

General Precautions

For winding operation using magnet wires, the treatment and operational precautions based on the properties thereof are described below.

1. Do dimensions (thickness and width) conform to the specifications?

Dimensions that passed inspection at the time of wire manufacture are put to use; there may be no need to inspect the dimensions again. In case of misuse for reasons related to storage, management, or other such processes, be sure to measure the outside diameter, width and thickness immediately before use, checking that the dimensions conform to the intended purpose.

2. Is there residual oxide film on bare wire surface?

Especially when winding a bare wire around a coil, the presence of an oxide film on the wire surface may pose a problem in soldering or the oxide film may come off as a fine powder and get into the coil insulation. Thus, when using a wire with a substantial oxide film, it is better to perform acid pickling, neutralization, and rinsing before use.

3. Are flaws or frictions checked for?

Wires may have been damaged due to poor handling during transport or storage. Accordingly, after inspecting the wires carefully, small flaws are repaired and significant flaws removed. Aluminum conductors are soft and easily deform; special care is needed during handling.

4. How to handle excess wires

After the coil winding process, excess wires shall be stored away from dust particles (metal powder in particular), moisture, and direct sunlight.

Precautions for Enamelled Wires

The insulation properties of enameled wires are generally ensured with a very thin coating. Therefore, take special note that these wires are susceptible to external damage by sharp-edged tools

1. Minimize stretching during the coil winding process!

Wire stretching shall be minimized during coil winding process. Stretching decreases the film thickness, leading to deterioration in properties. The smaller the stretching, the better it is. If stretching is limited to less than 5%, the property degradation of enameled wires, except for thin wires, will generally be lessened.

2. Exercise care in selecting treatment varnish

Generally, coils are varnish-treated after the coil winding process. However, various types of coil varnishes have been developed and are in use. Great care shall be exercised in combining these varnishes.

3. No releasing agent shall be dispersed

When using a chemical release agent to remove film before performing terminal soldering, special care must be exercised so that the release agent does not adhere to other portions of the coil. It is also important to neutralize the release agent and rinse it thoroughly with water after film removal. Failure to do so may cause narrow wires to become corroded and disconnected; due care must be exercised. When peeling films, be sure to wear protective gear such as goggles to prevent chemicals and separated chips from getting into the eyes.

COIL FORMING: OPERATIONAL PRECAUTIONS

Since general notes for handling wires have already been described, the below paragraphs describes some considerations for forming coils.

1. Considerations for Coil Forming

Dies are used for forming coils in many cases. A flaw on a die surface causes damage to the wire coating; die surfaces should be checked for damages.

2. Automatic Machine Winding

There is a trend toward direct coil winding to electric equipment by using an automatic coil winding machine. In general, there are a number of factors that make wires subject to harsh bending and stretching. Careful consideration must be given in advance to check coils with wires wound by a machine for damage or decreased dimensions.

3. Repairing at Corners

In some cases, coating wires are bent with a few millimeters of bend radius by using the coil of a rotating machine. It is inevitable that films are damaged at the corners to some extent; detailed maintenance is required as described earlier. It is desirable for repair materials to be identical to those of coating. In cases of inevitable situation, materials with similar mechanical, electric and thermal properties should be selected.

4. Handling after Coil Forming

Formed coils as mentioned above will become finished products through further stages - insulating, drying, and varnishing. These coils are assembled to stators or rotors. Extra care must be exercised to check for deformed coil shape and damaged coating during transportation or other handling processes down to the wire mounting process.

This requires each worker to pay close attention and to be ingenious in arranging and placing coils or even to use appropriate tools as necessary. Coils shall be stored away from dust particles (particularly metal powder) and moisture.

There is a recent trend toward omitting preliminary drying. However, due to the presence of strain, sweat, or moisture from enamel coatings in winding wires, preliminary drying should be performed sufficiently to improve insulation properties.

5. For Aluminum Conductor Magnet Wires

When winding a coil by a coil winding machine, appropriate tension must be given to a wire. Therefore, a tension device, which also serves as a corrector of wire bending, is put into use. It is desirable that the pressure surface should not be a slide surface but a roll surface and it is important that the tension be selected to minimize wire stretching. Special care must be taken with narrow wires.

- Precautions about Tension Device

Since aluminum conductors have a low tensile strength, the tension device for these conductors should be about 30% or less than that of copper wires. A higher tension increases stretching, thereby deteriorating the properties.

- Precaution in Automatic Machine Winding

Aluminum conductors may be stretched locally by 10% or more due to impact force during machine winding; special care must be exercised.

- Precaution in Moulding Process

An aluminum conductor is soft and may deform before its coating is damaged; special care must be taken with pressurizing method during coil moulding.