

SPECIFICATION

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Rev. date	Jul. 07, 2015	Rev. No.	12

PRODUCT NAME : STW-B
ITEM : 130°C, 1,410V

No.	Revised date	Revised details	Page	Report
8	Feb. 13, 2013	Amendment of length and bobbin size	7	M. H. JEONG
9	Apr. 28, 2014	Addition of specification (0.29mm)	7	M. H. JEONG
10	Sep. 24, 2014	Addition of maximum conductor resistance	7	M. H. JEONG
11	Mar. 20, 2015	Addition of section number in Appendix 2.	7	M. H. JEONG
12	Jul. 07, 2015	Addition of conductor elongation in Appendix 1.	6	M. H. JEONG

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1. APPLICATIONS

This specification is to be applied for Triple Insulated Winding Wire (STW-B; hereinafter referred to as the "wire") using the winding or the wiring such as electrical machine and electrical apparatus.

2. STRUCTURE



A. Conductor	: Annealed copper
B. 1st Extruded Insulation	: Polyester
C. 2nd Extruded Insulation	: Polyester
D. 3rd Extruded Insulation	: Polyamide compound

2.1 CONDUCTOR

The conductor shall be used the annealed copper wire specified in UL SUBJECT 2353 Section 4, 5, 6.

2.2 INSULATION

The insulation covering shall consist of triple extruded layer (1st and 2nd layer: polyester type resin, 3rd layer: thermally reinforced polyamide) which are at least equivalent thereto in quality, extruded on the surface of the conductor uniformly. The insulation layers so applied shall have no detrimental effect to the conductor and shall show no flaws or dirt. Further, the wires shall be such that the soldering is possible without removing of the insulation layer. The wire shall be satisfied with B rated (130°C) thermal index of IEC 172 and UL SUBJECT 2353 test condition.

2.3 COLOR

The color of the wire is basically yellow. Other colors are available on request.

3. CHARACTERISTICS

The characteristics of wire shall be satisfied with Appendix 2 value accordance with the requirements for Section 4. Other requirement of characteristics than those covered by this specification shall be as given in IEC 60950 (Safety of information technology equipment including electrical business equipment) sub-clause 2.10.5.4 and Annex U. The insulation grade shall be the reinforced (test voltage 3,000Vrms for 1min).

4. TEST

4.1 Appearance

Each winding wire shall be examined for scratch, contamination, crack and other harmful defects on the insulation by visual examination.

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4.2 Dimension

The wire shall be measured the conductor diameter, insulation thickness and outer diameter as specified in IEC 60851 - 2.

4.3 Spark Test

Final product shall be subjected to the spark test in accordance with the requirements for UL1581 Section 900. The test shall be performed at 3,000 Vrms.

4.4 Flexibility Test

Three samples are taken from a same lot of wire prepared in the manner described in below and tested at room temperature. A straight piece of wire at least 305 mm (12 inches) long is to be wound for 10 continuous carefully and adjacent turns around a polished mandrel of the diameter specified in Table 1. After winding, the specimen is to be examined for exposure of the base conductor or delamination by visual examination. There shall be no exposure of bare conductor, or delamination of the insulation. After visual examination of the specimen, the sample is to be wound on the mandrel and subjected to electric strength tests at 3,000V for 1 min. The voltage shall be applied between the conductor and the mandrel.

Table 1 Mandrel diameter

Nominal conductor diameter		Mandrel diameter	
mm	Inch	mm \pm 0.2 mm	inch (0.01 inch
0.20~0.34	0.008~0.014	4.0	0.16
0.35~0.49	0.014~0.019	6.0	0.24
0.50~0.74	0.019~0.029	8.0	0.31
0.75~2.49	0.029~0.039	10.0	0.39

4.5 Withstand Voltage Test

4.5.1 Straight Test

Five samples are taken from a same Lot of wire prepared for this test. A straight piece of the final wire construction, approximately 305 mm (12 inches) in length, with the insulation removed at one end and wrapped approximately 150 mm (5.9 inch) length of metal foil. The voltage of 3,000V is to be applied between the conductor and foil wrapped in direct contact with the center 150 mm of the sample for 1 min.

4.5.2 Twisted Test

Five samples are taken from a same Lot of wire prepared in the manner described in below and tested at room temperature. A straight piece of the final wire construction, approximately 400 mm (16 inches) in length, with the insulation removed at both ends, is to be twisted back on itself for a distance of 125 ± 5 mm (5 ± 0.2 inches) with a load applied to the wire pair, and with the number of twists, as provided in loads applied to the wire pairs and number of twists, see Table 2. The loop at the end of the twisted section is to be cut at two places to provide a maximum spacing between the cut ends. Any bending to ensure an adequate separation between the two wire ends is to be arranged to void sharp bends or damage to the insulation. After visual examination, the sample is to be subjected to electric strength tests at 6,000V for 1 min. The voltage shall be applied between the conductor's cut ends.

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Table 2 Loads applied to the wire and number of twists

Nominal conductor diameter				Load		Number of twists
Over		Up to and including		N	(lbf)	
mm	Inch	mm	Inch			
0.100	0.004	0.250	0.009	0.85	0.19	33
0.250	0.009	0.355	0.014	1.70	0.38	23
0.355	0.014	0.500	0.019	3.40	0.76	16
0.500	0.019	0.710	0.027	7.00	1.57	12
0.710	0.027	1.060	0.041	13.50	3.03	8
1.060	0.041	1.400	0.055	27.00	6.06	6
1.400	0.055	2.000	0.078	54.00	12.14	4
2.000	0.078	5.000	0.200	108.00	24.27	3

4.6 Heat Shock Test

Three samples are taken from a same Lot of wire prepared in the manner described in below and tested at room temperature. A straight piece of wire at least 305 mm (12 inches) long is to be wound for 10 continuous and adjacent turns around a polished mandrel of the diameter specified in the Table 1. The specimen is placed into an oven with forced air circulation for a period of 30 minutes and at a temperature within ± 5 °C (± 9 °F) of the temperature specified in Table 3. After removal from the oven, the specimen is to be allowed to cool to room temperature, and after cooling is to be examined for cracks under a magnification level (wire diameter 0.04~0.50, magnification level 5~10; wire diameter up to 0.5, magnification level 0~6). After visual examination of the specimen, the sample is to be wound on the mandrel and subjected to electric strength tests at 3,000V for 1 min. The voltage shall be applied between the conductor and the mandrel.

Table 3 Oven temperature

Thermal Class	A (105 class)	E (120 class)	B (130 class)	F (155 class)	H (180 class)
Oven temperature °C (°F)	200 (392)	215 (419)	225 (437)	240 (464)	260 (560)

4.7 Solderability Test

Three straight samples are taken at random from a same Lot of wire at least 150 mm (59 inches) long are immersed in a solder melt (Sn96.5/Ag3.0/Cu0.5) at 420 ± 5 °C during the specified in Table 4. After removal from the solder melt, the specimen is to be allowed to clean using a soft dry cloth, and after cleaning is to be examined for adhesion uniformity by visual examination except the 10 mm immersed ends of specimen.

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Table 4 Dipping time of Solderability Test at 420 ± 5 °C

Conductor diameter (mm)	Dipping time (second)
0.20 ~ 0.40	4
0.45 ~ 0.70	6
0.75 ~ 1.00	10

5. INSPECTION

Inspection of final product shall be satisfied with Appendix 2 value accordance with the requirements for Section 4. The inspection items shall be added or omitted by customer's demand.

6. PACKAGING

The wires shall be wound on suitable bobbin without loosen and tangle according to the conductor diameter (Appendix 1) and adequately packaged to avoid scratch or tangle during transportation. The packaged products shall be possible to permit 1 open-joint and if there is insufficient standard packaging length available to fill additional ones. However, the additional quantity shall not exceeding 30% of total supply quantity.

7. PRODUCT DESCRIPTION

Each product is attached with a tag to indicate following information

- 1) Product name or Symbol : Triple insulated Wire or STW-B
- 2) Conductor diameter : 0.50 mm
- 3) Color
- 4) Product Lot No.
- 5) Quantity or Product length
- 6) Manufacturer
- 7) Date of manufacture

8. CAUTION OF HANDLE

- 1) Always keep product away from the fire.
- 2) Do not expose the product direct sunlight area.
- 3) Also be carefully not to expose the product hot or humidity area.
- 4) The relevant products shall be applied within one year. If not applied for within one year, the product performance shall be confirmed before using the product.

9. ENTIRE AGREEMENT AND AMENDMENTS

- 1) This Specification shall come into force as of the date of its agreement by the customer or one month after offered to customer and effect until terminated in customer's demands.
- 2) Amendments or changes to this Specification shall be valid only if made in writing and signed by an authorised signatory of each of the Parties.

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Appendix 1 Specification of Wire

Dimensions					Maximum conductor resistance	Minimum conductor elongation	Length	Bobbin Size
Conductor		Insulation						
Diameter	Tolerance	Min. Overall Diameter	Typical Overall Diameter	Max. Overall Diameter				
(mm)	(mm)	(mm)	(mm)	(mm)	Ω/km	%	(m)	-
0.20	± 0.008	0.380	0.400	0.420	607.6	10	6,000	PT-10
0.22	± 0.008	0.400	0.420	0.440	498.4	10	6,000	PT-10
0.23	± 0.008	0.410	0.430	0.450	454.5	10	6,000	PT-10
0.25	± 0.008	0.430	0.450	0.470	382.5	10	6,000	PT-10
0.28	± 0.010	0.460	0.480	0.500	307.3	10	6,000	PT-10
0.29	± 0.010	0.470	0.490	0.510	285.7	10	6,000	PT-10
0.30	± 0.010	0.480	0.500	0.520	262.9	10	6,000	PT-10
0.32	± 0.010	0.500	0.520	0.540	230.0	10	6,000	PT-15
0.35	± 0.010	0.530	0.550	0.570	191.2	10	6,000	PT-15
0.37	± 0.010	0.550	0.570	0.590	170.6	10	6,000	PT-15
0.40	± 0.010	0.575	0.600	0.625	145.3	10	5,000	PT-15
0.45	± 0.010	0.625	0.650	0.675	114.2	10	5,000	PT-15
0.50	± 0.010	0.675	0.700	0.725	91.43	10	4,000	PT-15
0.55	± 0.020	0.725	0.750	0.775	78.15	10	4,000	PT-15
0.60	± 0.020	0.775	0.800	0.825	65.26	10	3,000	PT-15
0.65	± 0.020	0.825	0.850	0.875	55.31	10	3,000	PT-15
0.70	± 0.020	0.875	0.900	0.925	47.47	10	3,000	PT-25
0.75	± 0.020	0.925	0.950	0.975	41.19	10	3,000	PT-25
0.80	± 0.020	0.970	1.000	1.030	36.08	10	2,000	PT-25
0.85	± 0.030	1.020	1.050	1.080	31.87	10	2,000	PT-25
0.90	± 0.030	1.070	1.100	1.130	28.35	10	2,000	PT-25
0.95	± 0.030	1.120	1.150	1.180	25.38	10	2,000	PT-25
1.00	± 0.030	1.170	1.200	1.230	23.33	10	2,000	PT-25

* All the above values are shown just for reference and may slightly differ from each Lot.

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Appendix 2 Summary of the test specification

Test Item	Property		Related Standard
Appearance [4.1]	Shall not have scratch, contamination or crack on the surface and other harmful defects.		
Dimensions [4.2]	Shall be satisfied with Appendix 1.		IEC 60851-2
Spark Test [4.3]	No pinhole at 3,000V with final product		UL1581 section 900 UL SUBJECT 2353
Flexibility [4.4]	Specimens shall not show evidence of cracking. Shall be no insulation breakdown at 3,000V for 1 min.		UL SUBJECT 2353
Withstand Voltage [4.5]	Straight Test [4.5.1]	Shall be withstand without breakdown at 3,000V for 1min	UL SUBJECT 2353
	Twisted Test [4.5.2]	Shall be withstand without breakdown at 6,000V for 1min	
Heat shock [4.6]	Specimens shall not show evidence of cracking. Shall be withstand without breakdown at 3,000V for 1min.		UL SUBJECT 2353
Solderability [4.7]	Solder shall adhere to the conductor uniformity.		KS C 3006, 16. JIS C 3003, 16.