Tianjin Ruiyuan Electric Material Co., Ltd. / 天津瑞源电工材料有限公司

Specification Approval Form

RY-TIW-WIRE-TS-2025-001 Revised Version 1.0 (2025-01-15)

Tianjin Ruiyuan Electrical Material Co., Ltd.

Acknowledgment

APPROVAL SHEET

Customer Name: _____

Customer material code: _____

Material Name: Triple-insulated wire

Supplier Model : TIW-B/0.13～1.0MM

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RY-TIW-WIRE-TS-2025-001 Revised Version 1.0 (2025-01-15)

name	Specification Approval	serial number	RY -17-1025001(01)

Edition	Date of formulation	Revision content and reasons
00	2017/6/8	Newly formulated method for describing changes in packaging weight.
01	2017/8/22	Increase minimum resistance

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1. Scope of application

   Our products are suitable for high-frequency transformer windings and inductor windings, etc.

   Note: If there are any matters not specified in this specification, they will be described in the order or revised subsequently.

2. Varieties and Naming

   The types and names of triple-insulated wires are shown in Table 1.

Table 1

variety	name
Class B heat-resistant triple-insulated wire	TIW-B

3. conductor

   Soft copper wire as specified in GB/T3953 Electrical Round Copper Wire Standard.

4. Heat resistance rating, outer coating and properties

5. 1. Our products meet the IEC60950 standard Class B (130℃) high heat resistance.

4.2, External covering

(1) Outer Sheath: The first and second outer sheaths are made of PET resin, and the third outer sheath is made of PA resin, which is uniformly coated on the conductor surface. The outer sheath should not damage the conductor and should have sufficient durability. The outer sheath does not need to be removed during soldering and has good direct solderability.

Note: The outer quilt should be yellow in principle.

(2) The insulating outer sheath material is made of the same resin as UL heat rating 130° C (FILE No. E357240).

4. 3. Characteristics

According to Table 2.

Table 2

project	characteristic	Test methods / Test conditions	Check and distinguish: Type examine	Check and distinguish: conventional examine
Appearance	• No scratches on the surface. • Smooth surface and consistent color. • There are no adhering substances on the surface. • The roll shape is not messy.	Visual inspection of each axial material Method of inspection .	○	○
size	As shown in the attached table.		○	○
conductor resistance	As shown in the attached table.	————————	○	○
elongation	As shown in the attached	————————	○	○

	table.				
Insulation withstand voltage	As shown in the attached table.	————————————		○	○
Direct weldability	It should adhere completely to the solder without leaving any residue.	conductor diameter mm	Soldering time	○	○
		0.13～0.40	1-2 seconds		
		0.45～0.70	1.5 to 2.5 seconds		
		0.75～1.00	2-3 seconds		
Flexibility	The outer sheath should be free of exposed conductor cracks.	Wrap tightly 10 times		○	-
Adhesion	The exposed copper at the wire end should not exceed 3mm.	Rapid breakage		○	-
Withstand voltage	Withstand voltage 6000V	Use twisted pair method with AC voltage 6000V/5mA/60S		○	-
Thermal shock resistance	There should be no exposed conductors or cracks in the outer sheath.	The heating temperature is 225±5 ℃		○	-

5. Test methods

5.1 Visual Inspection

The surface of triple-insulated wire should be smooth and free from any defects inconsistent with good industrial products.

5.2.

Dimensional

Inspection

(1)

Conductor

Diameter

Remove the outer sheath using a method that does not damage the conductor. Measure three points on a 1-meter-long line and record the average value. (2) Complete the outer diameter measurement.

Measure 3 points on a 1-meter-long line

and record the average value. (3) Outer

thickness (single side)

(Completed outer diameter - conductor diameter) / 2

5.3 Conductor resistance test (1)

Take a 1-meter sample, and be

sure to leave enough clamp

length. (2) The measured value

should be converted to the

value at 20℃.

$$R_{20} = \frac{Rt \times \alpha t}{L} \times 10^{3}$$

R_{20} The conductor

resistance value Rt

at 20℃: The

conductor resistance

value at t℃

Table of temperature conversion factors for αt (Table-3)

L: Specimen length (meters)

Table 3 Temperature Conversion Factors

Temperature (° C)	coefficient αt	Temperature (° C)	coefficient αt	Temperature (° C)	coefficient αt
10	1.042	19	1.004	28	0.969
11	1.037	20	1.000	29	0.965
12	1.033	21	0.996	30	0.962
13	1.029	22	0.992	31	0.958
14	1.025	23	0.988	32	0.954
15	1.020	24	0.984	33	0.951
16	1.016	25	0.980	34	0.947
17	1.012	26	0.977	35	0.943
18	1.008	27	0.973		

5.4 Elongation Test

Take a suitable length of specimen and stretch it until it breaks using an elongation tester at an elongation rate of 300 mm/min. The increase in length of the specimen after stretching is...

$$\text{Elongation \%} = \frac{\text{Length of the specimen before stretching}}{} \times 100\%$$

Note: The length of the sample is the length between the two clamps.

5.5 Insulation withstand voltage test

Three samples of appropriate length were taken from the same reel and tested using the twisting method. The test voltage was an AC voltage of 50Hz or 60Hz with a voltage boosting rate of 500V/s.

Table 4 Loads and number of twists applied to the twisted pair

conductor nominal diameter		Load N (kgf)	Number of twists
Greater than	Less than or equal to		
0.100	0.250	0.85 (0.087)	33
0.250	0.355	1.70 (0.173)	twenty three
0.355	0.500	3.40 (0.347)	16
0.500	0.710	7.00 (0.714)	12
0.710	1.000	13.50 (1.378)	8

5.6 Direct Weldability Test

Take three appropriately sized samples from the same roll, test them at 420±5℃, and remove them at the time specified in Table-7. The soldered parts should be completely tinned.

Table 7

conductor diameter (mm)	Soldering time	backfire distance
0.13～0.40	1-2 seconds	2-4mm
0.45～0.70	1.5 to 2.5 seconds	3-5mm
0.75～1.00	2-3 seconds	4-6mm

5.7 Flexibility Test

Take three samples from the same roll and tightly wind them 10 times onto a smooth metal rod. The outer casing should be free of any visible damage.

5.8 Adhesion Test

Take three samples from the same roll, and quickly pull the samples apart with both hands. The exposed copper at the wire end should not exceed 3mm.

5.9 Withstand Voltage Test

Take three samples of appropriate length from the same roll and test them using the twisting method. The load and number of twists used in the test are in accordance with the requirements of Table-4. The test voltage is an AC voltage of 50Hz or 60Hz, and the test conditions are in accordance with the requirements of Table-2.

5. 10. Thermal shock resistance test

Take three samples from the same spool and tightly wind them 10 times onto the smooth metal rod required in Table-5. Place the wound samples in an oven at 225° C and bake for 30 minutes. Remove them and let them cool to room temperature.

Table 5

conductor diameter (mm)	0.05～0.34	0.35～0.49	0.50～0.74	0.75～1.00
Metal rod diameter (mm)	4	6	8	10

(1) Visual inspection

Using the magnifying glass specified in Table-6, the outer cover should be free of cracks.

Table 6

Conductor size	0.040～0.500	0.501以上
Magnification	5～10	0～6

(2) Voltage withstand verification

Remove the outer sheath from one end of the sample and connect it to the

electrodes on the twisted test device of the automatic voltage tester along with the metal rod used for winding. The test conditions are in accordance with the <<UL2353>> standard.

6. examine

The inspection items can be divided into type inspection and routine inspection. They shall be inspected in accordance with the test methods in item 5 and the items specified in Table-2, and must meet the requirements of item 4.

Note: When finished products are shipped, the data from routine inspections will be recorded in the shipment inspection report according to the delivery inspection items (refer to Table-2).

7. Package

7.1 Packaging

Triple-insulated wires should be wound onto a suitable spool in a secure and tangle-free manner, and the wires wound onto the same spool should be conductors of the same specification.

7.2 Appropriate outer packaging should be used to prevent damage and tangling during transportation.

8. Name of the product

Named according to type, color and conductor diameter or marking, color and conductor diameter.

exam Class B heat-resistant triple-insulated wire, 0.55mm² or TIW-B-0.55mm²
ple:

9. Mark
ing

Mark the following information in an appropriate place on the reel or container.

(1) Varieties

(2) Conductor diameter

(3) Manufacturing batch number

(4) Charge for length per roll

(5) Manufacturer's name or abbreviation

(6) Date of manufacture

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Appendix 1 Product Dimensions and Characteristics

conductor diameter (mm)	Conductor tolerance		Transformer wire Finished product OD(mm)		Inductor wire Finished product OD(mm)		Resistance, 20℃		elongation %	Insulation withstand voltage KV	
	MAX (mm)	MIN (mm)	Minimum	maximum	Minimum	maximum	MIN Ω/km	MAX Ω/km	Minimum	Twisting method	Round bar method
0.13	+0.008	-0.008	0.31	0.350	0.340	0.370	1153.21	1474.9	15.0	6	3
0.15	+0.008	-0.008	0.33	0.370	0.360	0.390	879.74	1088.7	15.0	6	3
0.16	+0.008	-0.008	0.34	0.380	0.370	0.400	778.12	950.1	15.0	6	3
0.18	+0.008	-0.008	0.36	0.400	0.390	0.420	621.37	742.0	15.0	6	3
0.20	+0.008	-0.008	0.38	0.420	0.410	0.440	507.62	595.5	15.0	6	3
0.21	+0.008	-0.008	0.39	0.430	0.420	0.450	462.12	538.0	15.0	6	3
0.23	+0.008	-0.008	0.41	0.450	0.440	0.470	387.72	445.4	15.0	6	3
0.25	+0.008	-0.008	0.43	0.470	0.460	0.490	329.94	374.8	15.0	6	3
0.28	+0.01	-0.01	0.46	0.500	0.490	0.520	261.14	301.1	20.0	6	3
0.30	+0.01	-0.01	0.48	0.520	0.510	0.540	228.53	261.0	20.0	6	3
0.35	+0.01	-0.01	0.53	0.570	0.560	0.590	169.46	189.9	20.0	6	3
0.37	+0.01	-0.01	0.55	0.590	0.580	0.610	152.09	169.4	20.0	6	3
0.40	+0.01	-0.01	0.58	0.620	0.610	0.640	130.65	144.3	20.0	6	3
0.42	+0.01	-0.01	0.60	0.640	0.630	0.660	118.78	131.3	20.0	6	3
0.43	+0.01	-0.01	0.61	0.650	0.640	0.670	113.44	124.4	20.0	6	3
0.45	+0.01	-0.01	0.63	0.670	0.660	0.690	103.79	113.4	20.0	6	3
0.50	+0.01	-0.01	0.68	0.720	0.710	0.740	84.44	91.43	20.0	6	3
0.55	+0.02	-0.02	0.73	0.770	0.760	0.790	67.60	78.15	20.0	6	3
0.60	+0.02	-0.02	0.78	0.820	0.810	0.840	57.13	65.26	20.0	6	3
0.65	+0.02	-0.02	0.83	0.870	0.860	0.890	48.92	55.31	20.0	6	3
0.70	+0.02	-0.02	0.88	0.920	0.910	0.940	42.36	47.47	20.0	6	3
0.73	+0.02	-0.02	0.91	0.950	0.940	0.970	39.04	43.55	20.0	6	3
0.75	+0.02	-0.02	0.93	0.970	0.960	0.990	37.04	41.19	20.0	6	3
0.80	+0.02	-0.02	0.98	1.020	1.010	1.040	32.66	36.08	25.0	6	3
0.85	+0.02	-0.02	1.03	1.070	1.060	1.090	29.02	31.87	25.0	6	3
0.90	+0.02	-0.02	1.08	1.120	1.110	1.140	25.95	28.35	25.0	6	3

0.95	+0.02	-0.02	1.13	1.170	1.160	1.190	23.34	25.38	25.0	6	3
1.00	+0.03	-0.03	1.18	1.220	1.210	1.240	20.70	23.33	25.0	6	3

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Appendix 2: Packaging Specifications and Weight Details Reference Table

Serial Number	Specification (mm)	Each axle package Number of meters loaded	Minimum mass per kilometer approximately (kg / km)	Axle load approximately (Kg)	box weight approximately (Kg)	Minimum net weight (kg/shaft)	Minimum Gross Weight (kg/shaft)	Minimum weight (kg/box)	Shaft model	Several axes / box
1	0.13	3000	0.180	0.25	0.59	0.540	0.790	3.750	PT-4	4-axis
2	0.15	3000	0.224	0.25	0.59	0.672	0.922	4.278	PT-4	4-axis
3	0.16	3000	0.248	0.25	0.59	0.744	0.994	4.566	PT-4	4-axis
4	0.18	3000	0.301	0.25	0.59	0.903	1.153	5.202	PT-4	4-axis
5	0.20	3000	0.359	0.25	0.59	1.077	1.327	5.898	PT-4	4-axis
6	0.21	3000	0.390	0.25	0.59	1.170	1.420	6.270	PT-4	4-axis
7	0.23	3000	0.456	0.25	0.59	1.368	1.618	7.062	PT-4	4-axis
8	0.25	3000	0.528	0.25	0.59	1.584	1.834	7.926	PT-4	4-axis
9	0.28	3000	0.640	0.25	0.59	1.920	2.170	9.270	PT-4	4-axis
10	0.30	3000	0.725	0.25	0.59	2.175	2.425	10.290	PT-4	4-axis
11	0.32	3000	0.816	0.25	0.59	2.448	2.698	11.382	PT-4	4-axis
12	0.35	3000	0.963	0.25	0.59	2.889	3.139	13.146	PT-4	4-axis
13	0.37	3000	1.068	0.42	0.630	3.204	3.624	7.878	PT-10	2-axis
14	0.40	3000	1.236	0.42	0.630	3.708	4.128	8.886	PT-10	2-axis
15	0.42	3000	1.355	0.42	0.630	4.065	4.485	9.600	PT-10	2-axis
16	0.43	3000	1.417	0.42	0.630	4.251	4.671	9.972	PT-10	2-axis
17	0.45	3000	1.544	0.42	0.630	4.632	5.052	10.734	PT-10	2-axis
18	0.50	3000	1.887	0.42	0.630	5.661	6.081	12.792	PT-10	2-axis
19	0.55	3000	2.200	0.42	0.630	6.600	7.020	14.670	PT-10	2-axis
20	0.60	3000	2.606	0.55	0.340	7.818	8.368	8.708	PT-15	1 axis
twenty one	0.65	3000	3.048	0.55	0.340	9.144	9.694	10.034	PT-15	1 axis
twenty two	0.70	3000	3.524	0.55	0.340	10.572	11.122	11.462	PT-15	1 axis
twenty	0.73	3000	3.827	0.55	0.340	11.481	12.031	12.371	PT-15	1 axis

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three										
twenty four	0.75	3000	4.035	0.55	0.340	12.105	12.655	12.995	PT-15	1 axis
25	0.80	2500	4.581	0.55	0.340	11.453	12.003	12.343	PT-15	1 axis
26	0.85	2500	5.162	0.55	0.340	12.905	13.455	13.795	PT-15	1 axis
27	0.90	2000	5.778	0.55	0.340	11.556	12.106	12.446	PT-15	1 axis
28	0.95	2000	6.429	0.55	0.340	12.858	13.408	13.748	PT-15	1 axis
29	1.00	1500	6.998	0.55	0.340	10.497	11.047	11.387	PT-15	1 axis

Note: PT4 axle load is approximately 0.25±0.01KG, PT10 axle load is approximately 0.42±0.01KG, and PT15 axle load is approximately 0.55±0.01KG. Minimum weight refers to online weight.
Within the size difference range, the product weight is not less than this value, and our company will not have more than 2 connectors per axis.

Dia.	Tolerance		Transformer		Inductor		Resistance , 20℃		Elongation	High Votage	
	MAX	MIN	O.D mm		O.D mm		MIN	MAX	%	KV	
(mm)	(mm)	(mm)	Min	Max	Min.	Max.	Ω/km	Ω/km	Min	Twist	Wrap
0.13	+0.008	-0.008	0.31	0.350	0.340	0.370	1153.21	1474.9	15.0	6	3
0.15	+0.008	-0.008	0.33	0.370	0.360	0.390	879.74	1088.7	15.0	6	3
0.16	+0.008	-0.008	0.34	0.380	0.370	0.400	778.12	950.1	15.0	6	3
0.18	+0.008	-0.008	0.36	0.400	0.390	0.420	621.37	742.0	15.0	6	3
0.20	+0.008	-0.008	0.38	0.420	0.410	0.440	507.62	595.5	15.0	6	3
0.21	+0.008	-0.008	0.39	0.430	0.420	0.450	462.12	538.0	15.0	6	3
0.23	+0.008	-0.008	0.41	0.450	0.440	0.470	387.72	445.4	15.0	6	3
0.25	+0.008	-0.008	0.43	0.470	0.460	0.490	329.94	374.8	15.0	6	3
0.28	+0.01	-0.01	0.46	0.500	0.490	0.520	261.14	301.1	20.0	6	3
0.30	+0.01	-0.01	0.48	0.520	0.510	0.540	228.53	261.0	20.0	6	3
0.32	+0.01	-0.01	0.50	0.540	0.530	0.560	201.67	228.4	20.0	6	3
0.35	+0.01	-0.01	0.53	0.570	0.560	0.590	169.46	189.9	20.0	6	3
0.37	+0.01	-0.01	0.55	0.590	0.580	0.610	152.09	169.4	20.0	6	3
0.40	+0.01	-0.01	0.58	0.620	0.610	0.640	130.65	144.3	20.0	6	3
0.42	+0.01	-0.01	0.60	0.640	0.630	0.660	118.78	131.3	20.0	6	3
0.43	+0.01	-0.01	0.61	0.650	0.640	0.670	113.44	124.4	20.0	6	3

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0.45	+0.01	-0.01	0.63	0.670	0.660	0.690	103.79	113.4	20.0	6	3
0.50	+0.01	-0.01	0.68	0.720	0.710	0.740	84.44	91.43	20.0	6	3
0.55	+0.02	-0.02	0.73	0.770	0.760	0.790	67.60	78.15	20.0	6	3
0.60	+0.02	-0.02	0.78	0.820	0.810	0.840	57.13	65.26	20.0	6	3
0.65	+0.02	-0.02	0.83	0.870	0.860	0.890	48.92	55.31	20.0	6	3
0.70	+0.02	-0.02	0.88	0.920	0.910	0.940	42.36	47.47	20.0	6	3
0.73	+0.02	-0.02	0.91	0.950	0.940	0.970	39.04	43.55	20.0	6	3
0.75	+0.02	-0.02	0.93	0.970	0.960	0.990	37.04	41.19	20.0	6	3
0.80	+0.02	-0.02	0.98	1.020	1.010	1.040	32.66	36.08	25.0	6	3
0.85	+0.02	-0.02	1.03	1.070	1.060	1.090	29.02	31.87	25.0	6	3
0.90	+0.02	-0.02	1.08	1.120	1.110	1.140	25.95	28.35	25.0	6	3
0.95	+0.02	-0.02	1.13	1.170	1.160	1.190	23.34	25.38	25.0	6	3
1.00	+0.03	-0.03	1.18	1.220	1.210	1.240	20.70	23.33	25.0	6	3

No.	DIA （mm）	M/ spool	Min. Weight（kg/km）	Spool weight (Kg)	Carton Weight (Kg)	Min.Net Weight (kg/spool)	Min.Gross weight（kg/spool）	Min. Gross Weight(kg/carton)	Spool size	Spool/ Carton
1	0.13	3000	0.180	0.25	0.59	0.540	0.790	3.750	PT-4	4
2	0.15	3000	0.224	0.25	0.59	0.672	0.922	4.278	PT-4	4
3	0.16	3000	0.248	0.25	0.59	0.744	0.994	4.566	PT-4	4
4	0.18	3000	0.301	0.25	0.59	0.903	1.153	5.202	PT-4	4
5	0.20	3000	0.359	0.25	0.59	1.077	1.327	5.898	PT-4	4
6	0.21	3000	0.390	0.25	0.59	1.170	1.420	6.270	PT-4	4
7	0.23	3000	0.456	0.25	0.59	1.368	1.618	7.062	PT-4	4
8	0.25	3000	0.528	0.25	0.59	1.584	1.834	7.926	PT-4	4
9	0.28	3000	0.640	0.25	0.59	1.920	2.170	9.270	PT-4	4
10	0.30	3000	0.725	0.25	0.59	2.175	2.425	10.290	PT-4	4
11	0.32	3000	0.816	0.25	0.59	2.448	2.698	11.382	PT-4	4
12	0.35	3000	0.963	0.25	0.59	2.889	3.139	13.146	PT-4	4
13	0.37	3000	1.068	0.42	0.630	3.204	3.624	7.878	PT-10	2
14	0.40	3000	1.236	0.42	0.630	3.708	4.128	8.886	PT-10	2
15	0.42	3000	1.355	0.42	0.630	4.065	4.485	9.600	PT-10	2

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16	0.43	3000	1.417	0.42	0.630	4.251	4.671	9.972	PT-10	2
17	0.45	3000	1.544	0.42	0.630	4.632	5.052	10.734	PT-10	2
18	0.50	3000	1.887	0.42	0.630	5.661	6.081	12.792	PT-10	2
19	0.55	3000	2.200	0.42	0.630	6.600	7.020	14.670	PT-10	2
20	0.60	3000	2.606	0.55	0.340	7.818	8.368	8.708	PT-15	1
21	0.65	3000	3.048	0.55	0.340	9.144	9.694	10.034	PT-15	1
22	0.70	3000	3.524	0.55	0.340	10.572	11.122	11.462	PT-15	1
23	0.73	3000	3.827	0.55	0.340	11.481	12.031	12.371	PT-15	1
24	0.75	3000	4.035	0.55	0.340	12.105	12.655	12.995	PT-15	1
25	0.80	2500	4.581	0.55	0.340	11.453	12.003	12.343	PT-15	1
26	0.85	2500	5.162	0.55	0.340	12.905	13.455	13.795	PT-15	1
27	0.90	2000	5.778	0.55	0.340	11.556	12.106	12.446	PT-15	1
28	0.95	2000	6.429	0.55	0.340	12.858	13.408	13.748	PT-15	1
29	1.00	1500	6.998	0.55	0.340	10.497	11.047	11.387	PT-15	1