(Reference translation)

6A-51 DV wire

(C rank)

Established in March, 1955

March 3, 2014 (revised 12)

Enforcement on April 3, 2014

Distribution Department

Tokyo Electric Power Company, Incorporated

1. Scope of application

This product is mainly used for a low voltage overhead drawing lead wire.

2. Related standards

2.1 Japanese industrial standards

JIS C 3005 (2000) Test methods for rubber and plastic insulation wires

JIS C 3341 (2000) Vinyl insulated lead-in wires (DV)

JIS K 6723 (1995) Soft polyvinyl chloride compound

JIS K 7216 (1980) Test method for the brittle temperature of plastics

JIS Z 8703 (1983) Standard conditions of a testing location

3. Types and symbols

Types and symbols of electrical wires are as in the following table.

Type	Symbol	Size of a conductor
2-wire strand	DV 2R	2.6 ㎜, 3.2 ㎜, 14 ㎟, 38 ㎟
3-wire strand	DV 3R	2.6 ㎜, 3.2 ㎜, 14 ㎟, 22 ㎟, 38 ㎟, 60 ㎟

4. Naming of electrical wires

Naming of electrical wires is as in the following example.

Example: DV 2R 14 ㎟

5. Structure and materials

5.1 General matters

This product shall attain an excellent finishing with easy handling, and it can be used for a long period of time.

5.2 Provisions of main structural parts

Provisions of main structural parts are based on the attached tables 1, 2 and the following items in accordance with JIS C 3341 'Vinyl insulated lead-in wires (DV)'.

5.2.1 Conductors

Conductors are based on Section 5 'Materials, structures and processing methods (a) Conductors' of JIS C 3341 'Vinyl insulated lead-in wires (DV)'.

5.2.2 Insulators

As for insulators, conductors shall be covered concentrically with vinyl conductors whose thicknesses are shown as in the attached tables 1 and 2. Furthermore, with regard to red and white phases, a double layer structure comprising a weather resistant black layer as an outer layer and each color layer as an inner layer shall be formed by simultaneous extrusion molding. Also, as for insulators, recycled materials from the removed parts of power distribution equipment of our company can be used as a recycled vinyl resin, and their mixing rate shall be clearly specified in a production specification and a QC process diagram.

The average thickness of insulators shall be within ± 10% of the tolerances value in the attached tables 1 and 2, and the minimum thickness shall have 80% or more of the value of those attached tables. Furthermore, the minimum thickness of an insulative inner layer in red and white phases shall have 50% or more of the value of those attached tables, and the thickness of an insulative outer layer in a black phase shall be 0.2mm or more. Also, there shall be no harmful scratches on the surface of electrical wires.

5.2.3 Surface printing

On the surface of insulators in red and white phases, a color that is same as the color of an insulative inner layer shall be used for continuously printing a line along the longitudinal direction of electrical wires. The average width of a printed line shall be 2mm or more.

5.2.4 Wire stranding

This is based on ‘1) 2-wire strand’ and ‘2) 3-wire strand’ in ‘Section 5 ‘Materials, structures and processing methods (d) Wire stranding’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’. No loosening, kinking, etc. shall be observed, and wires are formed by uniformly twisting over their whole length.

5.2.5 Colors of wire cores

The colors of insulative inner layers in red and white phases and lines on their insulative surfaces shall be red and white respectively, and the color of insulators in a black layer shall be black. (Black and white in the case of two cores)

5.2.6 Dimensions

Dimensions are based on the attached tables 1 and 2 as a standard.

(The section below is intentionally left blank)

6. Performance

Performance of a wire shall be based on Table 1 when tests in Section 8 are performed.

Table 1

Item	Performance	Test method applied section
Appearance	There are no inappropriate parts for practical use.	8.1
Structure	Items in Section 5 must be satisfied. The average width of printing surface lines shall be 2.0mm or more.	8.2
Conductor tensile	Values in the attached tables 1 and 2 or more	8.3
Resistance of conductors	Values in the attached tables 1 and 2 or less	8.4
Withstand voltage		
(1)In water	The test voltage shown in the attached tables 1 and 2 can be tolerated for 1 minute.	8.5(1)
(2)In air	The test voltage shown in the attached tables 1 and 2 can be tolerated for 1 minute.	8.5(2)
Insulation resistance		
(1) At room temperature	Values in the attached tables 1 and 2 or more	8.6(1)
(2)At a high temperature	Values in the attached tables 1 and 2 or more	8.6(2)
Insulator tensile		
(1) At room temperature	Tensile strength; 10Mpa or more, Elongation; 100% or more	8.7(1)
(2)Heating	Tensile strength retention; 85% or more, Elongation retention; 80% or more	8.7(2)
Winding		
(1) Heating	Breaks, cracks and other abnormality shall not occur on a surface.	8.8(1)
(2) At a low temperature	Breaks, cracks and other abnormality shall not occur on a surface.	8.8(2)
Heating deformation	Thickness decreasing ratio of insulators shall be 30% or less.	8.9
Burning resistance	Flames shall go out within 15 seconds spontaneously.	8.10

7. Display on the surface of electrical wires

On the surface of a black phase of electrical wires, the following items shall be displayed continuously by embossing.

Furthermore, in the case of printing a display, displaying continuously on the line of a white phase is possible.

1 Name : 'DV' (In the case of using recycled materials, 'DV/R' shall be displayed.)

2 Name of a manufacturer or its abbreviation and a registered trademark

3 Products to which electrical appliances and materials safety act applies shall display conformity inspection marks

4 Year of production (indicated by an A.D. year Example:2008)

5 Conductor diameter (Nominal cross-sectional area)

8. Test method

8.1 Appearance test

This test shall be based on ‘Section 6.1 Appearance’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’.

8.2 Structure test

This test shall be based on ‘Section 6.2 Structure’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’. Furthermore, the width measurement of a printing line on a surface shall be carried out by selecting and measuring arbitrary five locations of a meter long sample.

8.3 Conductor tensile test

This test shall be based on ‘Section 6.3 Conductor tensile’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’.

8.4 Conductor resistance test

This test shall be based on ‘Section 6.4 Conductor resistance’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’.

8.5 Withstand voltage test

(1) Test in water

This test shall be based on ‘Section 6.5 Withstand voltage a) In water’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’.

(2) Test in air

This test shall be based on ‘Section 6.5 Withstand voltage b) In air’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’.

8.6 Insulator resistance test

(1) Room temperature insulator resistance test

This test shall be based on ‘Section 6.6 Insulator resistance a) Insulator resistance at room temperature’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’.

(2) High-temperature insulator resistance test

This test shall be based on ‘Section 6.6 Insulator resistance b) Insulator resistance at a high temperature’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’.

8.7 Insulator tensile test

(1) Room temperature test

This test shall be based on ‘Section 6.7 Insulator tensile’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’.

(2) Heating test

This test shall be based on ‘Section 6.8 Heating’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’.

8.8 Winding test

(1) Winding and heating test

This test shall be based on ‘Section 6.9 Winding and heating’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’.

(2) Low-temperature winding test

This test shall be based on ‘Section 6.10 Winding at a low temperature’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’.

8.9 Heating deformation test

This test shall be based on ‘Section 6.11 Heating deformation’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’.

8.10 Burning resistance test

This test shall be based on ‘Section 6.12 Burning resistance’ of JIS C 3341 ‘Vinyl insulated lead-in wires (DV)’.

9. Tests and inspections

9.1 General matters

Section 9.2 Model test, Section 9.3 Manufacturing process inspection and Section 9.4 Acceptance inspection shall be performed by using Section 8 Test method, and each product must pass all the above provisions.

9.2 Model test

For each application size, the following model tests shall be performed on a coil or a drum of samples. The number of samples for a test carried out in a frame unit and other tests except one in Section 4.11 shall be three for each test. As a rule, samples shall be taken out of a coil or a drum.

(1) Appearance inspection

(2) Structure inspection

(3) Conductor tensile test

(4) Conductor resistance test

(5) Withstand voltage test

  (a) Test in air

  (b) Test in water

(6) Insulator resistance test

  (a) Room temperature test

  (b) High temperature test

(7) Insulator tensile test

  (a) Room temperature test

  (b) Heating test

(8) Winding test

  (a) Winding and heating test

  (b) Low temperature winding test

(9) Heating deformation test

(10) Burning resistance test

9.3 Manufacturing process inspection

In performing a model test, to confirm that the exactly same product as a model test product is produced in a production process, a series of inspections such as materials used, quality management items of each production process, quality control methods, defect countermeasures, quality management systems, etc. shall be generally carried out.

9.4 Acceptance inspection

Acceptance inspection shall be performed under supervision if it is directed by a customer at delivery destination. Also, specific test items and a sampling rate are consulted with customers at delivery destinations. If the acceptance inspection is carried out without any supervision, manufacturers shall perform an in-house test predetermined after consultation with our company and submit a test report to customers at delivery destinations.

10. Others

10.1 General matters

(1) Except for items prescribed in this specification, necessary items to satisfy product performance and functionality shall be determined after consultation with our company.

(2) This specification can be changed with our company's approval if substantial profits are expected for use and in manufacturing by changing a part of it.

(3) When deemed necessary by our company, process on-site and material inspections, etc. can be performed.

10.2 Packing method

(1) As for packing a stored good, it should be wound as a coil or wound around a plastic drum or a wooden drum indicated in the attached tables 1 and 2 to avoid damaging during transportation. Furthermore, if it is difficult to use a plastic drum designated by our company, a wooden drum, one satisfying the Japanese Electric Wire & Cable Makers' Association standard (JCS) can be used after consultation with our company.

(2) A label based on the attached figure 1 shall be attached to a plastic drum.

(3) Items indicated in figure 1 shall be indicated on the surface of a wooden drum in a suitable way that they cannot be erased easily.

(4) The following items shall be printed on each suitable place of a coil or not less than two tags indicated these must be attached.

1 Name：'DV'(In the case of using recycled materials, display as recycled products.)

2 Type

3 Conductor size

4 Length (m)

5 Net mass (kg) (In the case of winding around a drum, display a total mass as well.)

6 Products to which electrical appliances and materials safety act applies shall display conformity inspection marks.

7 Name of a manufacturer or its abbreviation

8 Date of production

(Note) DV is an abbreviaion for Polyvinyl Chloride Insulated Drop Service Wires.

【Commentary】

From a conventional knowledge, ‘a proper manner’ means that as a standard of determination, two tags shall be displayed in a place where they are easily checked in the case of winding as a coil, and a label shall be either printed or attached in the case of winding around a drum.

10.3 Load of testing products

A product used for testing, specimens and implementation costs shall be paid by the deliverers or applicants for inspection.

10.4 Documents to be submitted

10.4.1 Production specification

In order that our company evaluates compliance with this specification, necessary items shall be stated in a production specification specifically, and a figure with dimensional tolerances and materials shall be attached.

Also, technical references according to the production specification shall be attached if necessary.

10.4.2 Test result list

A model test described in Section 9.2 shall be carried out, and its result and test conditions shall be stated.

10.4.3 Quality management report

Contents concerning to materials used, quality control items for each production process, quality control methods, defect countermeasures, quality management systems, etc. shall be specifically described in ‘quality management process diagram’, ‘outsourced supplier management’, etc. Furthermore, in the case when main production processes are outsourced, outsourced process control documents (that show the status of outsourced process managements and are described as in the format of a management process diagram) shall be submitted. The scope of a specific description shall be consulted with our company.

10.4.4 Technical references

For a model review, to determine product performance and quality adequately and properly, the following technical references shall be submitted. Also, submission of technical references other than the below is sometimes requested.

(1) In the case of using recycling materials for insulators

[1] Rationale behind the mixing ratio of recycled materials

[2] Quality assurance after repeatedly recycling

Attached table 1

Conductor			Insulator thickness mm	Finished outer diameter (Approximately) mm	Test voltage V		Insulation resistance MΩkm		Tensile load for a conductor N	Conductor resistance (20℃) Ω／km	Remarks		
Cross-sectional area mm^2 Or Diameter mm	Constituent Number of strands / Strand diameter mm	Outer diameter mm			BetweenConductors in air	Between conductors and the ground in water	(20℃)	(60℃)			Approximate weight kg / km	Standard strip length m	Standard packing method
14	7/1.6	4.8	1.4	15.5	3000	2000	40	0.1	5630	1.36	340	300	Drum
38	7/2.6	7.8	1.8	23.0	4000	2500			7080	0.492	860	300	Drum
Diameter 2.6	?	2.6	1.0	9.2	3000	1500	50	0.15	2071	3.48	125	200	Coil
3.2		3.2	1.2	11.5					3100	2.30	190	200	Coil

Attached table 2

Conductor			Insulator thickness	Finished outer diameter (Approximately)	Test voltage V		Insulation resistance MΩkm		Tensile load for a conductor	Conductor resistance (20 ℃)	Remarks		
Nominal cross-sectional area mm^2 Or Diameter mm	Constituent Number of strands / Strand diameter mm	Outer diameter mm	mm	mm	BetweenConductors in air	Between conductors and the ground in water	(20 ℃)	(60 ℃)	N	Ω／km	Approximate weight kg / km	Standard strip length m	Standard packing method
14	7/1.6	4.8	1.4	16.5	3000	2000	40	0.1	5630	1.36	510	730	Drum
22	7/2.0	6.0	1.6	20	4000				4100	0.832	785	380	Drum
38	7/2.6	7.8	1.8	25.0		2500			7080	0.492	1290	340	Drum
60	19/2.0	10.0		30.0			30	0.07	10600	0.306	1960	320	Drum
Diameter 2.6	—	2.6	1.0	9.9	3000	1500	50	0.15	2071	3.48	190	200	Coil
3.2		3.2	1.2	12.5					3100	2.30	285	150	Coil