

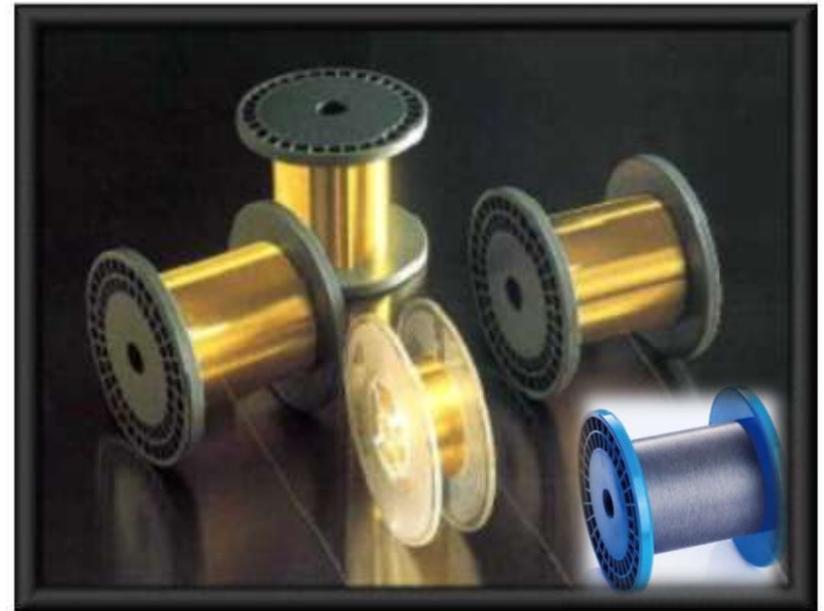
What is SP Wire?

SP Wire is a hybrid double-layer electrode wire for EDM enables ultra precision micro-cutting.
Wire diameter : Φ 0.03 mm to Φ 0.10 mm

SP Wire is a hybrid double-layer electrode wire consisting of a high strength special steel wire core and a copper alloy outer layer with excellent electrical properties, having similar advantages of both tungsten wires and brass wires.

SP Wire, produced by bringing together the fine wire technology and the plating technology developed by us over many years, will meet your needs in all respects with its superior properties such as high tensile strength, electrical discharge characteristic, processing performance, mechanical/electrical properties, cost performance, etc.

This high-performance electrode wire replaces conventional tungsten wires or brass wires in the precision and micro-cutting field.



Features

The hybrid double-layer structure provides advantages of both tungsten wires and brass wires to have tensile strength almost equivalent to tungsten wires in the practical use, and to have higher electrical discharge characteristic than brass wires. Further, surface hardness and roughness are far much lower than those of tungsten wires, and those advantages make the SP Wire less abrasive to rollers and pins in the wire running system of EDM.

SP Wire is sure to outshine tungsten wires in the ultra-precision cutting field, and also enables a more precise cutting by its high tension in the brass wire territory. The same corner R could be cut with a wire with diameter one size thicker, because of the narrower cutting widths by SP Wire, thus the cutting speed is far much increased with SP Wire.

Further more, numbers of cutting operations in cutting process can be far reduced with SP Wire in the field of fine wire below 0.1mm ϕ . Together with features described above, SP Wire enables to shorten cutting time, reduce costs, and shorten delivery lead time.

Structure of SP/SPZ Wire

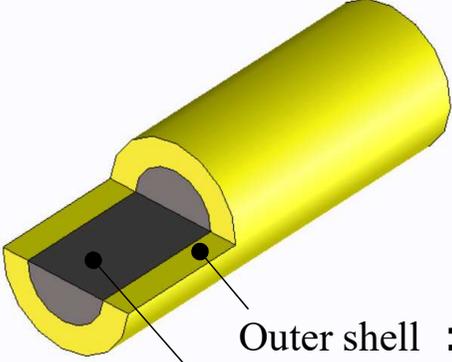
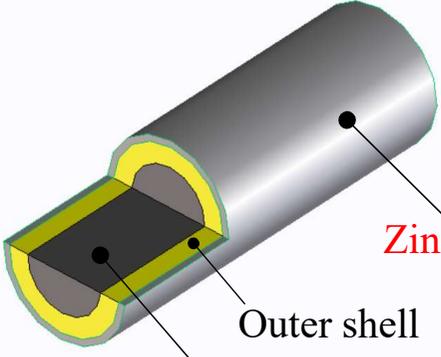
We have two types of structure of SP Wire.

① 『SP Wire』 (Brass type)

② 『SPZ Wire』 (Zinc-rich type)

Both Brass type and Zinc-rich type have tensile strength almost equivalent to tungsten wires in the practical use and higher electrical discharge characteristic than brass wires.

Concept of hybrid structure

① 『SP Wire』 (Brass type)	② 『SPZ Wire』 (Zinc-rich type)
 <p>Outer shell : Brass plated shell enabling an excellent ED</p> <p>Core : High tensile strength piano wire enabling a high breaking strength</p>	 <p>Zinc-rich surface</p> <p>Outer shell : Zinc-rich brass plated shell enabling a more stable ED</p> <p>Core : High tensile strength piano wire enabling a high breaking strength</p>

Advantage of zinc-rich type

Evaluation example of cutting time of SPZ Wire in comparison with SP Wire is as follows :

	Type of wire	Main cutting	Trim cutting
①	『SP Wire』 (Brass type)	100	100
②	『SPZ Wire』 (Zinc-rich type)	60	90

This shows zinc-rich type will enable total cutting time reduce by about 30%.

(By our own comparison)

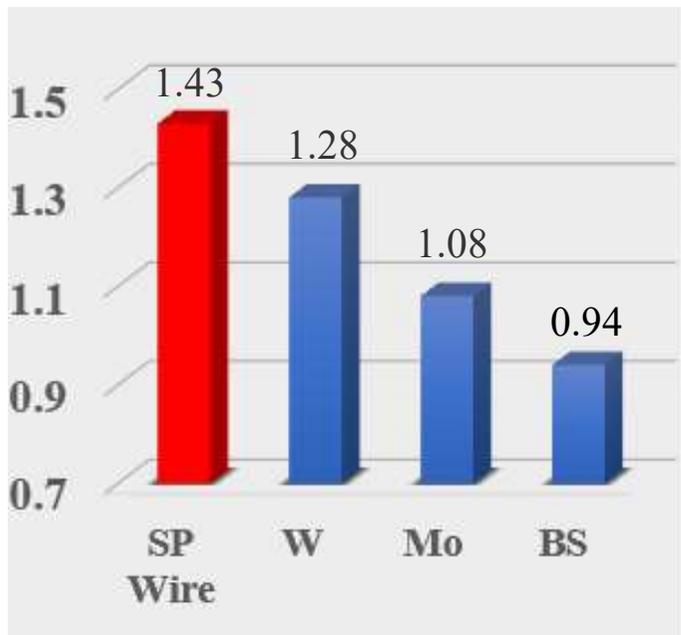
SP Wire Properties

The high voltage working current tends to flow through the outer layer, therefore, this double-layered structure enables SP Wire excellent in electrical properties.

SP Wire has superior cutting properties combining advantages of both conventional tungsten wires and brass wires. The cutting results vary depending on cutting conditions, however, some examples by our own comparison are shown below:

Cutting speed

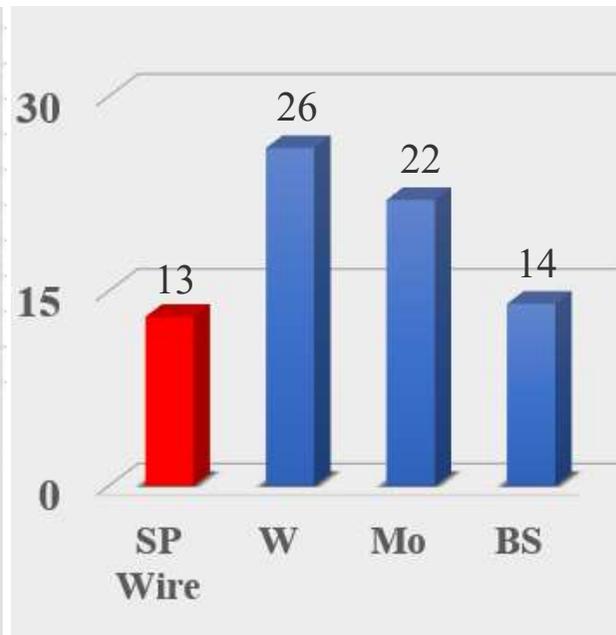
(mm/min)



Wire diameter : $\Phi 0.10\text{mm}$
Work piece : SKD-11 ($t=15\text{mm}$)

Surface roughness

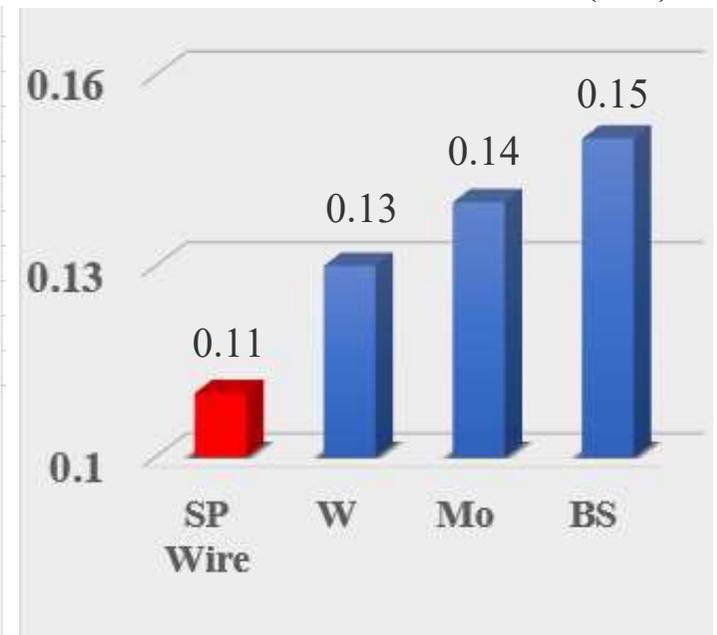
(μm)



Wire diameter : $\Phi 0.10\text{mm}$
Work piece : SKD-11 ($t=15\text{mm}$)
Surface roughness: avg. 10pt. roughness

Cutting width (clearance)

(mm)



Wire diameter : $\Phi 0.10\text{mm}$
Work piece : SKD-11 ($t=15\text{mm}$)

SP / SPZ Wire Advantages

1. High Tensile Strength

Tensile strength largely affects cutting precision and speed. SP Wire has a special piano wire core with high tensile strength, and its sufficient tension enables high precision, high speed cutting with less breakage.

2. Cutting speed

Improvement of 10% over tungsten wire and 50 % over brass wire, thanks to SP Wire's high electrical conductivity.

3. Surface roughness

Due to its excellent ED stability and high tensile strength, SP Wire provides fine surface roughness as good or better than that of brass wire.

4. Cutting width (clearance)

With its high tensile strength and stable ED characteristics, SP Wire provides precise fine cutting whose cutting width (clearance) is narrower than that of tungsten wire or brass wire, and the corner radius is smaller than that with tungsten wire. Thus, the same cutting accuracy can be obtained with one size larger SP Wire, to make a much faster cutting speed.

5. Abrasion of wire guides

Since SP Wire has a smooth and soft surface made of brass or zinc-rich brass, abrasion of the wire guides (electro-feeding pins, guide rollers, etc.) of EDM is far less than that with tungsten wire, to reduce operating costs.

6. Automatic wire joining

SP Wire has excellent straightness, allowing a high rate of automatic wire joining.

7. Surface stability

Unlike tungsten wire, SP Wire is rather hard to cause surface oxidation. Remained wire can, therefore, be stored easily.

8. HOMO phenomenon

The HOMO phenomenon, an unstable ED that occurs when cutting a tungsten-containing work piece (e.g., tungsten carbide) with a tungsten wire, does not occur with SP Wire.

9. An easy method for setting the cutting conditions

To find the optimum cutting conditions for SP Wire, first set the cutting conditions for a brass wire electrode having a diameter equal to SP Wire. Then gradually increase the wire tension until the SP wire breaks. The optimum tension is that just before breakage. Recommended cutting condition data for SP Wire could be obtained from prime ED machine manufacturers.

10. Longer continuous length

SP wire provides a longer continuous length per spool: 5,000m/spool, 10,000m/spool, 20,000m/spool, 30,000m/spool and 40,000m/spool, while that of tungsten wire is 3,000m/spool to 5,000m/spool. Thus, longer continuous operation and higher productivity could be achieved.

11. Cost performance

In addition to the excellent properties above, prices of SP Wire are far less expensive than those of tungsten wire, providing an excellent cost performance.

SP / SPZ Wire Uses

SP Wire turns out to be excellent when used in the ultra-precision and the super fine micro cutting (wire diameter below 0.1mm ϕ), that had been made possible only by tungsten wires or molybdenum wires. SP Wire is approved and recommended by prime EDM manufacturers as the best electrode wire.

1. Electrode Wire for Ultra-precision Metal Molds

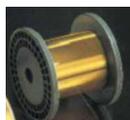
Semiconductor lead frame molds, connector molds, engineering plastic molds, precision parts molds

2. Electrode Wire for Microcutting

Precision gears, textile nozzles, shaped dies, precision parts processing, pinhole processing

Specifications

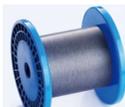
『SP Wire』 (Brass type)



Product code	Wire dia. (mm)	Dia. tolerance (mm)	Tensile strength (N/mm ²)	Conductivity (%)	Length / spool					Wire weight per 5,000m (g)
					5,000 m	10,000 m	20,000 m	30,000 m	40,000 m	
					P3 spool				P5 spool	
SP30S	0.03	+0.000 -0.003	2160 ≤	13 ≤	○	○	○			28
SP40S	0.04	+0.000 -0.003	2160 ≤	13 ≤	○	○	○			50
SP50S	0.05	+0.000 -0.003	2160 ≤	13 ≤	○	○	○	△	△	78
SP60S	0.06	+0.000 -0.003	2160 ≤	13 ≤	○	○	○			111
SP70S	0.07	+0.000 -0.003	2160 ≤	13 ≤	○	○	○	△	△	152
SP80S	0.08	+0.000 -0.003	2160 ≤	13 ≤	○	○	○			198
SP100S	0.10	+0.000 -0.004	1960 ≤	13 ≤	○	○	○	△		309

※ △ : These items are made to order

『SPZ Wire』 (Zinc-rich type)



Product code	Wire dia. (mm)	Dia. tolerance (mm)	Tensile strength (N/mm ²)	Conductivity (%)	Length / spool					Wire weight per 5,000m (g)
					5,000 m	10,000 m	20,000 m	30,000 m	40,000 m	
					P3 spool				P5 spool	
SP30Z	0.03	+0.000 -0.003	2160 ≤	15 ≤	○					28
SP40Z	0.04	+0.000 -0.003	2160 ≤	15 ≤	○	○	○			50
SP50Z	0.05	+0.000 -0.003	2160 ≤	15 ≤	○	○	○	△	△	78
SP70Z	0.07	+0.000 -0.003	2160 ≤	15 ≤	○	○	○	△	△	152
SP100Z	0.10	+0.000 -0.004	1960 ≤	15 ≤	○	○	○	△		309

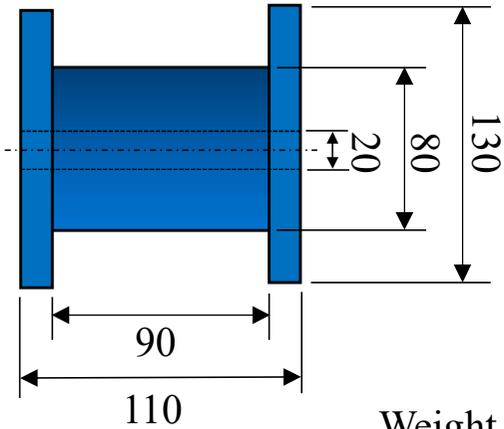
※ △ : These items are made to order

Spool dimensions and Packaging

Spool dimension

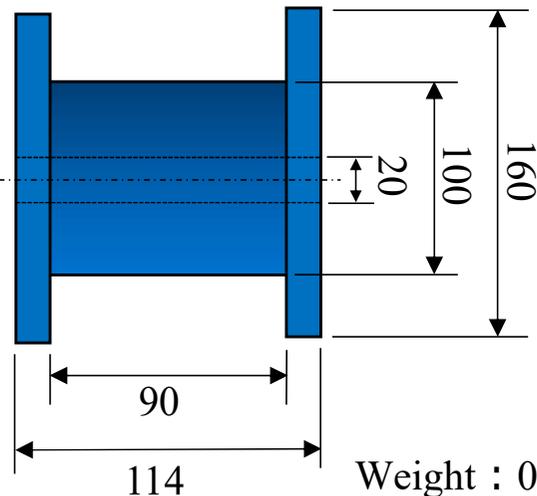
Unit [mm]

■ P3 spool (standard)



Weight : 0.25kg / pcs.

■ P5 spool (length : 40,000m only)

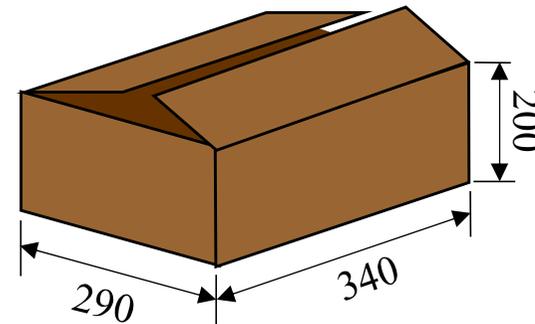


Weight : 0.356kg / pcs.

Size of packaging

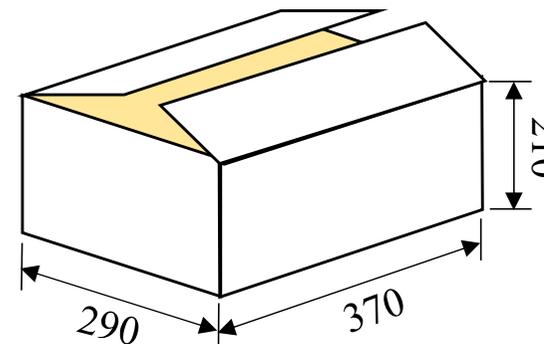
Unit [mm]

■ Standard packaging



Weight : 0.756kg / pcs.

■ Specific packaging (length : 40,000m only)



Weight : 1.04kg / pcs.

General information for storage and handling of SP Wire

1. Storing wire:

Please keep the spools stored in a horizontal position. (Fig.1)

If you put the spools stored in a vertical position, it will be a cause of loosen wire winding. (Fig.2)

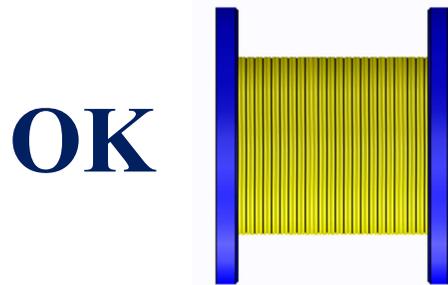


Fig.1

Storing the wire in a horizontal position.

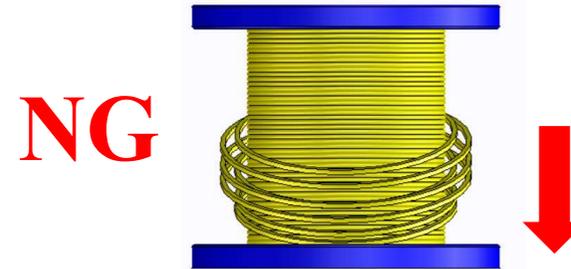


Fig.2

With storing wire in a vertical position, it may loosen the wire on the spool, causing the wire to shift and become looped on itself. This may cause entanglement of the wire.

2. Handling the SP Wire:

Please carefully come out the wire with holding the wire-end by your finger, with enough tension applied to prevent it from loosing. (Fig.3)

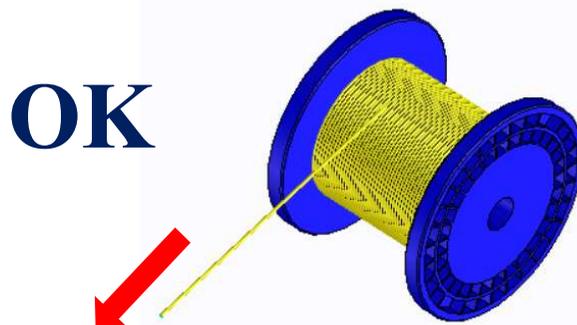


Fig.3

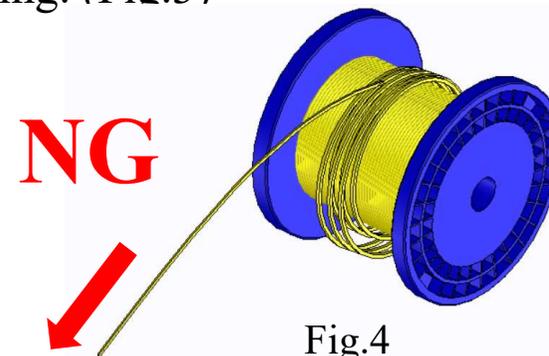
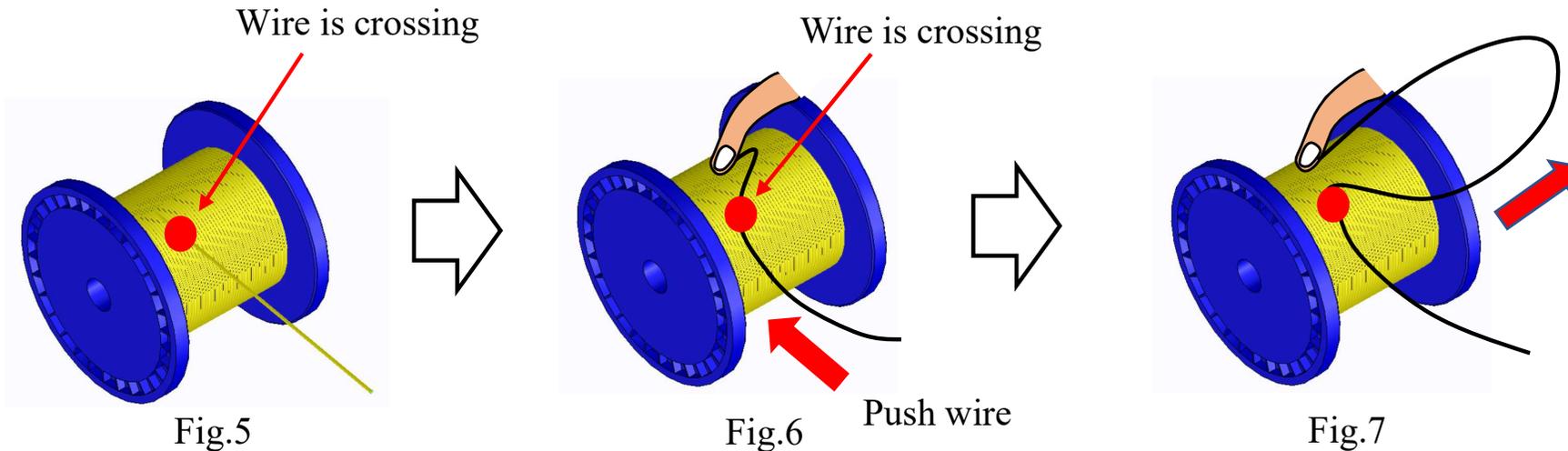


Fig.4

If you release wire-end, it will be a cause of wire tangling.

3. Action for wire crossing:

- ① Please hold the part of wire crossing with your finger and push the wire-end to make slack of wire. (Fig.5 and Fig.6)
(In case wire-end is far from the part where wire is crossing, please cut slack of wire.)



- ② Hold slack of wire with your finger and withdraw wire-end from where wire is crossing. (Fig.7)
- ③ Confirm that wire crossing is resolved. (Fig.8)
- ④ If crossing is not resolved, please continue the corrective action again.

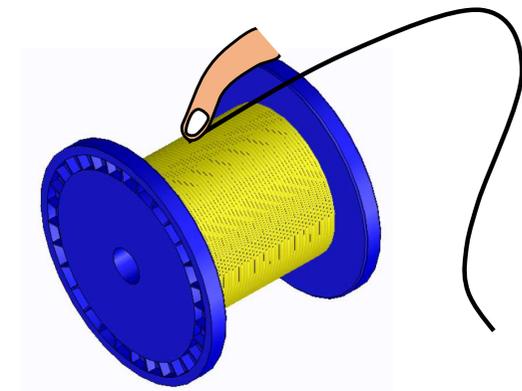


Fig.8

4. Action for loose winding:

If you find loose wire winding or released wire-end, please check the wire winding conditions and make the following corrective action.

- ① When wire winding become loose or complicated tangling, please hold the wire with your finger and cut tangling area. (Fig.9)
- ② Unwind wire until wire-end will be single.
- ③ Turn roll and unwind wire slowly to find a new wire-end. (Fig.10)

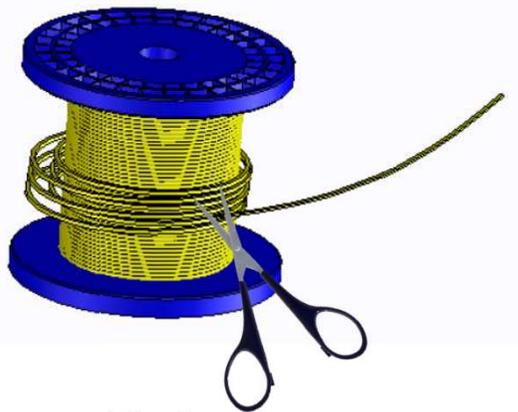


Fig.9

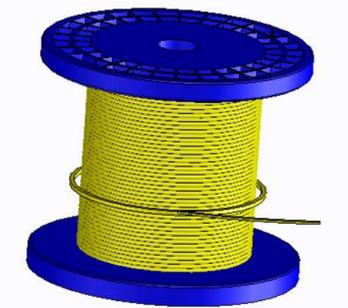
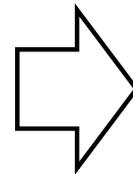


Fig.10

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