Standard Specifications

6E-69 Winding Grip

Established in October, 1964
Revised (05) in August, 2014
Implemented in September, 2014

Power Distribution Div. (Main Dept.)

TEPCO Power Grid, Inc.

1. Scope

This article is mainly used for (hereinafter referred to as "Grip") detaining and connecting points, made of galvanized steel-twisted wire and reinforced salt-resistant plated steel-twisted wire (hereinafter referred to as "Steel-twisted wire"), for the purpose of branch lines, cable messenger wires and aerial ground wires.

2. Related standards

2.1 Japanese Industrial Standards

(1) JIS G 3505(2004) Low carbon steel wire rod
(2) JIS G 3506(2004) High carbon steel wire rod
(3) JIS G 3537 (2011) Galvanized steel-twisted wire
(4) JIS H 0401(2013) Fused galvanization test method
(5) JIS Z 2371(2000) Salt spray test method

2.2 Our standard specifications

(1) 6A-2 Galvanized steel-twisted wire
(2) 6C-15 Insulator for branch lines
(3) 6D-30 Placing anchors for branch lines
(4) 6D-44 Joint use fittings
(5) 6D-49 Branch line poles
(6) 6D-50 Joint use fittings (S-type)
(7) 6E-78 Thimble
(8) 6Q-134 Reinforced salt-resistant steel-twisted wire

3. Category

Grips shall be categorized in two types of surface treatments of general plating and reinforced salt-resistant plating, and conform to appropriate steel-twisted wires and points of use as listed in Table 1.

Table 1 Category

Category	Appropriate steel-twisted wire	Point of use		
		Thimble portion	Ball insulator portion	Straight line portion
30 mm^2	7/2.3	For 30 mm^2 thimble	For 30 mm^2 ball insulator	For 30 mm^2 straight line
45 mm^2	7/2.9	For 45 mm^2 thimble	For 45 mm^2 ball insulator	For 45 mm^2 straight line
70 mm^2	7/3.5	For 70 mm^2 thimble	—	For 70 mm^2 straight line*
90 mm^2	7/4.0	For 90 mm^2 thimble	For 90 mm^2 ball insulator	For 90 mm^2 straight line

*: Category of 70 mm^2 straight line is applicable to reinforced salt-resistant types only.

4. Structure and material

4.1 General item

(1) This article shall be structured to be wound around a galvanized steel-twisted wire (reinforced salt-resistant plated steel-twisted wire in the case of reinforced salt-resistant type) with no difficulty in combination with our specifications, "6C-15 Insulators for branch lines" and "6E-78 Thimble."

For straight lines, it shall be structured to be wound by combining galvanized steel-twisted wires (reinforced salt-resistant plated steel-twisted wires in the case of reinforced salt-resistant type) each other with no difficulty.

4.2 Shape and dimensions

(1) Grip shall be shaped as shown in Appended Figure as a standard.

(2) The dimensions of Grip shall find no difficulty in combining thimbles and ball insulators except for specified in Appended Figure, and satisfy Para. 7.3 Grip force test.

(3) Grips for straight lines shall be so processed to facilitate winding works around the central part.

[Explanation]

In order to facilitate winding works, it is exemplified to process by spirally expanding around 80mm in length at the midpoint of winding center.

(4) The wire shall be twisted to the S direction.

4.3 Provision of main structure portion

(1) Materials

Concerning materials, use steel materials prescribed in the JIS to satisfy product's functional properties.

[Explanation]

With regard to "Steel materials prescribed in the JIS to satisfy product's functional properties," SWRM prescribed in JIS G 3505 (Low carbon steel wire rod) and SWRH prescribed in JIS G 3506 (High carbon steel wire rod) are found in traditional knowledge.

(2) Surface treatment

a. General type

After processing wire rods by wire-drawing, perform molten galvanization uniformly throughout the surface as prescribed in JIS G 3537 (Galvanized steel-twisted wire). In addition, it is excluded to use steel materials having the anti-corrosion property equal to or higher than molten galvanization.

b. After processing reinforced salt-resistant wire rods, perform surface treatment, having the anti-corrosion property equal to or higher than molten zinc-aluminum-alloy plating, uniformly throughout the surface.

5. Performance

The performance of this article shall conform to Table 2, when tests in Para. 7 are carried out.

Table 2 Performance

Item	Required performance	Test item
Appearance	Neither improper flaw nor crack shall be found in use. There shall be no other inappropriate defects in use.	7.1
Shape, dimensions	It shall conform to the shape and dimensions shown in Appended Figure.	7.2
Grip force test	Sliding shall be within the quantity prescribed in each category, when a test load show in Table 4 is applied.	7.3
Plating adhesion test	a. General type Adhesion shall be the quantity shown in Table 6. b. Reinforced salt-resistant type Adhesion shall be the quantity shown in Table 7.	7.4
Salt spray test *	No red rust shall arise after progress for 1,500 hours.	7.5
Natural immersion potential test *	Natural immersion potential on coated wire shall be -900 mV or lower.	7.6

*: Salt spray tests and natural immersion potential tests are applicable to reinforced salt-resistant types only.

6. Indication

Clearly indicate the following items on the Grip by labels or printouts on the spots as shown in Appended Figure. In addition, give color indications in Table 3 for each category of suitable steel-twisted wires. Moreover, regarding reinforced salt-resistant types, indicate in red to show salt-resistant types.

(1) Category (Example: 30 mm^2 for thimbles)

(2) Manufacturer's name or its abbreviation

(3) Salt-resistance indication, "Salt-resistant" *

*: Salt-resistance indication is applicable to reinforced salt-resistant types only.

Table 3 Color indication

Category	30 mm^2	45 mm^2	70 mm^2	90 mm^2
Color	Blue	Green	Black	Blue

7. Test method

7.1 Appearance inspection

Check for the appearance items by visual observation or hand-feeling.

7.2 Inspection for shape and dimensions

Inspect items on structure, shape, dimensions and finish by visual observation or proper scales and/or methods.

7.3 Grip force test

Carry out tests by the method as shown in Figure 1 or Figure 2. Nothing abnormal should occur to any parts, when retaining test loads shown in Table 4 for three minutes. In addition, this abnormality means the state where the grasp decreases due to disconnection in part of winding grip and the strength of winding grip decreases due to cutting-off of wire.

Appropriately increase load for 75% of test load values, and then increase load at the ratio of 0.98 kN per second to set it up to the test load in Table 4. Moreover, the sliding quantity by the change in gauge line distance after removing load shall conform to Table 4.

The diameters of retention fittings shall conform to Table 5. How to mark gauge lines for straight lines shall be made by marking gauge lines to the Grip and steel-twisted wire, after winding one side of the Grip around the steel-twisted wire, and by winding the Grip of the other side.

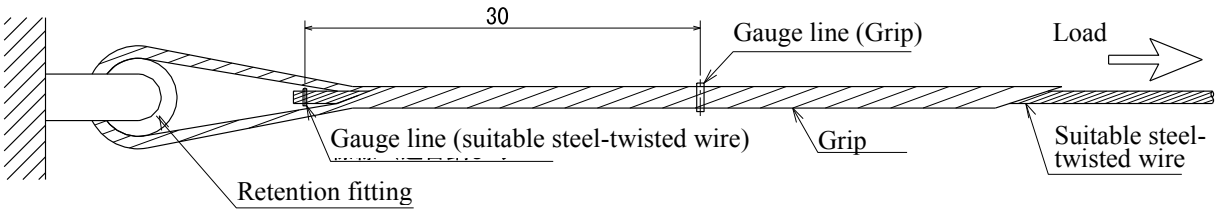


Figure 1 For thimbles and ball insulators

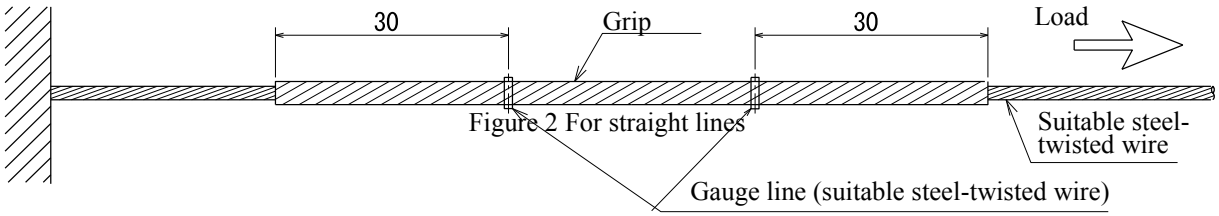


Figure 2 For straight lines

Table 4 Grip force test

Category	Test load (kN)	Sliding
30 mm^2	32.7 {3,340 kgf}	3 mm or less
45 mm^2	52.0 {5,310 kgf}	4 mm or less
70 mm^2	76.0 {7,750 kgf}	5 mm or less
90 mm^2	99.0 {10,100 kgf}	5 mm or less

Table 5 Diameter of retention fitting

Category	For thimble	For ball insulator
30 mm^2	φ32	φ65
45 mm^2		
70 mm^2	φ43	
90 mm^2		

*1: Use steel-twisted wires by taking out of a packed state prescribed in 6A-2 Galvanized steel-twisted wire (6Q-134 Reinforced salt-resistant plated steel-twisted wires in the case of reinforced salt-resistant type).
*2: Distance from retention fitting to loaded point should be 2m or more.

7.4 Plating adhesion quantity test

By using specimens sampled from finished products, measure the adhesion quantity by means prescribed in "Para. 11.6 Adhesion quantity test for wires" of JIS G 3537 (Galvanized steel-twisted wire). The plating adhesion quantity shall conform to Tables 6 and 7.

Table 6 General type

Wire diameter	Adhesion quantity test (g/m^2)
φ2.15 mm	200 or more
φ2.48 mm or more	230 or more

Table 7 Reinforced salt-resistant type

Adhesion quantity test (g/m^2)
300 or more

7.5 Salt spray test

Wires before processing shall be tested in accordance with JIS Z 2371 (Salt spray test method).

7.6 Nature immersion potential test

Choose wires before processing and immerse samples into 3% of NaCl water solution for five minutes. Measure the natural immersion potential of coated wires by using a saturated calomel electrode as a reference electrode.

8. Test

8.1 General item

This article shall be tested by the method in Para. 7 in accordance with "8.2 Type test," "8.3 Manufacturing process inspection" and "8.4 Acceptance inspection," and must pass all the provisions of Paras. 5 through 7.

8.2 Type test

Type tests shall be conducted for products or specimens manufactured under the same condition as products according to the following test items:

(1) Appearance inspection

(2) Shape / dimensions inspection

(3) Grip force test

(4) Plating adhesion quantity test

(5) Salt spray test *

(6) Natural immersion potential test *

*: Salt spray test and natural immersion potential test are applicable to reinforced salt-resistant types only.

8.3 Manufacturing process inspection

In the case of type tests, a series of inspections on design, quality control of materials, manufacture process, product management are carried out as a general rule. It shall be intended to verify whether products are exactly the same as test articles that were used in type tests and are being produced in a production process.

8.4 Acceptance inspection

Acceptance inspection shall be conducted by witnessing when delivery destination directs by means specified in "8.2 Type test." In addition, concrete test items and sampling rates shall be determined by discussing with the delivery destination. Moreover, when no acceptance inspection is conducted by witnessing, the manufacturer shall conduct its in-house tests determined by discussing with us beforehand, and submit to the delivery destination as test result reports.

9. Others

9.1 General item

(1) Any items needed to satisfy performance and performance of a product, except for provisions prescribed in these specifications, shall be decided by discussing with us.

(2) When a considerable profit arises in use or manufacture by changing a part of these specifications or approval specifications, it will be allowed to change it with our approval.

(3) When we recognize it to be necessary, it shall be possible to conduct on-the-spot process inspection, material inspection, etc.

9.2 Burdening of test articles

Products and test pieces to be used in tests, and expenses for conducting tests shall be incurred by the manufacturer.

9.3 Submission of documents

The manufacturer must submit the following documents in applying for type examination:

(1) Manufacturing specifications (including outside dimension drawings and tolerances)

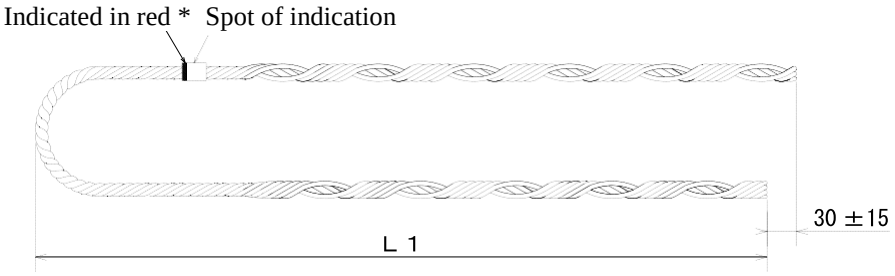
(2) Quality control report

(3) Test result report

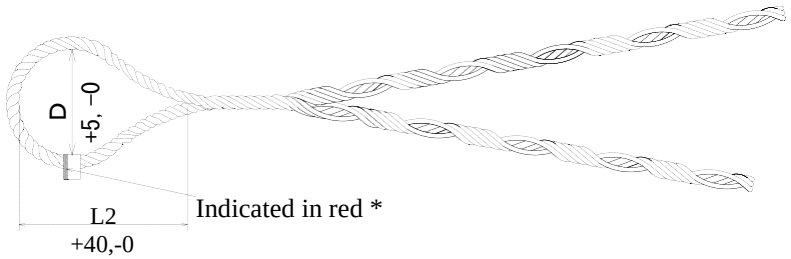
(4) Technical documentation

In the case of technical examination, it may be request to submit technical documentation in order to judge performance and quality of products sufficiently and appropriately.

(Items clarified by manufacturers, evidence of material selection, materials in use, material properties, workability, etc.)



Appended Figure 1-1 Standard diagram

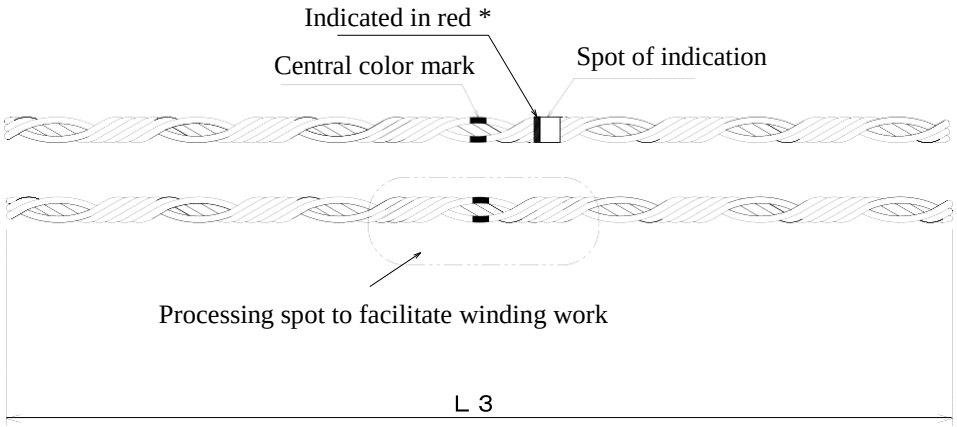


Appended Figure 1-2 Coupling status diagram

* Dimensions of D and L2 shall be measured after coupling.

* Indication in red is applicable to reinforced salt-resistant types only.

Appended Figure 1 For thimbles, ball insulators and wood poles



* Indication in red is applicable to reinforced salt-resistant types only.

Appended Figure 2 For straight lines (1 set made of 2 lines)

Appended Table 1

Unit [mm]

Category	Dimensions						
	For thimbles			For ball insulators			For straight lines
	L_1	L_2	D	L_1	L_2	D	L_3
30mm^2	660 or less	145	35	660 or less	160	65	1,050 or less
45mm^2	760 or less	150	40	760 or less	155	65	1,250 or less
70 mm^2	850 or less	155	40	—	—	—	1,450 or less*
90mm^2	950 or less	160	43	950 or less	175	65	1,550 or less

*: Category of 70 mm2 straight lines is applicable to reinforced salt-resistant types only.