



WAGO Installation Connectors

Operating and safety instructions for the use of installation connectors
from WAGO GmbH & Co. KG

User Note
0888-9999/0100-0101

Date: 2024-10-23 Copyright



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1 Description

This document provides an overview of the installation of installation connectors from WAGO GmbH & Co. KG.

Also note the information:

- On the product
- On the packaging label
- In the included documentation
- On the product certificate
- On the Internet at <http://www.wago.com>

2 Warning

Caution: Observe handling and safety instructions – risk to life and limb.

1. Only for use by qualified electricians.
2. Do not work under voltage/load.
3. Use only as intended.
4. Observe national regulations/standards/directives.
5. Follow the technical specifications of the products.
6. Only use the permissible number of potentials.
7. Do not use damaged/dirty components.
8. Observe conductor types, cross-sections and strip lengths.
9. Insert conductors as far as they will go.
10. Use original accessories.

Include handling and safety instructions when passing product on to others.



Installation, testing and operation of the product is only permitted when performed by electrically qualified professionals in accordance with following safety instructions. These qualified professionals must be familiar with the basics of electrical engineering. They must be capable of identifying and preventing hazards. The corresponding symbol on the packaging indicates that installation and operation require personnel with electrical expertise.

Caution: Avoid danger to life and limb by observing installation instructions! When passing on the products to others, include the installation instructions.

The product must only be used for its intended purpose.
The products' technical data must be observed.

Never connect or disconnect electrical connections under voltage/load. Improper use and failure to follow these instructions may result in personal injury and/or equipment damage.

Proper use of the products as intended ensures the technical properties of the products in combination with WAGO accessories. The user bears all responsibility if any accessories are used other than original accessories sold by WAGO (including products from the community at WAGO Creators).

Applicable national regulations/standards/directives must be followed/observed.

Put products, conductors and cables into operation only if they are in perfect condition. They must be checked regularly for damage. Take defective products, conductors and cables out of operation immediately. Replace any damaged products. Repairing the WAGO products is not permitted.

If conductor ends are damaged, they must be trimmed and prepared again.

Only permissible conductor types, conductor materials and conductor treatments may be used. In particular, conductors must be stripped to the specified strip length, and the conductor must be inserted as far as it will go. You can find this information in the technical data.

Make sure there is no contamination on the contact surfaces of conductors and cables.

Only use the permissible number of potentials when connecting conductors.

Use of push-in connection technology and reuse are only allowed if permissible products are used with permissible conductors. Additional details can be found in the corresponding certificates.

For installations above the extra-low voltage (ELV) limits, it is necessary to ensure that the conductors/cables are secured in place, e.g., by the conductor/cable routing or by use of suitable strain reliefs.

3 Using WAGO Splicing Connectors

3.1 General Application Notes

The user bears all responsibility if the product is used directly in conjunction with third-party products. Applicable national regulations/standards/directives must be followed/observed.

If applicable, appropriate enclosures (e.g. junction boxes) for the installed WAGO splicing connectors must be selected according to the respective national standards.

WAGO splicing connectors are suitable for various types of mounting, such as:

- Flying lead connection
- Carrier mounting on:
 - DIN-rails

- Surfaces
- The strain relief function must be ensured by the conductor/cable routing.
sicherzustellen.
- Install connectors and their accessories in suitable housings.
- Observe the specifications for touch-proof protection.

3.2 Additional Instructions for Use in Hazardous Areas

The connectors must be installed in a housing that meets the requirements of a recognized protection type in accordance with basic international standards IEC 60079-0, Section 1 or IEC 60079-31.

These connectors, which are approved for hazardous areas, must be secured in place.

WAGO splicing connectors with the corresponding WAGO mounting carriers are approved for maintaining clearances and creepage distances and for securing the connectors in place. In addition, other adapters or other suitable devices can be used if they meet the requirements of IEC 60079-7 on clearances and creepage distances and are approved separately.

Detailed information (such as country-specific information) can be found in the corresponding Ex certificate.

The permissible operating voltage of the specific connectors depends on the mounting method and is only approved in conjunction with the corresponding WAGO mounting carrier.

See certificates, as well as section “Accessories,” subsection “Mounting Carriers.”

4 General Electrical Contacts

Use only accessories and tools recommended by WAGO.

Observe the associated technical data.

You can find this information in the following locations:

- On the product
- On the packaging
- In the included documentation
- On the Web by following the WAGO link for the product
- In the product download area
- In the catalog
- On the product certificate

4.1 Connection Technologies for Connecting Copper Cables

For each item, it is necessary to consult the technical data / certificates to identify the permissible connectable conductors.

4.1.1 CAGE CLAMP®

A CAGE CLAMP® connection terminates the following conductor types:



Solid



Stranded



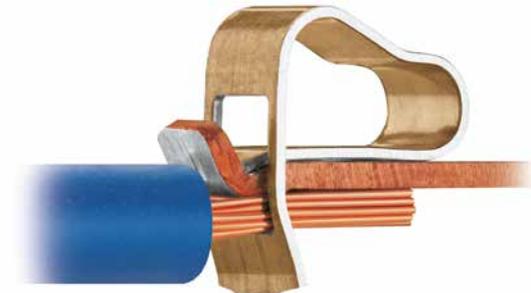
Fine-stranded, also with
tinned single strands



Fine-stranded, tip-bonded



Fine-stranded, with ferrule
(gastight crimped)



A CAGE CLAMP® connection is included in the following series: 221 – max. 4 mm²; 221 – max. 6 mm²; 221 – max. 4 mm²; 221 Series 221 Inline Splicing Connectors – max. 4 mm²; 222 and 224 – max. 6 mm²

Preparing the conductor

Strip the conductor to the specified length. The required conductor strip length can be found on the packaging or, if applicable, on the product housing.

Opening the clamping unit

The clamping unit must be opened fully. Proceed as follows depending on the actuation type:

- Lever: Open the clamping unit by raising the lever to the vertical position.
- Finger-operated lever: Press the finger-operated lever down as far as it will go.

Inserting the conductor

Insert the conductor into the open clamping unit as far as it will go. With a transparent housing, you can check the position of the conductor.

Closing the clamping unit

actuation type:

- Lever: Push the lever back down till it lies flush with the connector housing.
- Finger-operated lever: Release the finger-operated lever.

Releasing the conductor

Opening the clamping unit

The clamping unit must be opened fully. Proceed as follows depending on the actuation type:

- Lever: Open the clamping unit by raising the lever to the vertical position.
- Finger-operated lever: Press the finger-operated lever down as far as it will go.

Removing the conductor

Remove the conductor completely from the open clamping unit.

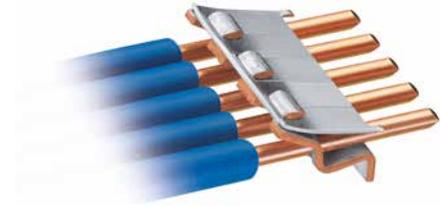
4.1.2 PUSH WIRE®

4.1.2.1 PUSH WIRE®, Solid

The PUSH WIRE® connection terminates the following conductor types:



Solid



The PUSH WIRE® connection is included in the following series: **2273, 224 and 243**.

Preparing the conductor

Strip the conductor to the specified length. The required conductor strip length can be found on the packaging or, if applicable, on the product housing.

Inserting the conductor (without activating clamping unit)

- Push the stripped conductor past the first force/pressure point into the round conductor entry until it reaches the end stop.
- With a transparent housing, you can check the position of the conductor.

Releasing the conductor (without activating clamping unit)

Remove solid conductors from the connector by twisting them back and forth in alternating directions while pulling gently.

4.1.2.2 PUSH WIRE®, Solid and Stranded

The PUSH WIRE® connection terminates the following conductor types:





The PUSH WIRE® connection is included in the following series: **773, 2773 and 873**.

Preparing the conductor

Strip the conductor to the specified length. The required conductor strip length can be found on the packaging or, if applicable, on the product housing.

Inserting the conductor (without activating clamping unit)

- Push the stripped conductor past the first force/pressure point into the round conductor entry until it reaches the end stop.
- With a transparent housing, you can check the position of the conductor.

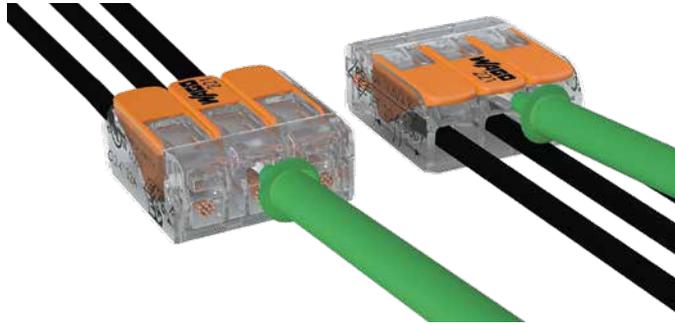
Releasing the conductor (without activating clamping unit)

Remove solid conductors from the connector by twisting them back and forth in alternating directions while pulling gently.

- Stranded conductors cannot be removed.

4.2 Testing

Use the corresponding test slot for voltage testing. Applicable national regulations/standards/directives must be followed/observed.



221: The 221 Series offers two test slots. One test slot is located on the conductor connection side above a conductor entry, and the other on the opposite side.

221-24xx (Inline Splicing Connector with Levers, 221 Series): These offer a test slot accessible from above between the two levers of a potential.

2273, 222, 773: These series offer a test slot on the side opposite the conductor entries.



Example: 2273, 773 Series



Example: 222 Series

2773: The 2773 Series offers a test slot on the side opposite the conductor entries.



2773-24xx (PUSH WIRE® Inline Splicing Connector, 2773 Series):
Do not have a test slot.

224: The 224 Series offers a test slot (see “test”) on the bottom of the connector.



243: The 243 Series offers a test slot (see “test”) on the conductor connection side, below the conductor entries.

873: The 873 Series does not have a test slot.



5 Accessories:

5.1 Mounting Types for WAGO Installation Splicing Connectors

Permissible types of mounting for WAGO installation splicing connectors:

- If it is necessary to secure the splicing connectors, e.g., on DIN-rails or surfaces, you can use the corresponding WAGO mounting carriers.

Strain relief:

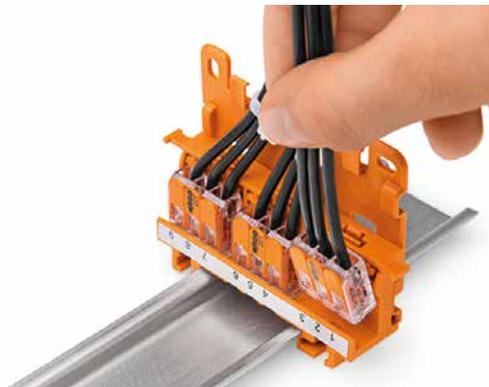
- With some WAGO mounting carriers, strain relief for the conductors/lines can be implemented directly with cable ties or by adding a suitable strain relief plate.

221 Series: Various WAGO mounting carriers are available for the WAGO 221 Series Splicing Connectors, which can be mounted on DIN-rails and/or surfaces.

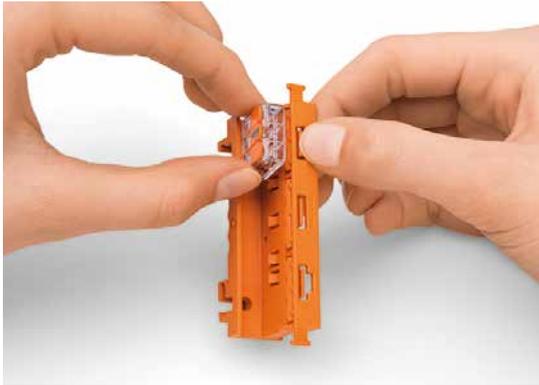
WAGO Mounting Carriers

Mounting the connector

Snap the connector into the WAGO mounting carrier



Removing the connector



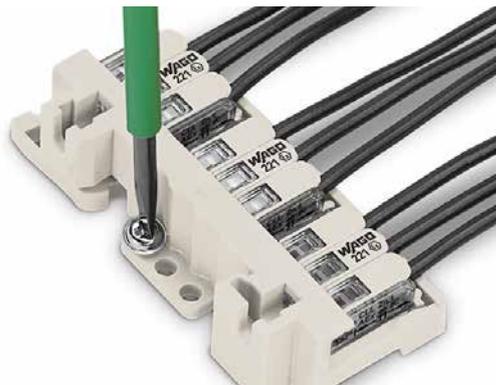
Release the splicing connector from the WAGO mounting carrier

Specific Information for WAGO Mounting Carriers in Hazardous Areas

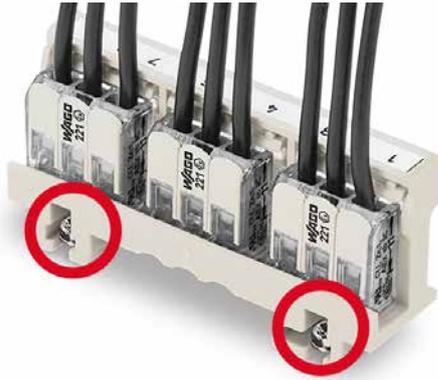
221 Series Ex – Examples of 440 V Mounting



Positioning the connector in a WAGO mounting carrier with a spacer between the connectors

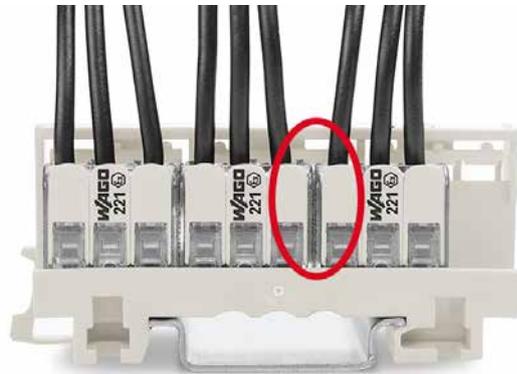


Horizontal screw mounting on a flat surface



WAGO mounting carrier screw mounting with a screw made from non-conductive material

221 Series Ex – Examples of 275 V Mounting



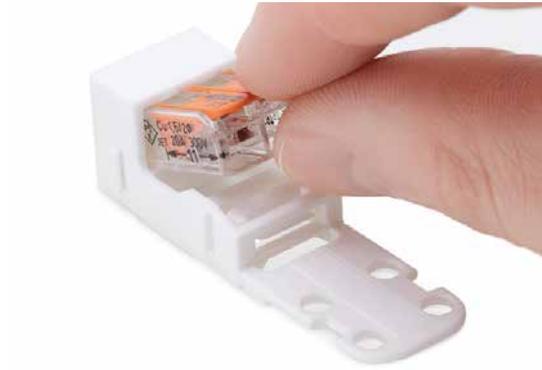
Positioning the connectors in the WAGO mounting carrier without a spacer between the connectors



WAGO mounting carrier screw mounting with a conductive screw

Single mounting carrier:

Mounting the connector



Snap the connector into the WAGO mounting carrier.

Removing the connector



Remove the connector from the WAGO mounting carrier.

WAGO Inline Splicing Connector, Item Number 221-24xx: Installing the WAGO Inline Splicing Connector

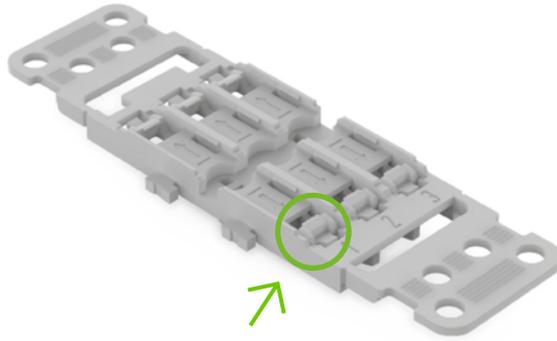


Place the WAGO inline splicing connector on the WAGO mounting carrier, in front of the mounting position.



Slide the inline splicing connector to the center till it snaps into place.

Removing the inline splicing connector



Remove the inline splicing connector from the mounting carrier by pressing the release tab.

2273 Series: For the WAGO 2273 Series Splicing Connectors, we offer a WAGO mounting carrier that can be mounted on DIN-rails and/or surfaces.

Mounting the splicing connector



Snap the connectors into the WAGO mounting carrier from above.

In its original condition upon delivery, the width of the WAGO mounting carrier is suitable for the following single-row connectors: item numbers 2273-202, 2273-203, 2273-204 and 2273-205.

For two-row connectors (item number 2273-208), the width of the WAGO mounting carrier must be adjusted as follows:



To adjust the mounting carrier, unlock the latch with the WAGO operating tool (5.5 mm blade) and turn the tool to move the clamping slide to the required width.

Removing the WAGO splicing connector

Spread the WAGO mounting carrier apart slightly with an operating tool and remove the connectors from the side.

222 Series: For WAGO's 222 Series Splicing Connectors, we offer a mounting carrier that can be mounted on DIN-rails and/or surfaces.

Mounting the connector



Slide the connectors into the WAGO mounting carrier from the side and use the locking mechanism to protect them against slipping out. The mounting carrier can be mounted on surfaces in various ways:

Removing the WAGO splicing connector



After opening the locking mechanism, remove the connectors from the side of the WAGO mounting carrier.

773 Series: For the WAGO 773 Series Splicing Connectors, we offer a WAGO mounting carrier that can be mounted on DIN-rails and/or surfaces.

Mounting the connector



Slide the connectors into the WAGO mounting carrier from the side and use the locking mechanism to protect them against slipping out.

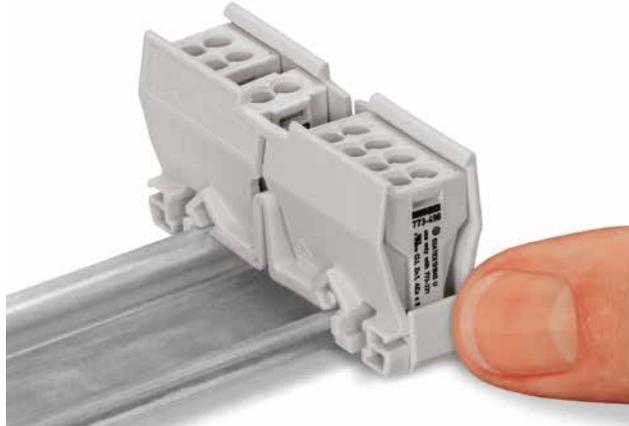
Removing the connector



After opening the locking mechanism, remove the connectors from the side of the WAGO mounting carrier.

773 Series Ex, Example: 275 V Mounting

Mounting the connector



Slide the connectors into the mounting carrier from the side and use the locking mechanism to protect them against slipping out.

773 Series Ex, Example: 550 V Mounting

Mounting the connector

Slide the connectors into the WAGO mounting carrier from the side and use the locking mechanism to protect them against slipping out. Only one connector may be used per side of the carrier.

2773 Series:

Mounting the WAGO splicing connector



Snap the connectors into the WAGO mounting carrier from above.

In its original condition upon delivery, the width of the WAGO mounting carrier is suitable for the following single-row connectors: item numbers 2773-402, 2773-403, 2773-404 and 2773-405.

For two-row connectors (item numbers 2773-406 and 2773-408), the width of the WAGO mounting carrier must be adjusted as follows:



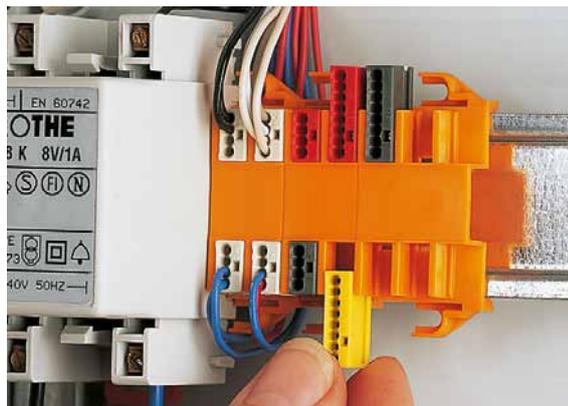
To adjust the mounting carrier, unlock the latch with the operating tool (5.5 mm blade) and turn the tool to move the clamping slide to the required width.

Removing the WAGO splicing connector

Spread the WAGO mounting carrier apart slightly with an operating tool and remove the connectors from the side.

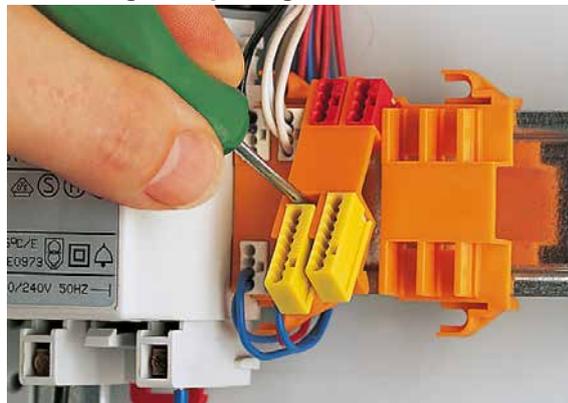
243 Series:

Mounting the splicing connector



Insert the splicing connector into the WAGO mounting carrier from the side.

Removing the splicing connector



Slide the splicing connector out of the WAGO mounting carrier from the side.

5.2 Using Ferrules

If certain requirements are met, ferrules can be connected to the CAGE CLAMP® connection.

These requirements are:

- Use only permissible tinned ferrules per DIN 46228, and then crimp them gas-tight to form a square cross-section.
- The permissible length and type of the ferrule can be found in the product-specific documentation for the corresponding connector.



5.3 Terminating Aluminum Conductors

WAGO connection technology is designed for connecting copper conductors.

Only the following are suitable for connecting solid aluminum conductors:		
PUSH WIRE® Series connections:	CAGE CLAMP® Series connections:	Screw connections of the following series:
2273	224	883
773	222	Note: Link www.wago.com/de/d/8211189
224	280/281/780/781	

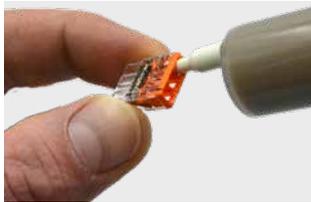
For connecting aluminum conductors, WAGO Alu-Plus Contact Paste (item number 249-130) must always be used. Connecting aluminum conductors in hazardous (Ex) areas is not permitted. The operating temperature range of the Alu-Plus Contact Paste extends to +50 °C. The following steps must be taken:

1. Use a syringe to press the contact paste into the corresponding clamping

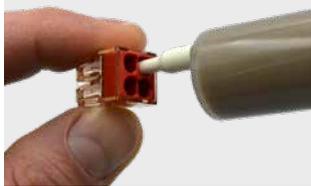
unit until the clamping unit is completely filled. For CAGE CLAMP® and WAGO splicing connectors with levers, use the assembly tool or lever to open the spring clamp before pushing the syringe plunger down.

2. Only use of solid aluminum conductors is permissible.

2273 Series



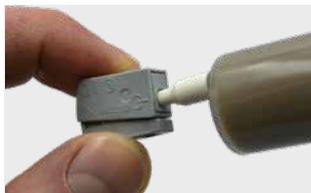
773 Series



222 Series



224 Series



280/281/780/781 Series



3. Strip the aluminum conductor to the length specified in the data sheet or on the housing.



4. Remove the oxidized layer from the stripped end of the aluminum conductor, for instance by scraping it off thoroughly.



5. To prevent re-oxidation, immediately after cleaning the stripped conductor, either coat it generously with Alu-Plus Contact Paste from the syringe, or insert it directly into the pre-filled clamping unit as far as it will go.

WAGO also offers connectors (item number 2273-24x) that come factory-filled with contact paste. These connectors have an operating temperature range extending to max. 60 °C.

For connector series not suitable for aluminum conductors, Cupal ferrules, e.g., from Klauke, may be used. In such cases, it is essential to take proper measures to ensure protection against accidental contact with fingers and to maintain the required creepage and clearance distances (e.g., by using heat-shrink tubing). Due to the lower conductivity of the aluminum conductors, the reduced nominal currents must be taken into account (e.g., 2.5 mm² = 16 A and 4 mm² = 22 A).

5.4 Jumpers, 221-94x Series

Jumpers for electrical connection of two WAGO 221 Series Splicing Connectors, 4 mm² or 6 mm²; only for use with fixed-position connectors in the WAGO 221 Series Mounting Carriers, 4 mm² or 221 Series, 6 mm², and in the WAGO 221 Series Junction Box, 4 mm²; the jumper can be used with both 221 Series connector sizes, 4 mm² and 6 mm², and is available with or without a locking function and in different colors.

Locking function

The locking function of the jumpers prevents unintentional disconnection. For N- or PE-distribution, use only jumpers with locking function. Only jumpers with locking function can be used to secure the jumper against unintentional disconnection and prevent serious distribution interruptions. The jumper can be disconnected by releasing the locking mechanism. A jumper from which the locking mechanism has been removed can still be used for commoning without the locking function if the metal part's insulation is undamaged. Check the insulation carefully to ensure that it is undamaged!

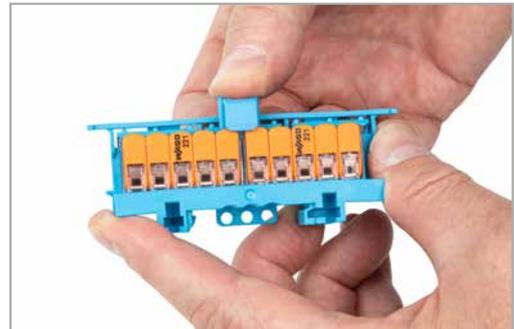
Mechanical properties

Plug-in mounting for jumpers with locking function, clamping units for jumpers without locking function; insertion into open clamping units for jumpers without locking function

Connecting the jumper

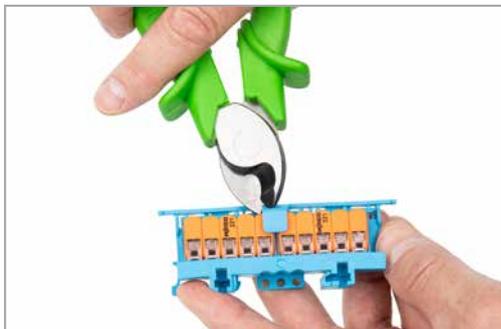


Inserting a jumper without locking function into open clamping units



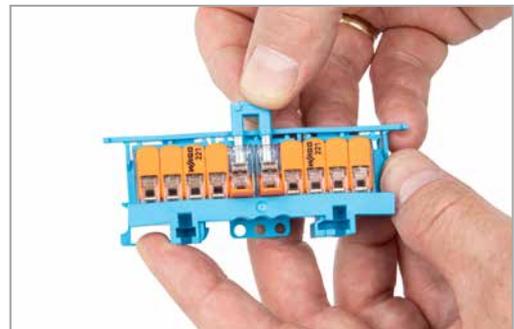
Inserting a jumper with locking function into closed clamping units

Removing the jumper



Required only for jumpers with locking function

Removing the locking mechanism for intentional jumper removal



Removing a jumper from open clamping units

On a jumper from which the locking mechanism has been removed, carefully check for damage of the metal part's insulation! An undamaged jumper from which the locking mechanism has been removed can be used for commoning without the locking function.

5.5 WAGO Gelbox, Item Number 207-13xx/207-14xx

Low voltage:

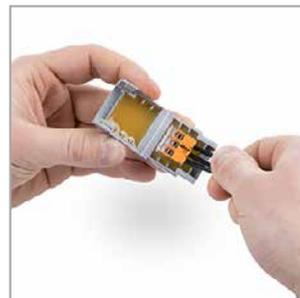
For low-voltage applications (e.g., 230 V), double insulation must be provided for the entire system, especially for the conductors. This can be achieved by installing the Gelboxes in a housing/junction box per EN 60670, for example.

Extra-low voltage:

For extra-low voltage applications (e.g., SELV), basic insulation of the electrical cable is sufficient. The basic insulation of the cable must be suitable for the intended application. The Gelboxes must not be reused, since their watertightness cannot be guaranteed if used again. The connectors must also not be reused. The connectors' rating data must be taken into account. Observe the terminal diagram for the Gelbox in question! Only use permissible combinations.



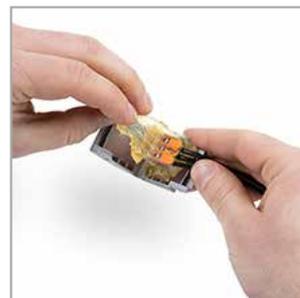
Open the Gelbox with the side latch.



Place the connected splicing connector in the Gelbox.



Close the Gelbox.



Easy circuit extension:
Open the Gelbox, remove the gel from the connector, open the connector and connect the new components to the cable.

5.6 WAGO Junction Box, Item Number 207-4301

Suitable for use with WAGO 221 Series Splicing Connectors, 4 mm², 221-41x.

Use:



Snap the connector into the holder.



Release the connector from the holder.



Snap the marking strip into the holder.



Insert the cable into the strain relief.



Insert the conductor.



Break the cable entry out of the cover.



Snap the cover on.

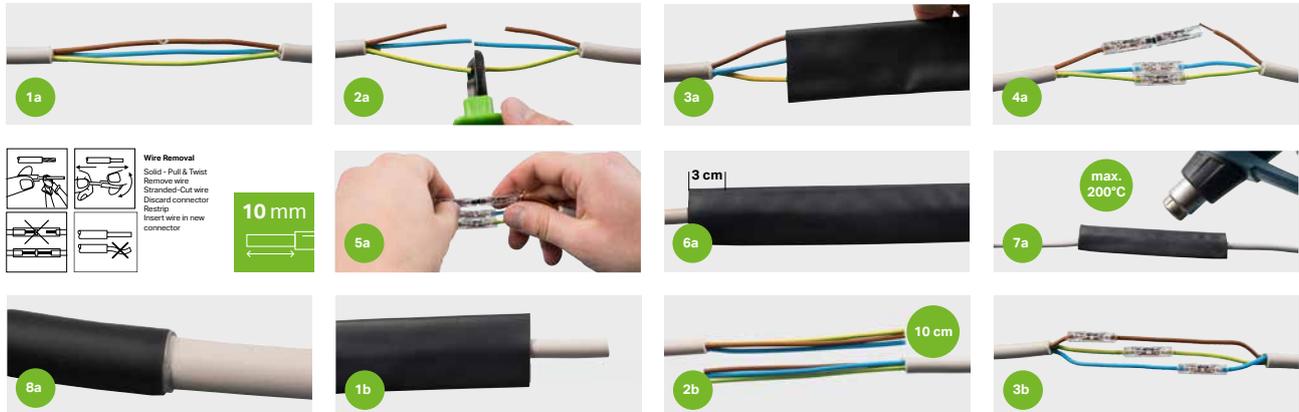


Snap the cover off.

5.7 WAGO Cable Repair Kit

A repair kit, e.g., item number 207-5485/316-000, is available for repairing damaged cables in the space behind a flush mounting.

Information about the WAGO Cable Repair Kit



Information about the Inline Splicing Connector (Item Number 2773-2401)



EN: For repair and extension applications in fixed installations

Damaged cable

- 1a. Strip the damaged cable about 10 cm symmetrically around the damaged section.
- 2a. If sections of the copper are damaged, cut out the damaged sections and disconnect all other conductors. For damaged sections between 1 mm and 30 mm in length, at least 30 mm of the damaged conductor must be removed. Tip: A connector (about 30 mm long) can be used to gauge the length.
- 3a. Pull the shrink tube over the cable end.
- 4a. Strip 10 mm of insulation from the conductor and wire jumper according to the specifications and place the connector. Only one connector is required for damaged sections < 1 mm in length or for cables that have been cut straight across. For damaged areas > 1 mm in length, two connectors with wire jumpers must be used.
- 5a. With wire jumpers, ensure a sufficient cross-section. The length of the wire jumper corresponds to that of the section of cable that has been cut out, but must be at least 30 mm. It is necessary to maintain insulation on the wire jumper between the connectors.
- 6a. Pull the shrink tube over the conductors. At least 3 mm of the length of the shrink tube must overlap with the cable sheath.
- 7a. Heat the shrink tube evenly with a hot air blower between 110 °C and 200 °C.
- 8a. The shrinking process is not completed until the shrink tube lies tight around the cable and the adhesive has visibly melted (see photo).

Extend cable: For compact extension of cables, arrange inline splicing connectors either in a staggered pattern (see figures), or in a bundle in the center.

- 1b. Pull the shrink tube over the cable end.
- 2b. If inline splicing connectors are to be arranged in a bundle, strip 5 cm of cable on each side. For a staggered arrangement of the inline splicing connectors, strip 10 cm from the cable and trim the conductors in pairs.
- 3b. Strip 10 mm of conductor according to specifications and place the inline splicing connector. Example illustration with staggered inline splicing connector; go to step 6.