-0, Black
Lock	PBT	UL94V-0, Black/Red/Orange
Bus bar	Copper	Tin plated
Spring	SUS	–
Cover	PC	UL94V-0,Clear
Screw	Iron	Trivalent chromate

・Characteristics

Rated current	Product	D30	D60	D150	D200	D250	D400
	Applicable cable	1.25mm^2=16A 2mm^2=21A 3.5mm^2=30A 5.5mm^2=40A	5.5mm^2=40A 8mm^2=50A 14mm^2=70A	22mm^2=94A 38mm^2=132A 60mm^2=175A	60mm^2=175A 100mm^2=240A	150mm^2 =310A	200mm^2 =400A
Rated voltage		600 V AC/DC			1000 V AC,1500 V DC		
Withstanding voltage		2500 AC per 1 minute			5000 V AC per 1 minute		
Contact resistance		1 mΩ max. (1A DC)		0.1 mΩ max. (1A DC)			
Operating temperature		-25°C to +105°C*					
Storage temperature		-10°C to +60°C					
Insulation resistance		1000 MΩ min. (500 V DC)					
Durability		50 times					

*: Including the temperature rising by current flow.

4 .2 Specifications of applicable cables

Current capacity sign	Applicable cable size (mm^2)			
30	1.25	2	3.5	5.5
60	5.5	8	14	-
150	22	38	60	-
200	60	100	-	-
250	150	-	-	-
400	200	-	-	-

5. Usage and Precautions

5.1 Applicable crimp contact (Contact with different thickness is not allowed)

Select the applicable crimp contact by referring to Table 1: Part numbers of recommended crimp contacts and Table 2: Dimensions of applicable crimp contacts.
Also, refer to the List of enabled/disabled of crimp contacts.

Table 1 Part numbers of recommended crimp contacts

Current capacity sign	Crimp contact manufacturer	Part numbers of crimp contacts					
30	JST	R1.25-5	R2-5	3.5-R4	R5.5-4	–	–
	Nichifu	R1.25-5	R2-5	R3.5-4	R5.5-4	–	–
60	JST	R5.5-5	R8-5	R14-5	–	–	–
	Nichifu	R5.5-5	R8-5	R14-5	–	–	–
150	JST	R22-8	R22-10	R38-8	R38-10	R60-8	R60-10
	Nichifu	R22-8	R22-10	R38-8	R38-10	R60-8	R60-10
200	JST	R60-10	R100-10	–	–	–	–
	Nichifu	R60-10	R100-10	–	–	–	–
250	JST	R150-12	R150-14	–	–	–	–
	Nichifu	R150-12	R150-14	–	–	–	–
400	JST	R200-12	R200-14	–	–	–	–
	Nichifu	R200-12S	R200-14	–	–	–	–

Prohibition:Using a crimp contact with a different size will cause a poor fit and insufficient contact.

Figure 1 Dimensions of applicable crimp contacts

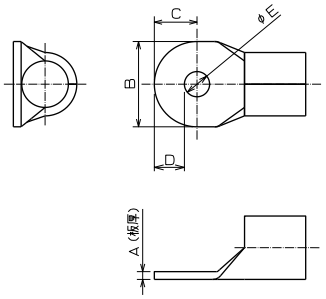


Table 2 Dimensions of applicable crimp contacts [mm]

Current capacity sign	A	B	C	D	E
30	1 +0.05/-0.3	9.5 or less	-	2.6 or less	4.3 or more
60	1.5 +0.1/-0.8	12.2 or less	-	3.35 or less	5.3 or more
150	1.8 +0.3/-0.1	24.3 or less	-	7 or less	8.4 or more
200	2.6 +0.2/-0.8	28.9 or less	–	10.5 or less	10.5 or more
250	3.3 ±0.1	36.5 or less	18±0.2	-	13 or more
400	4±0.1	44.5 or less	22±0.2	-	13 or more

Caution: Select the crimp contact that meets all dimensions shown above.
If one of the dimensions is not met lock or sufficient contact cannot be achieved.

Please adhere to the measurements especially for the contact thickness of A.

Table 3 List of enabled/disabled of crimp contacts

Current capacity sign	R1.25	R2	R3.5	R5.5	R8	R14	R22	R38	R60	R100	R150	R200
30	○	○	○	○	×	×	×	×	×	×	×	×
60	×	×	×	○	○	○	×	×	×	×	×	×
150	×	×	×	×	×	×	○	○	○	×	×	×
200	×	×	×	×	×	×	×	×	○	○	×	×
250	×	×	×	×	×	×	×	×	×	×	○	×
400	×	×	×	×	×	×	×	×	×	×	×	○

Caution: - ○: Enabled crimp contact, ×: Disabled crimp contact
- Using an inappropriate crimp contact may result in contact failure or ignition.

5.2 Crimp work procedure

5.2.1 Method for Cutting Cable Length and Cable Protrusion Length from Contact

Setting of cable cutting length and protrusion length from crimp contact

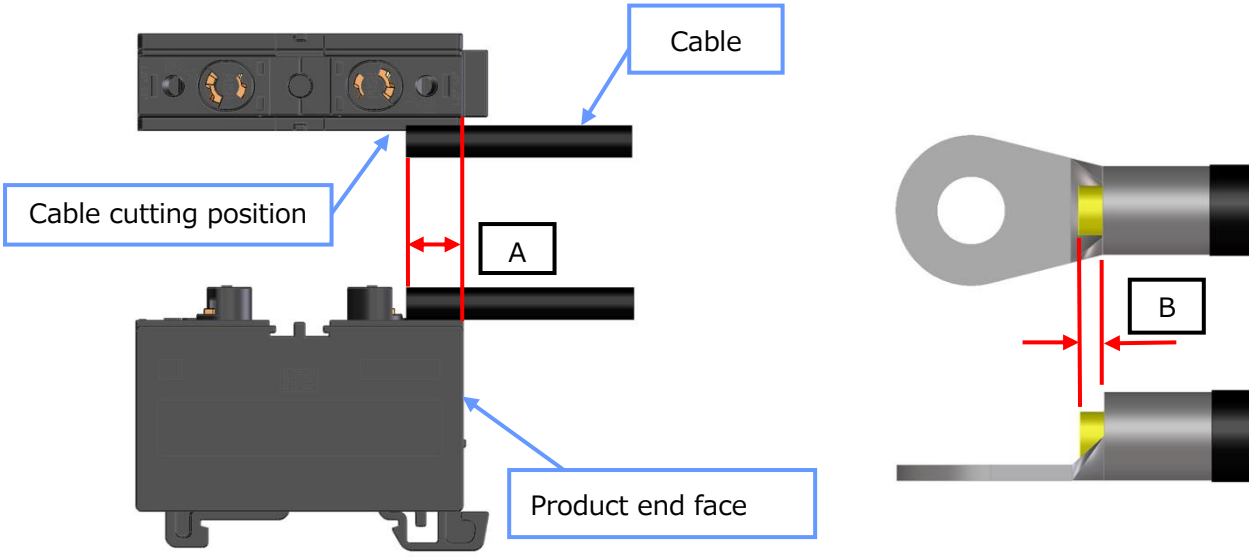
・A indicates the cable cutting position. Cut the cable at dimension A from the product end face. Cutting the cable out of the tolerance range may result in poor fit after crimping the terminal.

・B is the dimension of the conductor protruding from the crimp contact before crimping.

Caution: Set the ranges specified in the table. Setting a dimension out of tolerance range may result in a poor fit or continuity failure.

[mm]

Current capacity sign	Crimp contact size	A	B
30	R1.25	11±1	$1^{\ 0}_{-0.5}$
	R2	11±1	$1^{\ 0}_{-0.5}$
	R3.5	10±1	$1^{+1}_{-0.5}$
	R5.5	10±1	$1^{+1}_{-0.5}$
60	R5.5	11±1	$1^{\ 0}_{-0.5}$
	R8	10±1	$1^{+1}_{-0.5}$
	R14	8±2	2±1
150	R22	10.5±2	2±1
	R38	8±2	3±2
	R60	6±2	4±2
200	R60	13.5±2	3±2
	R100	12±2	3±2
250	R150	15.5±2	3±1
400	R200	9±2	4±2



5.2.2 Insulation Tube Handling

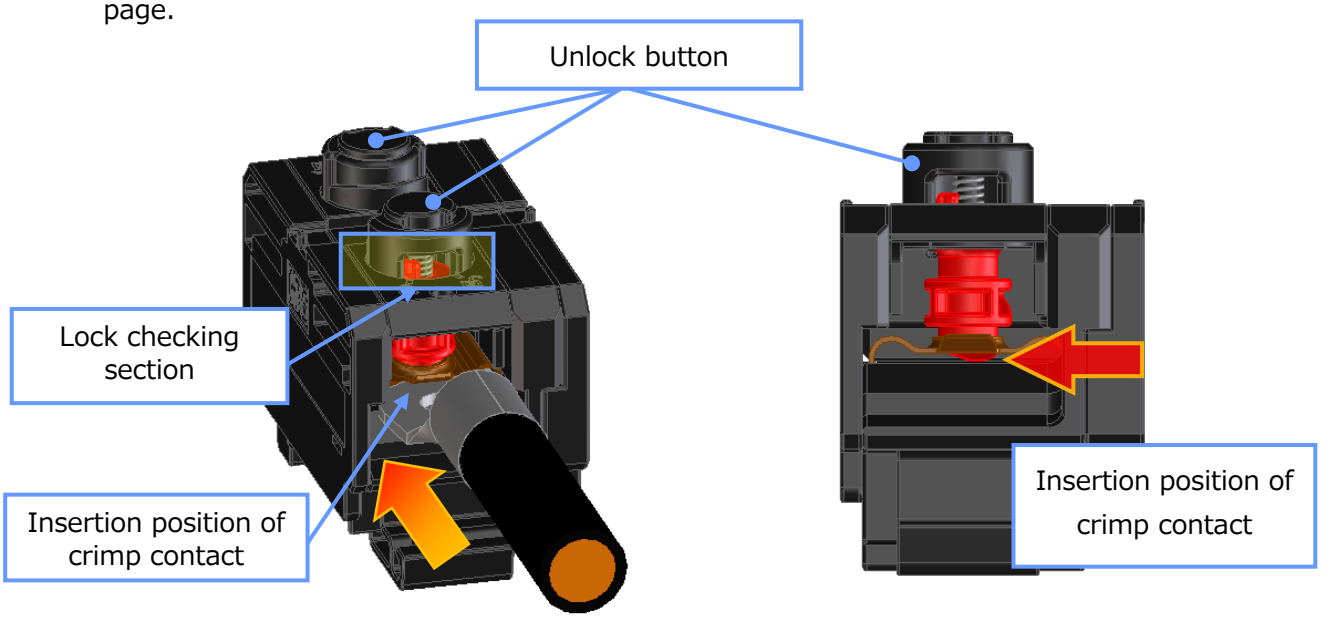
To prevent electric shock or short circuit, maintain an insulating range by use of insulation tube etc. so that the charging part is not exposed to the crimp contact.
If the insulation tube is displaced forward, the insulation tube may interfere with the lock engaging properly. If it does not lock, refer to the figure below to check the position of the insulation tube.

※The insulation tube is pushed forward.

5.3 Product operation

5.3.1 Inserting crimp contact

Insert the applicable crimp contact into the crimp contact insertion position (between the spring and the bus bar) shown in the figure below.
For the crimp contact insertion position, refer to the insertion cross-section view on the next page.

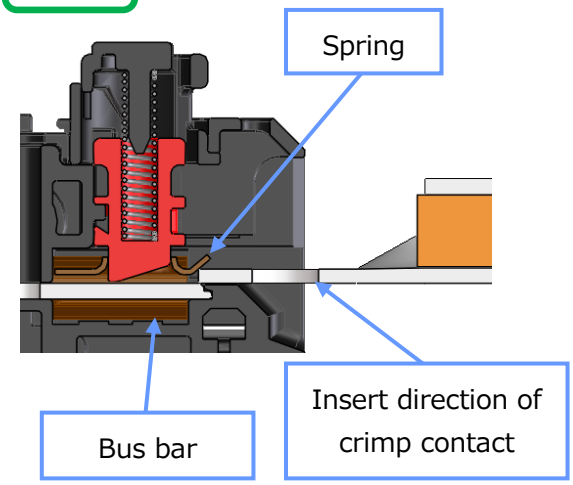


Fitting cross-section view

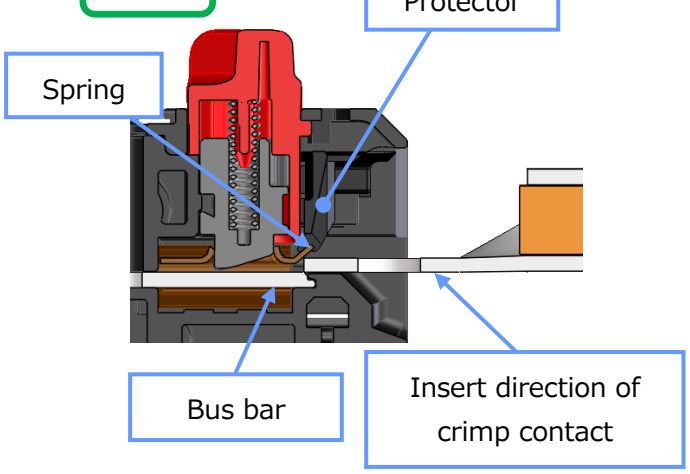
No protection

With protection

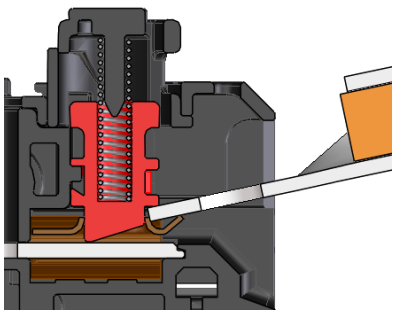
O K



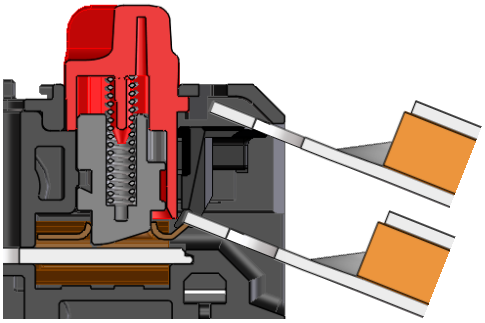
O K



Not OK



Not OK



Caution: ・The insert direction of the crimp contact is the position shown in the figure.
If the contact can fit 180° in the opposite direction, the product can be used with the contact in this position.
At this point, check that the product is in the locked state as described in Section 5.3.3.
・Depending on size, the cable may be difficult to insert. In such cases insert while moving the cable left and right.

Prohibition: ・Do not insert the crimp contact into a position other than the insertion position.
Inserting the crimp contact incorrectly will not provide a fitting lock even if the contact is inserted. Furthermore, the product may be damaged.

5.3.2 Locked state

5.3.2.1 Locked state（EF2-D30、D60）

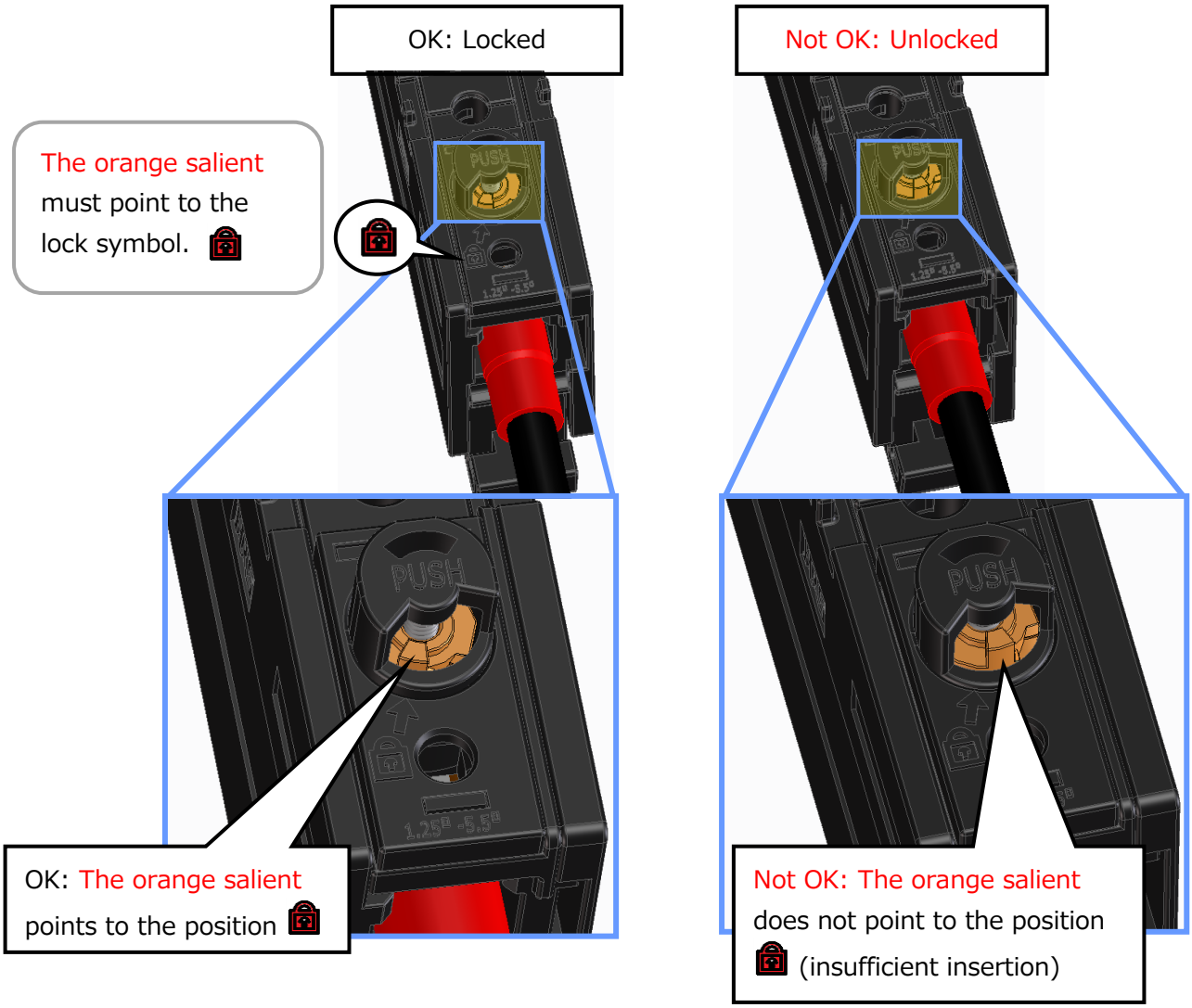
The locked state is a state in which the orange salient points to the symbol as shown in the figure below.

After changing the product into the locked state, make sure that the crimp contact is not disconnected even if the cable is pulled.

If the crimp contact is disconnected, the insertion is not sufficient.

Using the product in this state may result in contact failure or ignition.

Insert the crimp contact again and be sure to lock it.



Prohibition: ・Avoid leaving the product in the unlocked position.
Failure to follow this will detach the crimp contact to cause contact failure.
・If the product is in the unlocked state, fit the crimp contact into the locked state again.

5.3.2.2 Locked state（EF2-D150、D250、D400）

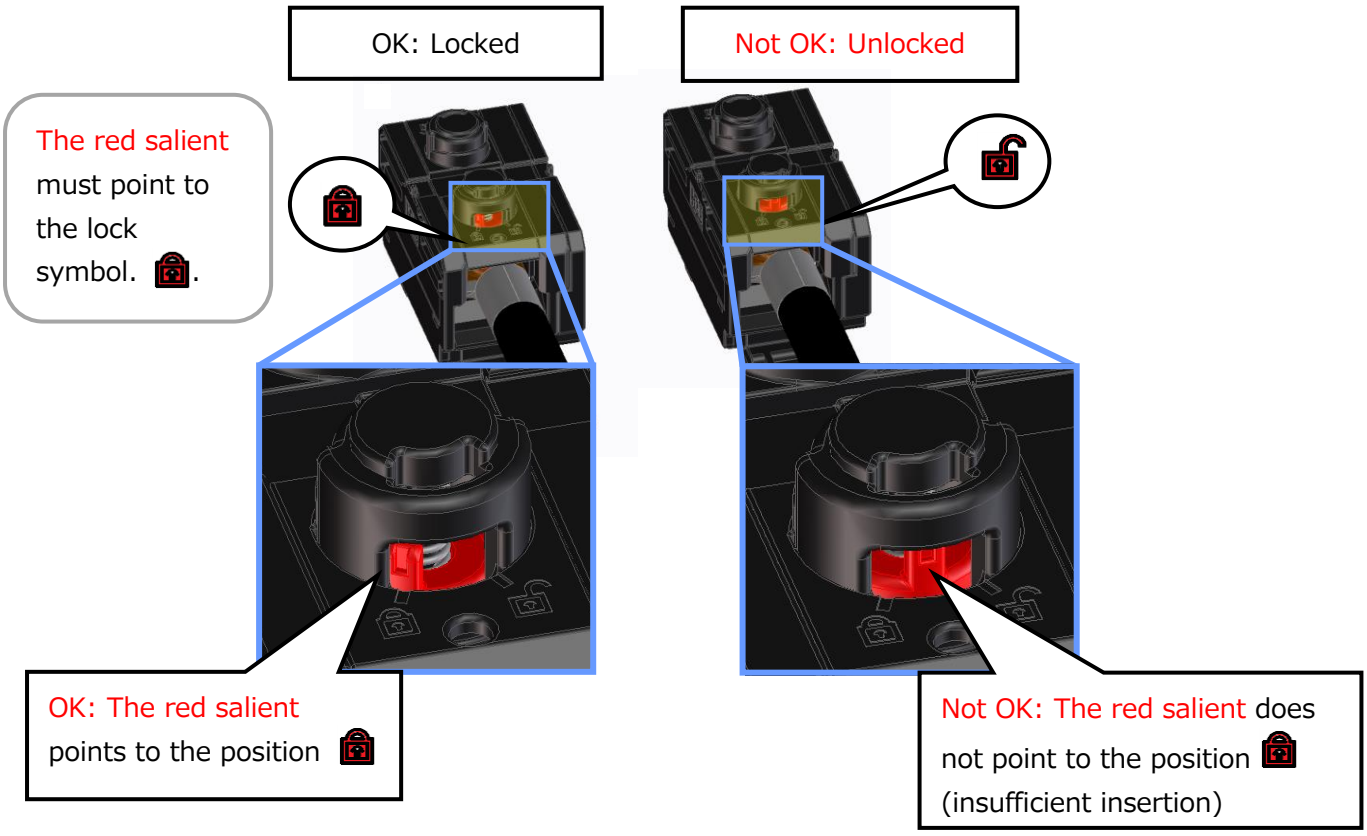
The locked state is a state in which the red salient points to the symbol as shown in the figure below.

After changing the product into the locked state, ensure that the crimp contact is not disconnected even if the cable is pulled.

If the crimp contact is disconnected, the insertion is not sufficient.

Using the product in this state may result in contact failure or ignition.

Insert the crimp contact again and make sure to lock it.



5.3.2.3 Unlock（EF2A-D150, D200, D250, D400）

Connector is locked when the raised red portion in the figure below is on the lock side.

After changing the product into the locked state, ensure that the crimp contact is not disconnected even if the cable is pulled.

If the crimp contact is disconnected, the insertion is not sufficient.

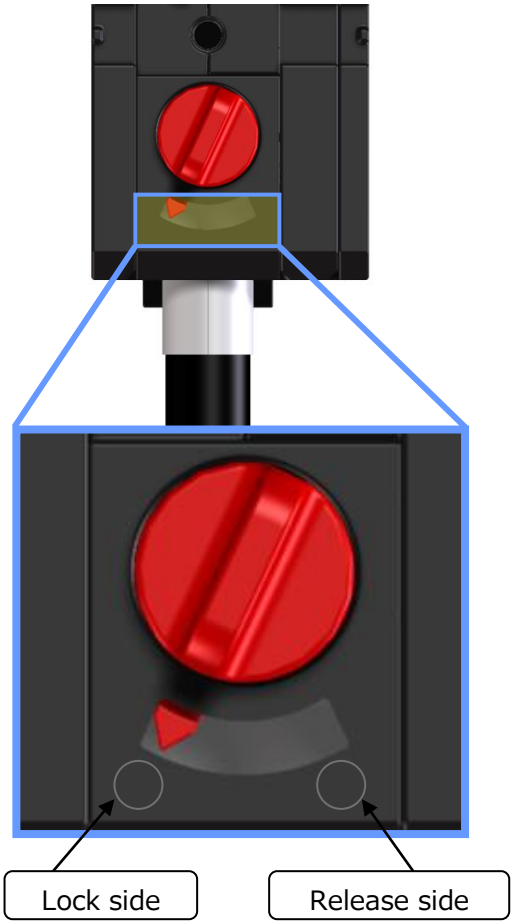
Using the product in this state may result in contact failure or ignition.

Insert the crimp contact again and make sure to lock it.

If the red raised portion is not on the lock side when the crimp contact has been fully inserted, twist the red raised portion to the lock side by hand.

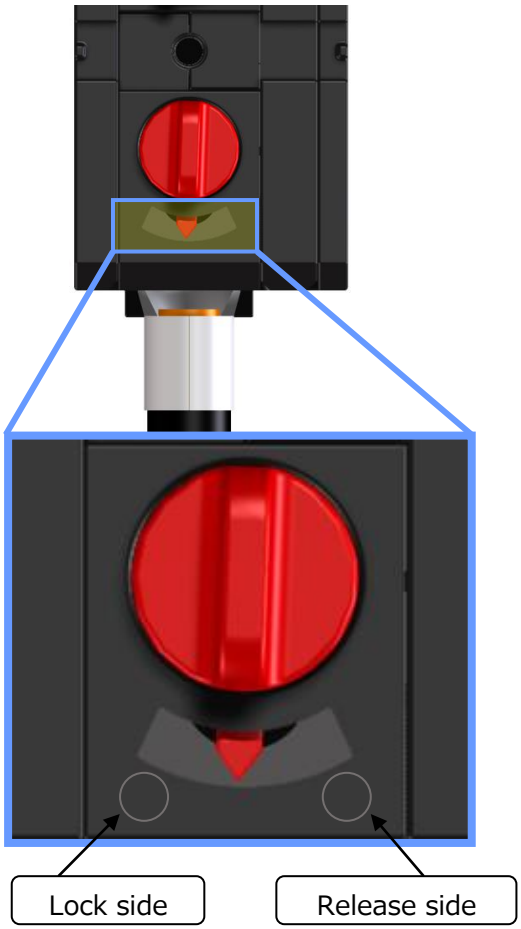
The product may be difficult to lock depending on the contact size and hole diameter. If it is difficult to lock move the crimp contact back and forth and left and right to lock.

OK: Locked



OK: The red raised portion is on the lock side.

Not OK: Unlocked

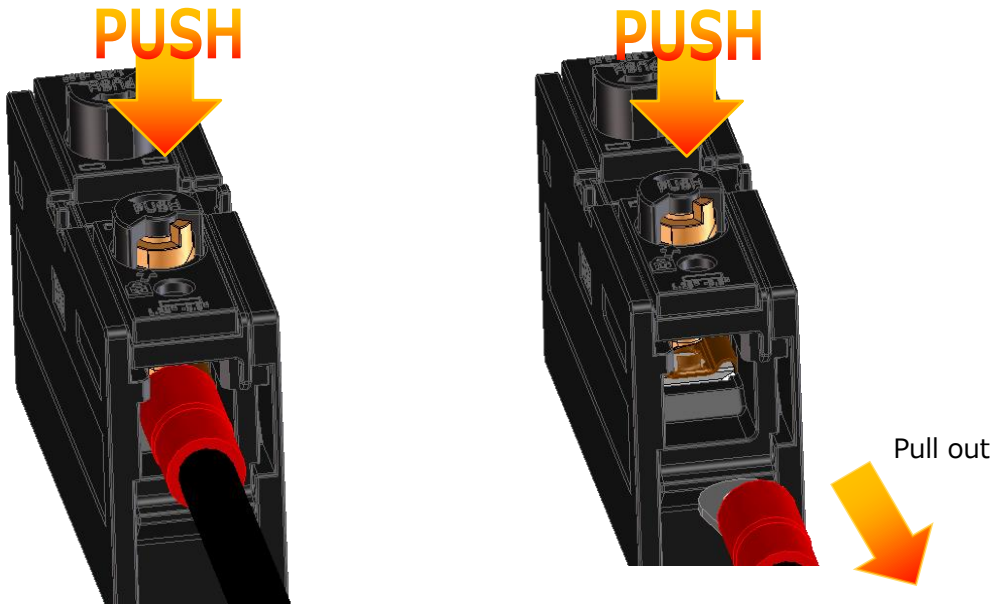


Not OK: The red raised portion is not on the lock side.
(insufficient insertion)

5.3.3 Locked state

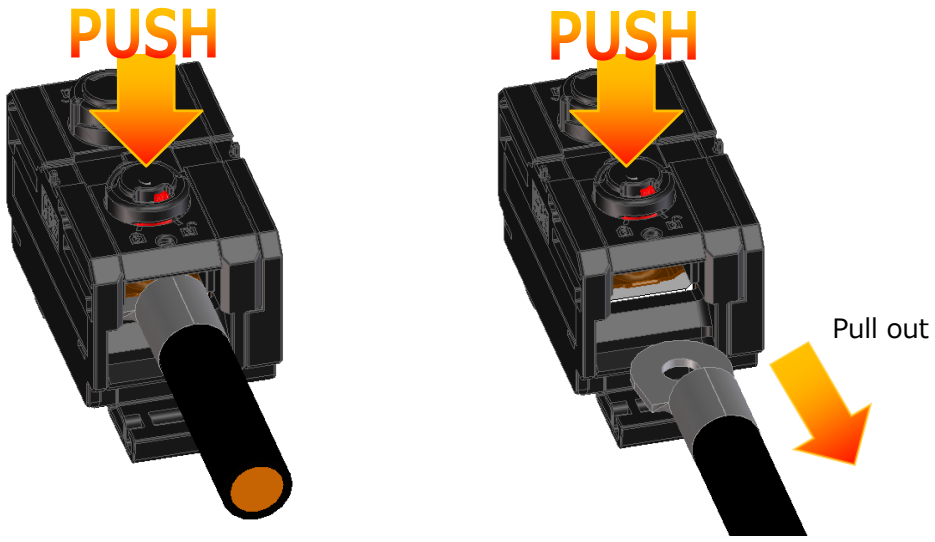
5.3.3.1 Unlock（EF2-D30、D60）

Unlock is performed by pulling out the crimp contact or cable while pressing the unlock button.



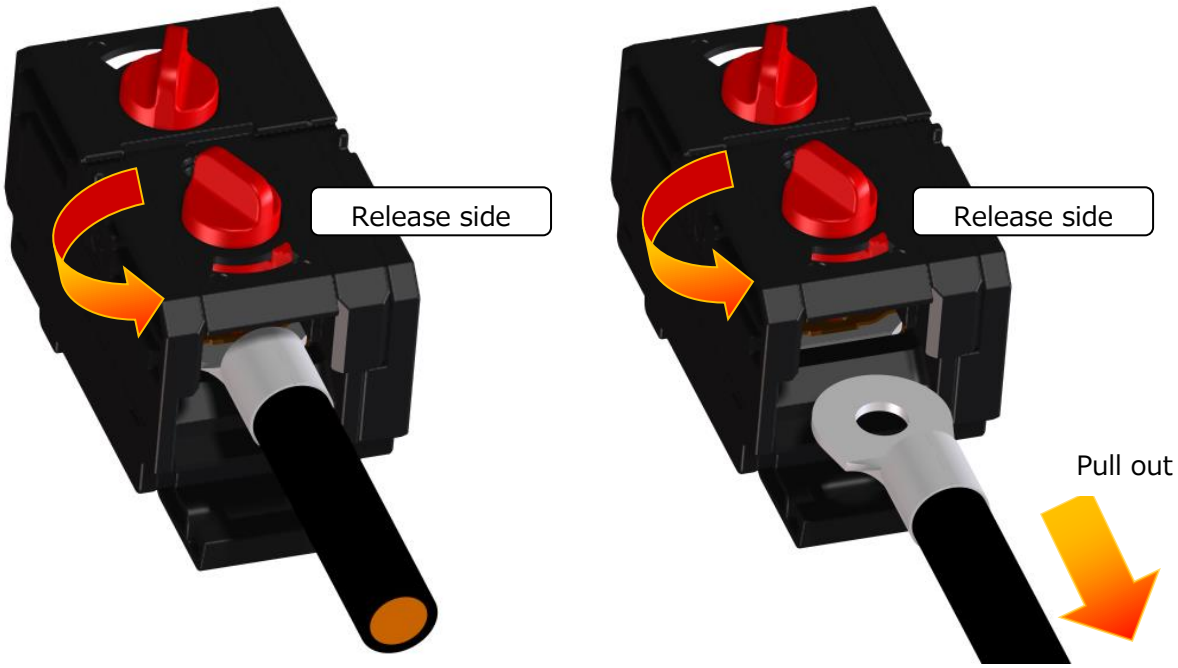
5.3.3.2 Unlock（EF2-D150、D250、D400）

Unlock is performed by pulling out the crimp contact or cable while pressing the unlock button.



5.3.3.3 Unlock（EF2A-D150, D200, D250, D400）

Pull out the crimp terminal or cable while twisting the "Unlock Button" to the release side to release the lock



5.3.4 One-Sided Screw Type

5.3.4.1 Screw Size

The following table shows the screw sizes and hexagon width dimensions.

Current capacity sign	Screw Size	Hexagon Width [mm]
150	M8	13
200	M10	17
250、400	M12	19

5.3.4.2 Tightening Torque

Use the tightening torque in the table below for the one-sided screw type.

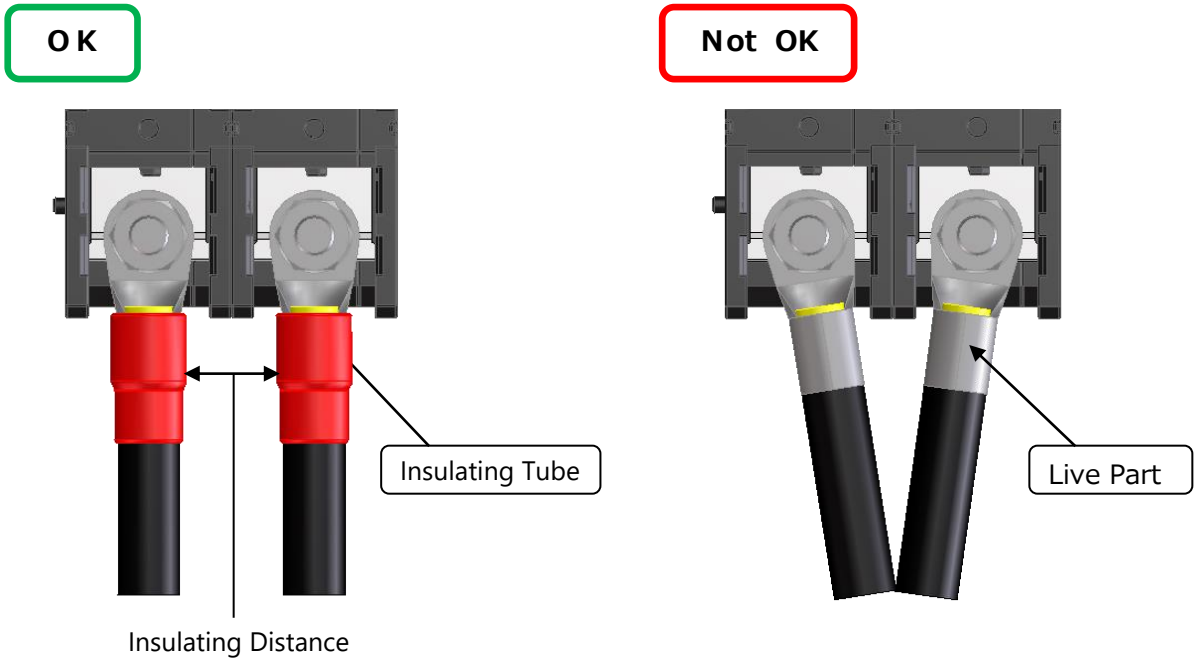
[N･m]

Current capacity sign	Tightening Torque
150	6
200	10
250、400	14

Caution: ･Observe the tightening torque.
Failure to do so may cause the screws to loosen or break.
･Please tighten regularly.

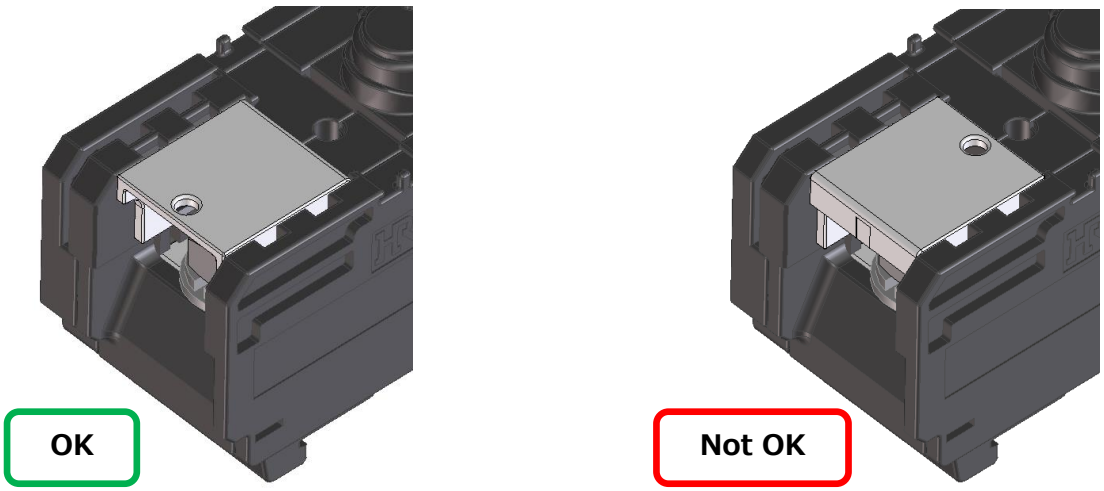
5.3.4.3 Insulating Distance

When using a bare crimp terminal, ensure sufficient insulating distance with the insulating tubes so that live parts are not exposed in order to prevent electric shock and short circuiting.



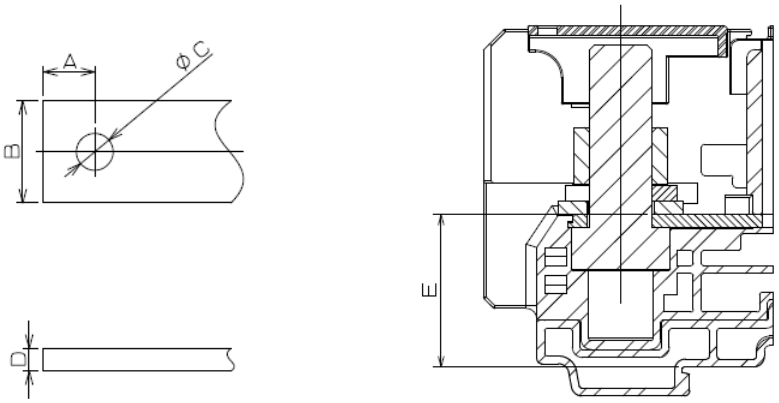
5.3.4.4 Cover Case Orientation

Install the cover case in the correct orientation as shown below.



5.3.4.5 Applicable Bus Bar Dimensions

A bus bar can only be used on the spring side. When using a bus bar, ensure that the dimensions and allowable current meet the specifications in the below diagram and check in advance that there is no abnormality in contact resistance before use.



Current Capacity Symbol	A	B	C	D	E
150	11.3or less	22.3 or less	8.4+0.4/0	(6)	22.9±0.5
200	14.3 or less	28.9 or less	10.5+0.4/0	(6)	29.8±0.5
250	20 or less	36.5 or less	13+0.5/0	(8)	29.2±0.5
400	23 or less	44.5 or less	13+0.5/0	(10)	30.5±0.5

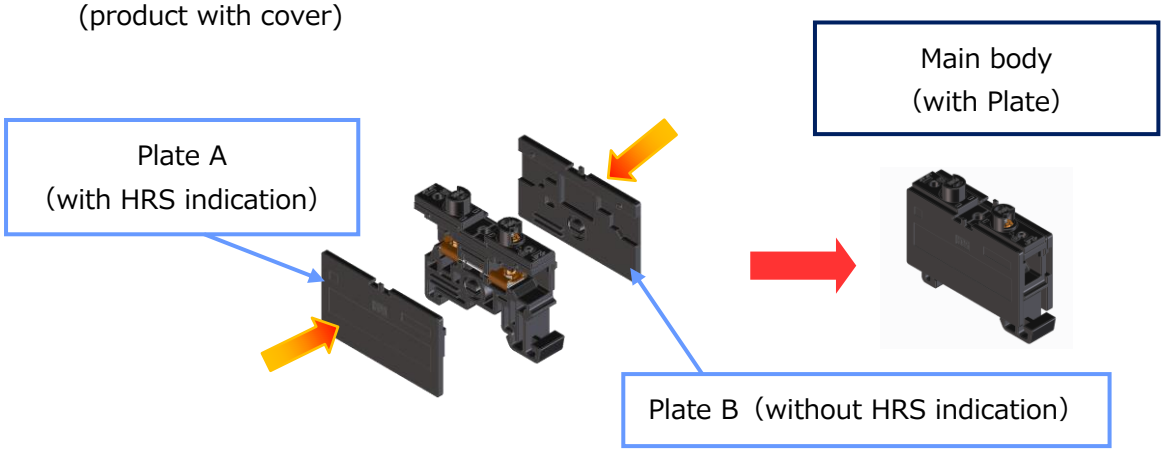
5.4 Support for linkage (Description of method for each product)

5.4.1 The method for linking each product is described.

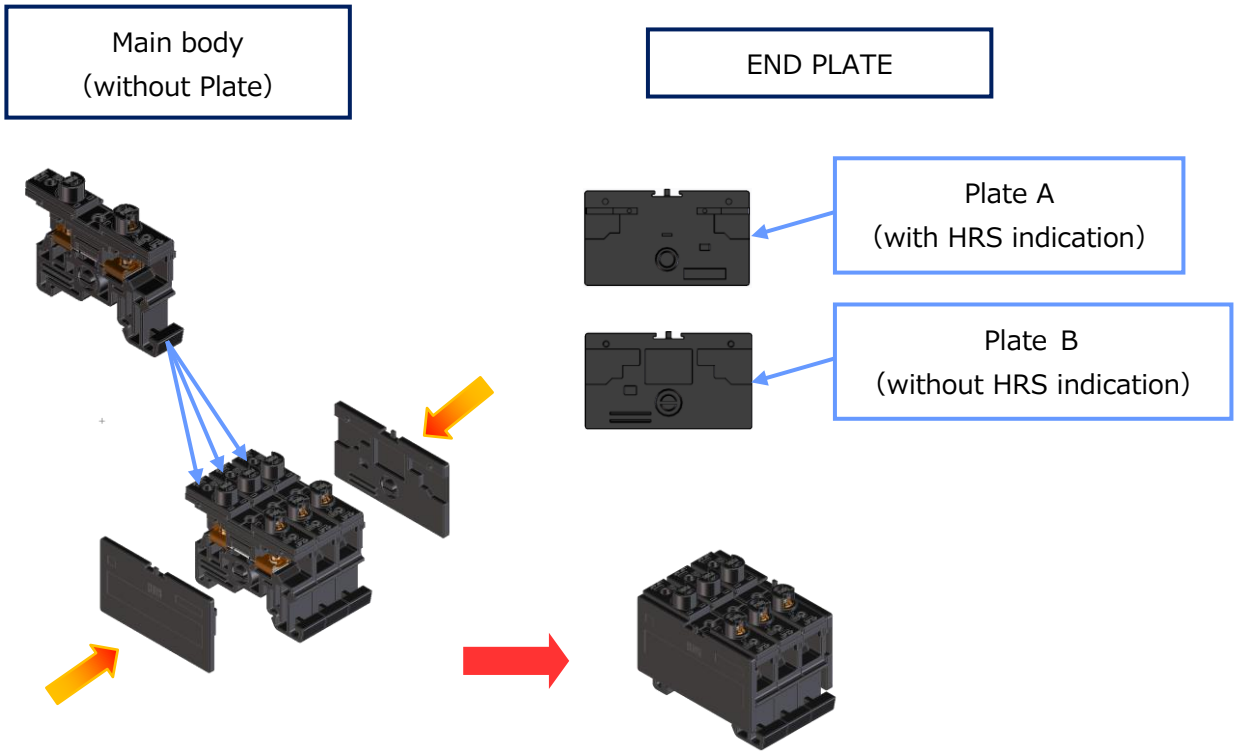
D30、D60

Combination of the product with a cover and the product without a cover creates a multi-pole product. (To be handled by the customer)

1-pole product
(product with cover)



For products with high pin counts use a combination of plateless and plate-only parts.

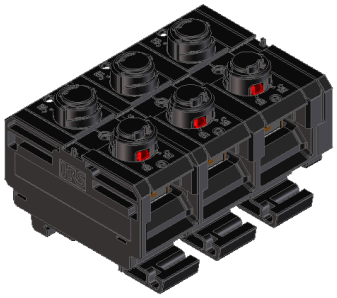


D150

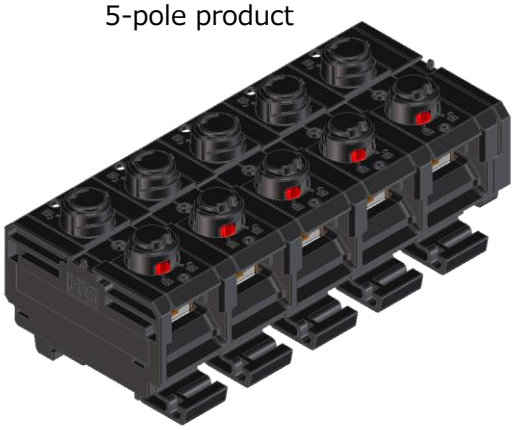
We provide an assembly with a maximum of 5 poles.
Therefore this product cannot be disassembled.

1-pole product

3-pole product



5-pole product

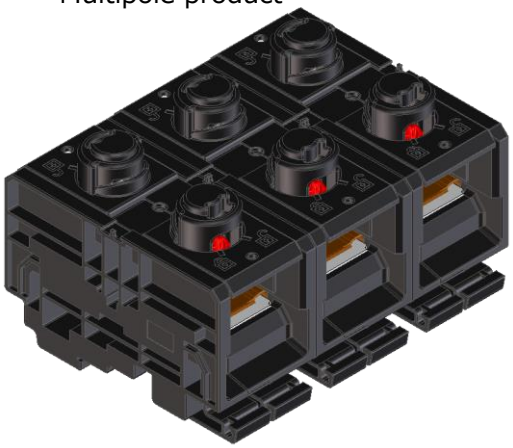


D200、D250、D400

Use 1-pole products as arranged. Respective products are not linked to each other.

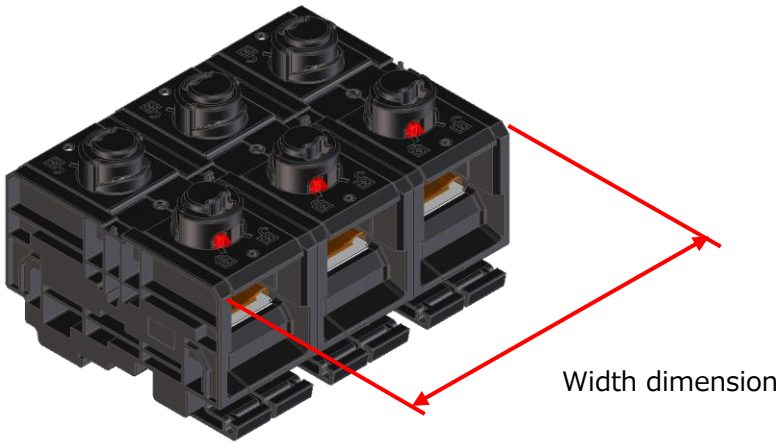
1-pole product

Multipole product



5.4.2 Width dimension in linkage [mm]

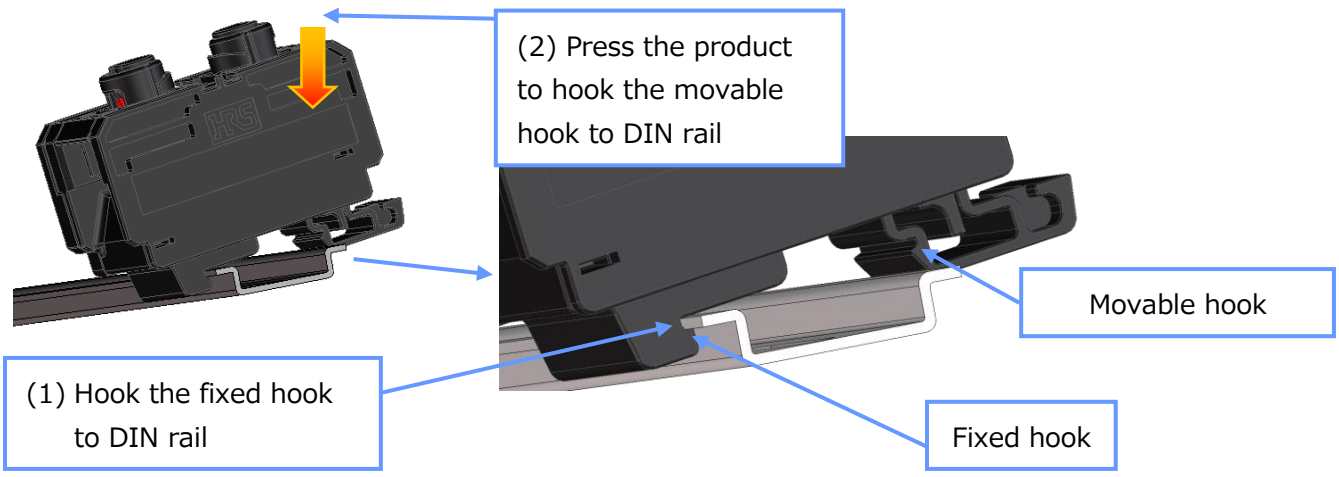
Current capacity sign	1 unit	2 units	3 units	n units
30	17.50	29.55	41.60	5.45 + 12.05 × n
60	21.00	36.55	52.10	5.45 + 15.55 × n
150	40.50	70.00	99.50	40.5 + 29.5 × (n-1)
200	40.40	80.80	121.2	40.4 × n
250	49.60	99.20	148.80	49.6 × n
400	55.00	110.00	165.00	55 × n



5.5 Mounting and removing to and from DIN rail

5.5.1 Basic mounting method

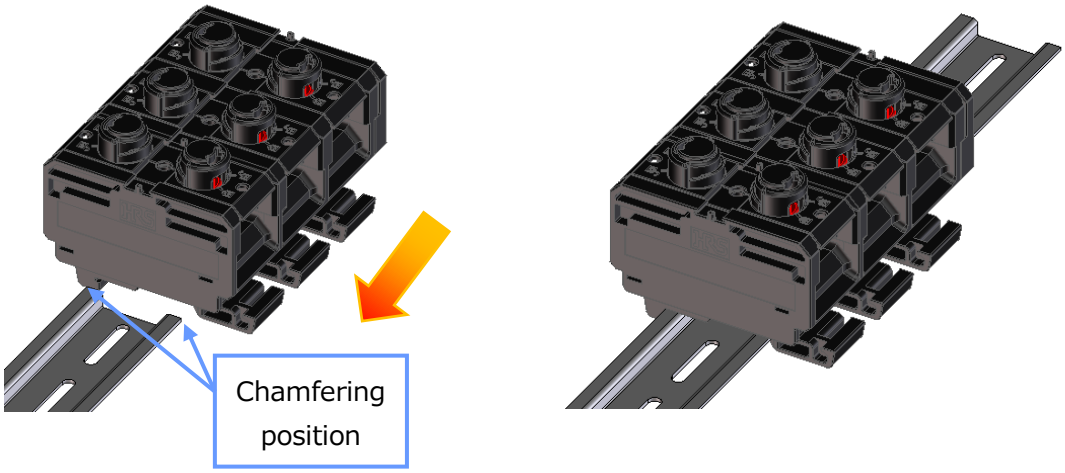
As shown in the figure below with the fixed hook hooked to the DIN rail, press the product until the movable hook is hooked to the DIN rail.
Do not use a deformed DIN rail as doing so may damage the product.
Applicable DIN rail: JIS C 2812 top hat type 35-7.5



5.5.2 When the mounting described in 5.5.1 is difficult:

Mount the product by sliding it from the DIN rail end as shown in the figure below.

If it is difficult to fit the product in DIN rail, chamfer the DIN rail.



5.5.3 Fixing of product

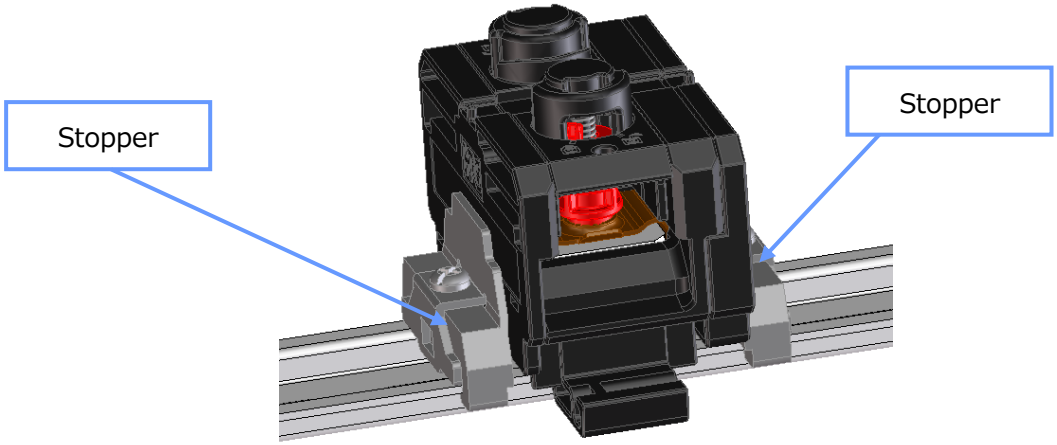
The mounted product must be fixed with a commercially-available stopper to prevent it from moving along the DIN rail.

The end plate easily disengages for products D30 and D60. Hold it with a stopper to prevent disengagement.

If the cable comes into contact with the end plate and the end plate comes off of the connector body, reattach the end plate to the connector body.

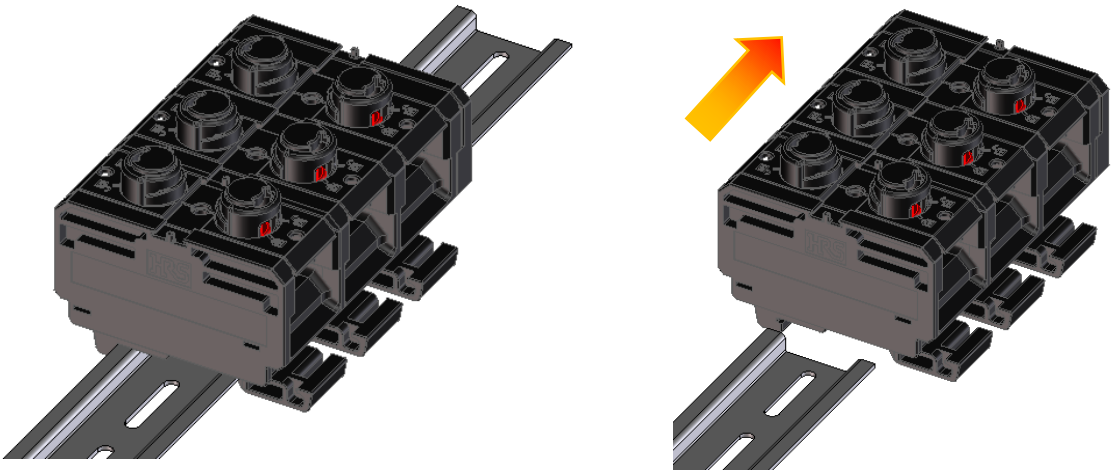
Applicable fastener: Use the one complying with applicable DIN rail.

Representative example: HDV-2 made by Toyogiken



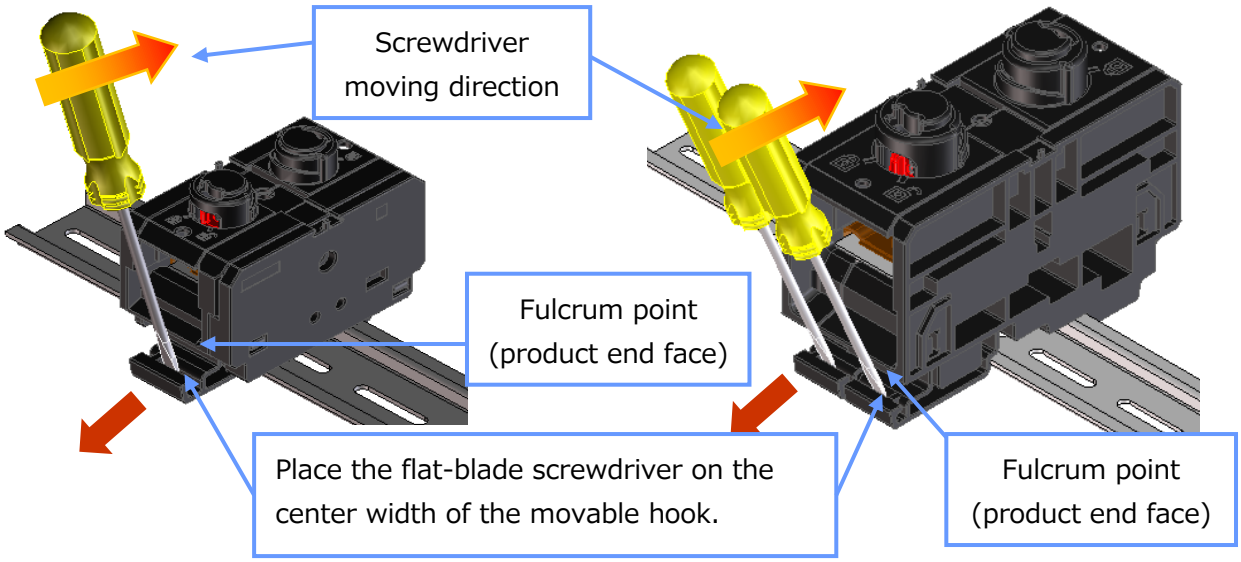
5.5.4 Removing product

Remove the product out of the DIN rail by sliding it as shown in the figure below.
Remove terminals from the product before removing the product.



If one unit is used, the product can be removed by placing the tip of a flat-blade screwdriver on the edge of the movable hook side and opening up the movable hook with the product end face set to fulcrum point.
For the D250 and D400 that have two movable hooks, remove the product by opening up the hook using two flat-blade screwdrivers simultaneously.
The position on which the flat-blade screwdriver is placed is the center section of the fixed hook in both cases.

●D30,D60,D150



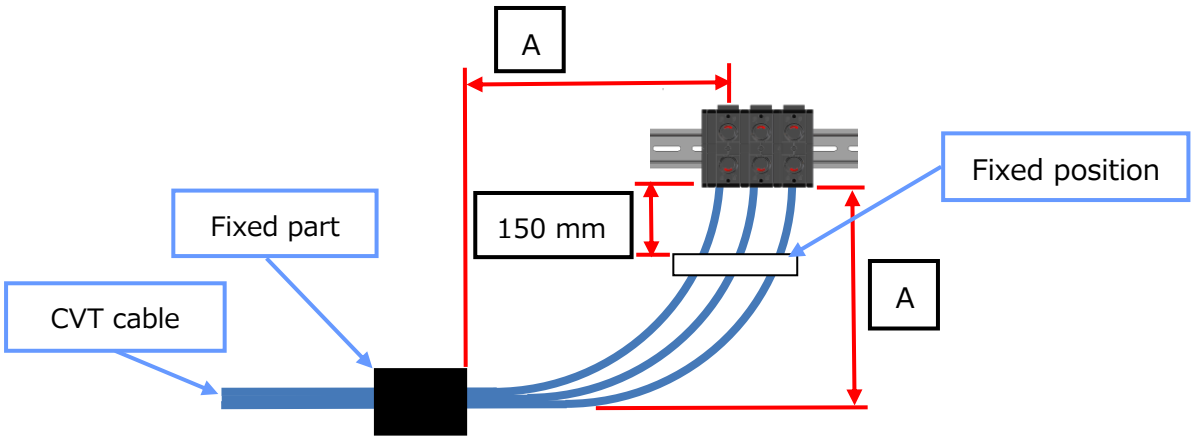
●D250,D400

5.6 Bending radius for each cable (bending radius which allows routing)

Bending R of cable is based on the table below.
When routing the cable sideways, refer to the bending R in the table below.
In consideration of influence from any vibration on the contact part, attach the cable 150 mm from the connector.
It is necessary to allow for a distance to the fixed part depending on the type of cable. Therefore, check that point when using cables.

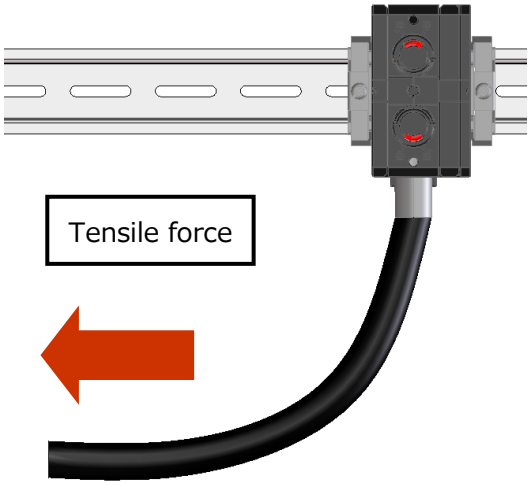
[mm]

Product name	Dimension A
	Cable size
EF2-D150-1	60 mm² : 200
EF2-D250-1	150 mm² : 360
EF2-D400-1	200 mm² : 410



5.7 Strength against prying of cable

The following table shows strength against prying of the cable.

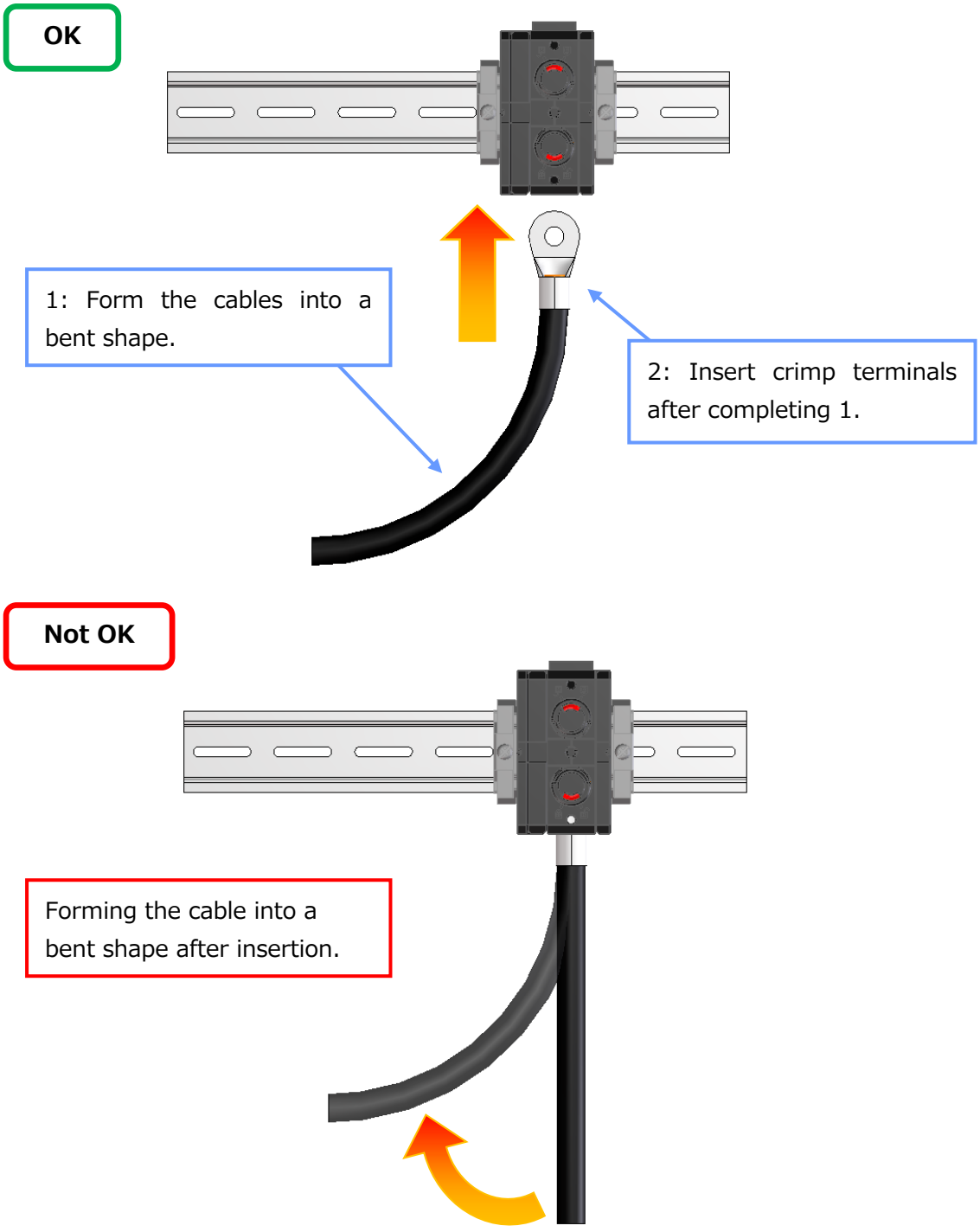


Applicable cable Stranded cable (mm^2)	1.25	2～3.5	5.5～8	14～22	38～60	150	200
Tensile force (N)	50	100	150	200	250	350	350

Caution: Unexpected load may cause damage to the connector,
depending on how the wire is handled. Follow the instructions in Sections 5.7.1 to 5.7.3.

5.7.1 About Forming Cables

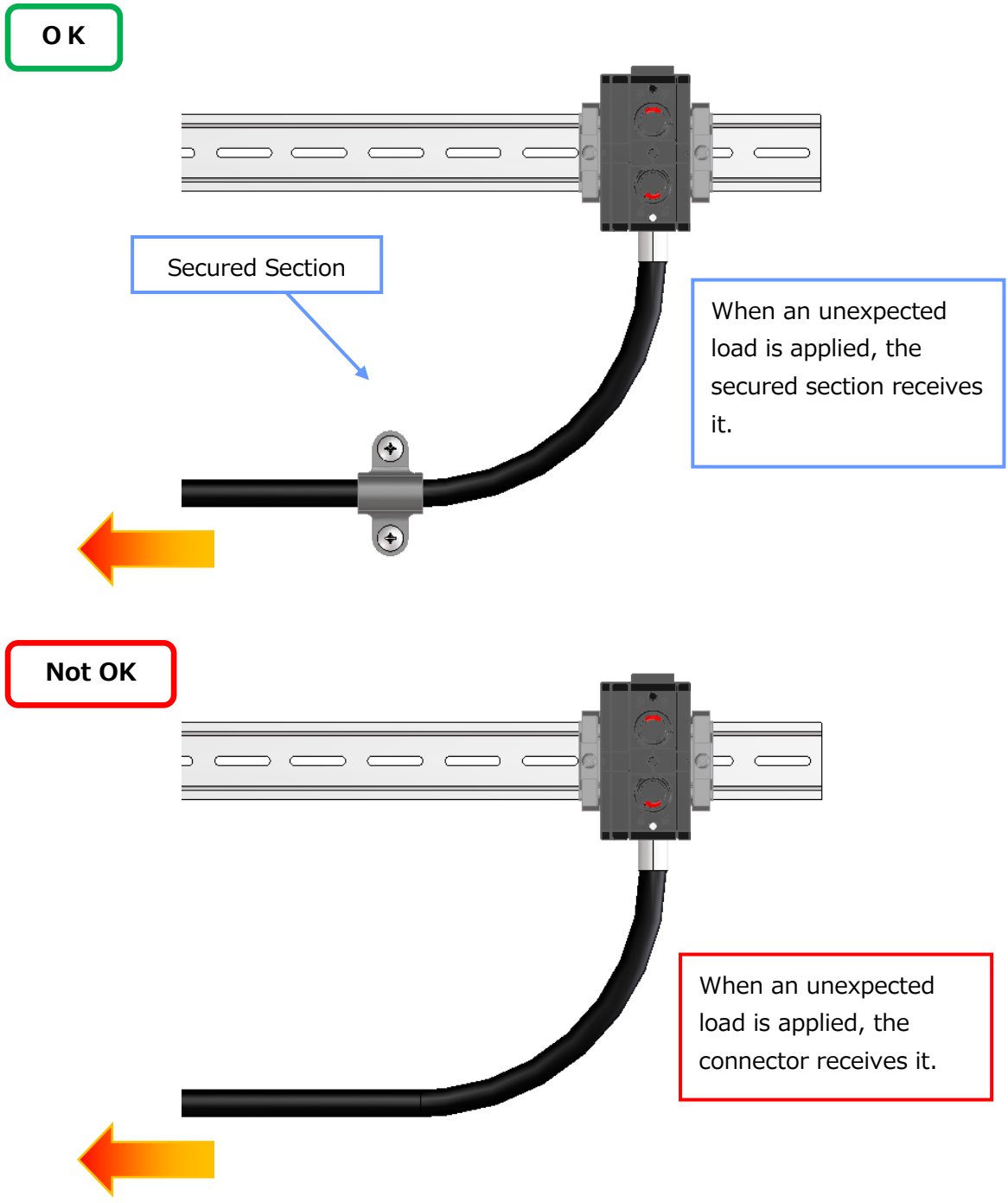
To prevent a load from being applied to the connector, form the cables into a bent position in advance before inserting crimp terminals.



Caution: Do not pull on the cable after inserting the crimp contact as it may produce an unexpected load that can damage the connector.

5.7.2 About Securing Cables

To prevent a load from being applied to the connector, form the cables into a bent shape in advance before inserting crimp terminals.

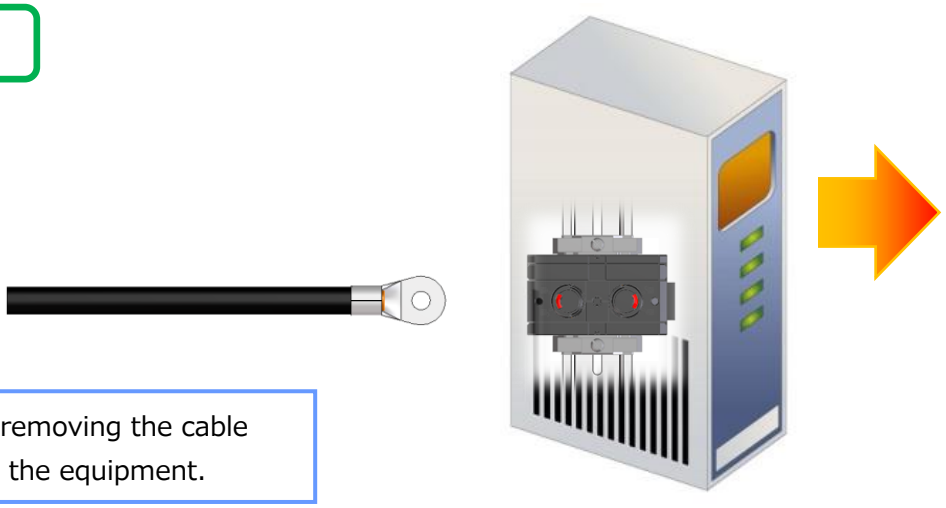


Caution: If an unexpected load is applied when the cable is not secured, the connector will be loaded. The lock may break, and in the worst case scenario, the cable may come out.

5.7.3 Removal of Cables When Moving Equipment

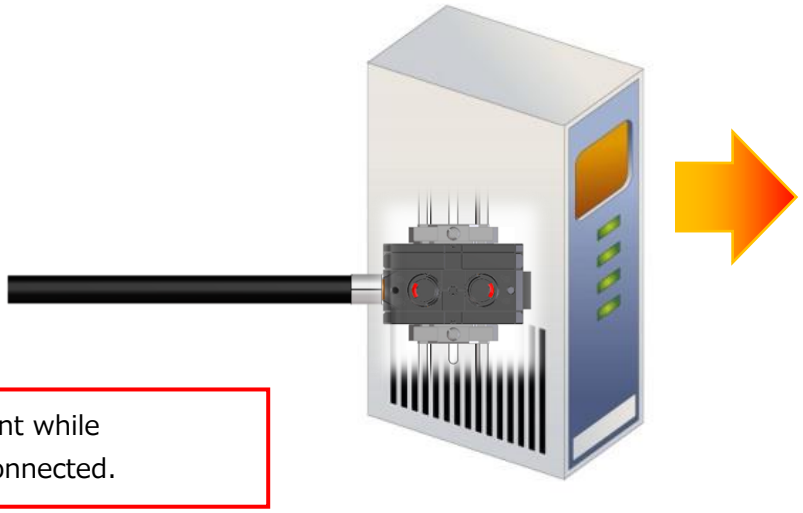
Remove the cables when moving equipment.

OK



After removing the cable move the equipment.

Not OK

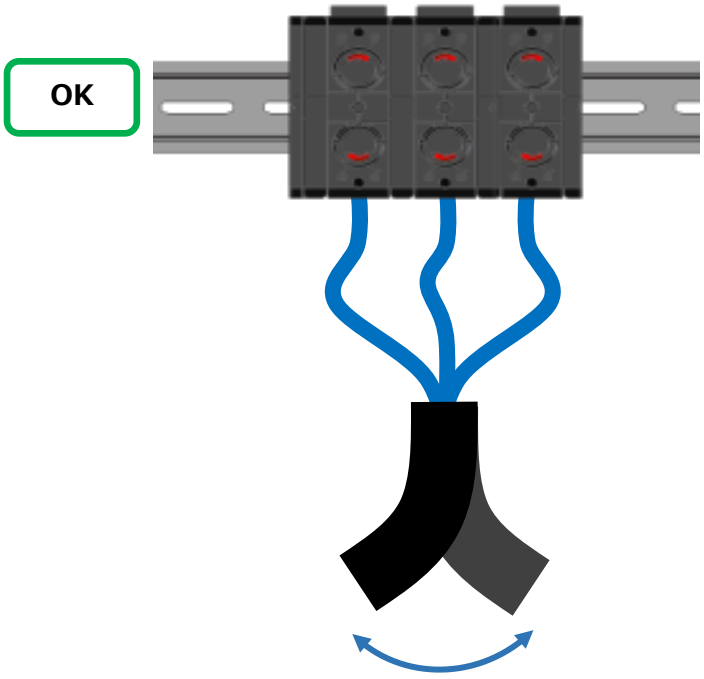


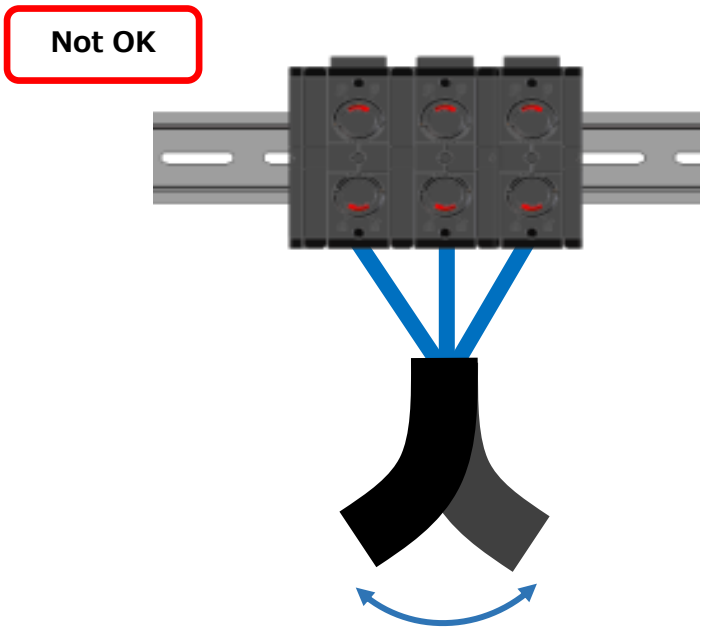
Moving equipment while the cables are connected.

Caution: When moving device with cables connected, the cable may receive an unexpected load, the lock may break, and in the worst case the cable may come out.

5.7.4 Strip Length of Capture Cable

When using a capture cable, ensure that the strip length is long enough to avoid loading the connector when the cable is swung.





Caution: If the strip length is short, the connector will be unexpectedly loaded when the cable is swung. In the worst case the cable may come out.

5.8 Nameplate

Use a commercially-available product, with a thickness of 0.5 mm and a width of 10 mm.

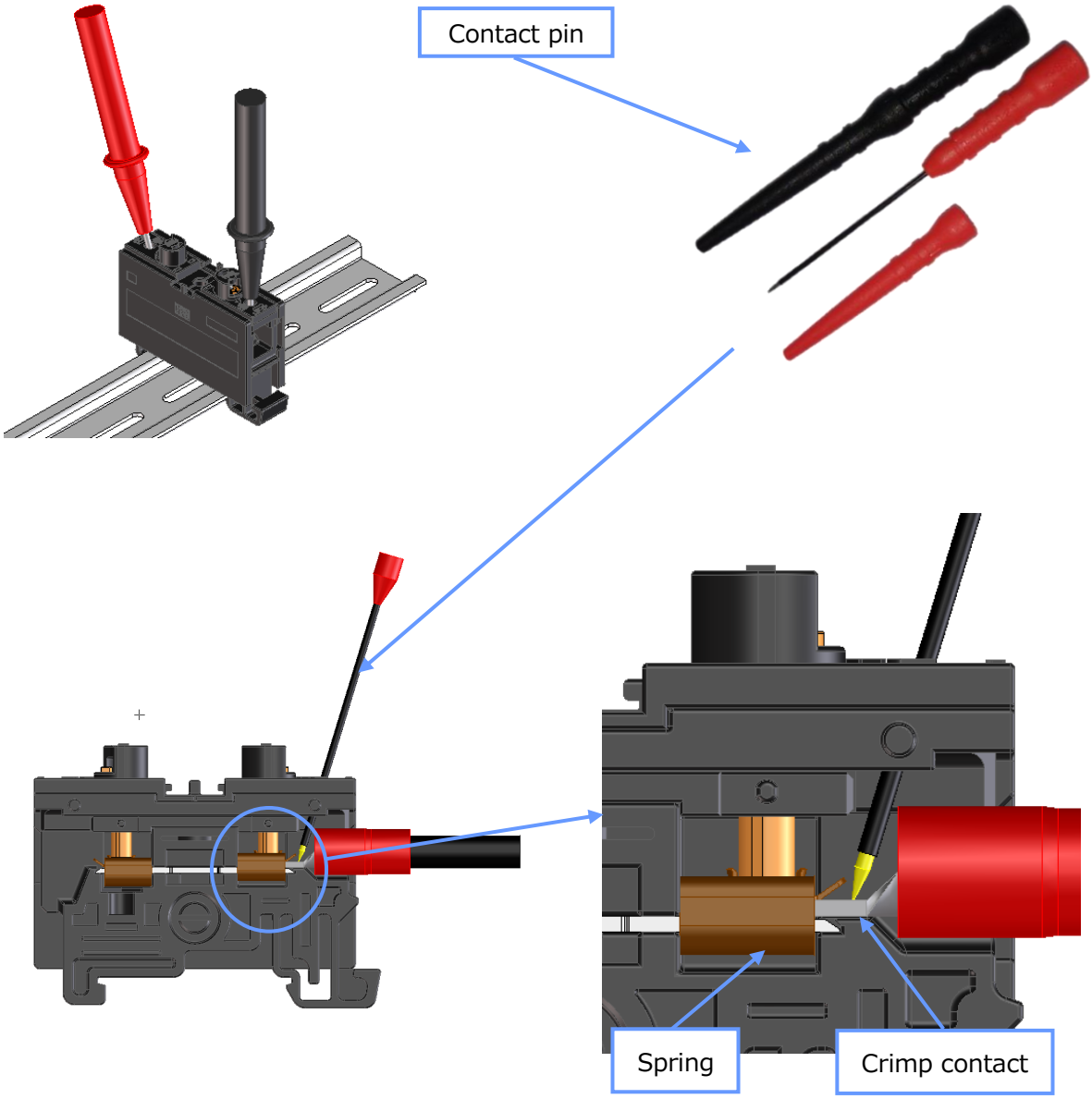
Reference product : AM-10 (Width: 10 mm) from TOYOGIKEN.

5.9 Applicable probe and usage

In voltage measurement, insert a probe through the hole of the cover case and contact it with the crimp contact or the spring.

It is recommended to use the attachment-type contact pin (diameter: 1 mm, length: 48 mm) for the tip of probe.

Example of use: Test lead L9207-10 (made by Hioki) + Contact pin L4933 (made by Hioki)



6. Connecting Tools

6.1 Recommended crimping tools

・When crimping a crimp contact, use the tool applicable to each crimp contact.

・Preform maintenance on the crimp contact to assure the crimp quality.

The following table shows examples of recommended crimping tools.

Recommended crimping tool	Applicable cable size (mm^2)	Remarks
5N18 made by Maxell Izumi Product Company	1.25, 2, 5.5, 8	Manual
REC-Li14S made by Maxell Izumi Product Company	2, 5.5, 8, 14	Electric
214A made by Maxell Izumi Product Company	2, 5.5, 8, 14	Manual
REC-Li60S made by Maxell Izumi Product Company	5.5, 8, 14, 22, 38, 60	Electric
9H-60 made by Maxell Izumi Product Company	14, 22, 38, 60	Manual
REC-Li150 made by Maxell Izumi Product Company	14, 22, 38, 60, 100, 150	Electric
REC-Li325 made by Maxell Izumi Product Company	150, 200	Electric
EZ4641 made by Panasonic Product Company	14、22、38、60、100、150、200	Electric

Revision history			
Revision	Date	Handled by	Comments
0	2018/06/26	H. Zemba	First version
1	2019/12/05	E. Kido	3.1: corrections,5.3.1: corrections, 5.3.4: additions, 5.7: corrections, 5.3.1 to 5.7.4: additions
2	2020/7/10	H.SATO	5.3.2.3: additions, 5.3.3.3: corrections
3	2020/10/16	S.MATSUZAKI	Cover: corrections, table of contents: corrections, 2,3.1,3.2,4.1: corrections, 5.1 Table 2: corrections, 5.3.1: corrections,5.3.2.3: corrections, 5.3.4.1,5.3.4.2: corrections, 5.3.4.3,5.3.4.5: additions, 5.4.1: corrections, 5.5.3: corrections