TCT KCT

TO WHOM IT MAY CONCERN

TCT Co., Ltd, was established in September 1989 and has been recognized as a reliable manufacturer in the copper wire industry over 20 years. We, **TCT Co., Ltd** hereby confirm that we are the OEM manufacturer of enameled copper wire for **Kin Copper Electric Sdn Bhd** under their brand name GAUGE , in accordance to specification below :

Grade : Polyesterimide Polyamideimide Enamelled Copper Wire (1 EI/AIW)
Standards : NEMA MW 73-C, MW 35-C
: JIS C3053 & JIS C3003

This specification of wire is readily recognized by the UL (Underwriter Laboratory) Standard, as well as other International Standards.

STANDARDS	IEC 60317-13 NEMA MW 73-C, MW 35-C JIS C3053
Symbol	EIAIW
Insulation Coating	Polyesterimide with Polyamide-Imide Overcoat
Mechanical Properties*	*properties stated are for sample at size 1.00mm
Elongation	>25%
Adherence - Flexibility	Film free from cracks such as expose the conductor
Resistance to Abrasion	>7.0N
Electrical Properties Braskdown Voltage	10KV
Thermal Properties	
Temperature Index	200°C
Cut Through	Min 300°C
Heat Shock	Film free from cracks such as to expose the conductor
Chemical Propertie	
Solvent Test	Film free from blister and peeling off by 2H pencil lead or finger nail
Resistance to Refrigerants	HFC134 - 404 - 407 FREON R12 R22 R134-a

TAIHAN COPPER TECH CO., LTD. PRESIDENT Onsan, Ulju, Ulsan, Korea

TCT Co., LTD
DATE : 1st June 2015

SGCN : 0620430000002 - CÔNG TY TNHH ĐỒNG KỸ THUẬT KOREA VIỆT NAM - KHU CÔNG NGHIỆP QUỲ TIÊN - T. HÀ NAM

KCT Co., LTD
DATE : 3rd June 2015

SPECIFICATION

FOR

POLYESTERIMIDE POLYAMIDEIMIDE ENAMELLED COPPER WIRE

(1 EI/AIW)

PREPARED BY T. J. SEO

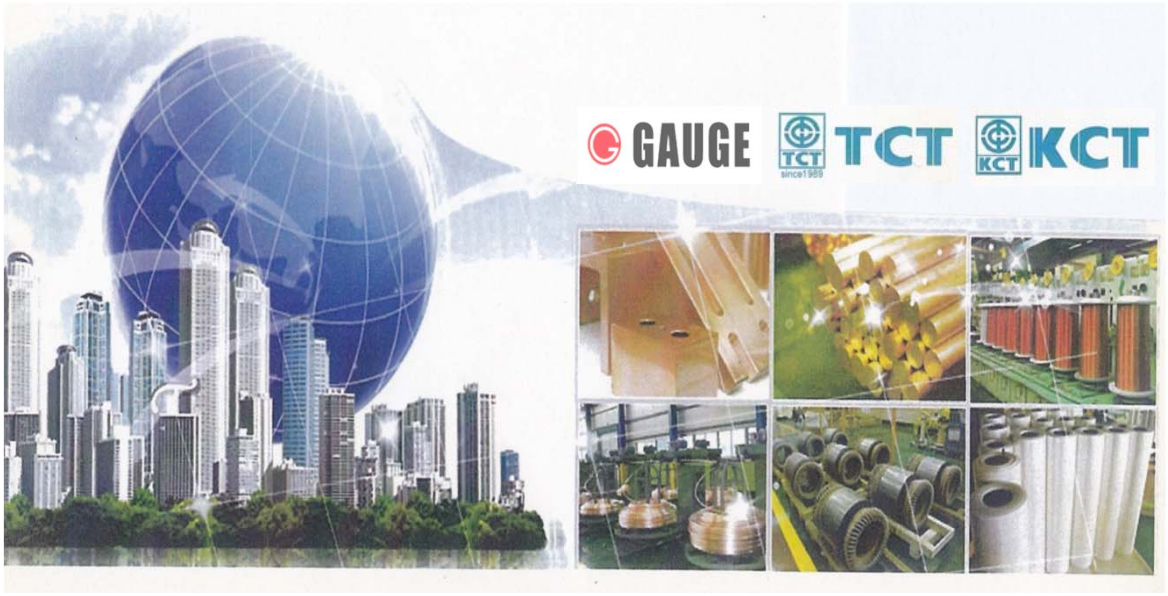
PREPARED BY Y. S. KIM

TCT since1989 TCT KCT KCT GAUGE

GAUGE 200

The GAUGE brand of enameled copper wire is produced on an OEM (Original Equipment Manufacturer) basis by established Copper Wire Manufacturers using foreign based Technologies.

In its finished form, the GAUGE 200 is a multi-purpose dual coated wire which combines the excellent physical and electrical properties of a Polyesterimide based coat with the added smoothness and high thermal rating of a Polyamide-Imide linear polymer top coat. The combination of these two high quality resins produce a coating which has outstanding surface toughness, abrasion resistance, flexibility, chemical resistance, burnout and thermal resistance and dielectric strength. This specification of wire is readily recognized by the UL (Under writer Laboratory) Standard, as well as other International Standards.



In Collaboration With TCT KCT

1. SCOPE

This specification covers the requirements for Polyesterimide overcoated with polyamideimide enamelled round copper magnet wire for use in the manufacture of electrical apparatus.

2. CLASS AND SYMBOLS

The wires are classified according to the conductor and thickness of film, and the classes and symbols shall be as Table 1.

Table 1

Class	Symbol
Class H POLYESTERIMIDE POLYAMIDEIMIDE ENAMELLED COPPER WIRE	1EI/AIW

3. CONDUCTOR, INSULATING FILM AND APPEARANCE

3.1 Conductor

The conductor of the wire shall be annealed copper wire specified JIS C 3102 Annealed Copper Wires for Electrical Purpose or the equivalent, for class 1.

3.2 Insulation film

The insulation film shall be made up by uniformly applying and thoroughly baking insulation varnish underlying film shall be primarily composed of polyesterimide resin and the superimposed film shall be composed of Polyamideimide resin.

4. DIMENSIONS

The conductor diameter and its tolerance, minimum film thickness and maximum finished out side diameter shall comply with attached Appendix 1.

Applicable standards

1) JIS C 3003 Methods of Test for Enamelled Copper and Enamelled Aluminium Wires
2) JIS C 3102 Annealed Copper Wires
3) JIS C 3202 Enamelled Winding Wires
4) JIS K 8576 Sodium Hydroxide
5) JIS K 8951 Sulfuric Acid

5. CHARACTERISTICS

The characteristics of the wires shall comply with Table 2, when tested by 6.

Table 2

Item	Characteristics		Test Methods
Appearance	(1) No flaws (2) Smooth surface, uniform luster and color (3) Not sticky (4) Not to be readily scratched off by nail		6.1
Pinhole	No defect.		6.3
	In retest both test pieces to comply with the above value.		
Flexibility	Film shall show no crack through which conductor is visible		6.4
Adherence	Film shall show no crack through which conductor is visible		6.5
Resistance to abrasion	Shall meet the values specified in Appendix 1.		6.6
Dielectric breakdown voltage	Conductor Dia.(mm)	Dielectric breakdown voltage(V)	6.7
	0.30 ~ 0.70 0.75 ~ 4.20	10000 ↑ 10000 ↑	
Resisitance to cut through	340℃ ↑		6.8
Resisitance to heat shock	Film shall show no crack through which conductor is visible		6.9
Resistance to solvent Resistance to chemicals	Elongated	No bubble or blister in the film Film not to peel off to expose the conductor	6.10 6.11
	Wound	No bubble or blister in the film With 2H, Film not to peel off to expose the conductor	
Conductor resistance	To comply with the values of attached Appendix 1.		6.12
Spring Elongation Number (S.E.N)	Conductor Dia.(mm)	S. E. N (cm)	6.13
	0.30 ~ 0.55 0.60 ~ 2.50	320 ↑ 320 ↑	

6. TESTING METHODS

6.1 Appearance
This shall comply with 4. of JIS C 3003
(Methods of Test for Enamelled Copper and Enamelled Aluminium Wires)

6.2 Dimension
This shall comply with 5.(1) of JIS C 3003

6.3 Pinhole
This shall comply with 6.of JIS C 3003. In case the number of pinhole does not comply with the requirements, a retest may be made by taking 2 more test pieces from the same bobbin

6.4 Flexibility
This shall comply with 8.1 of JIS C 3003. The elongation or the diameter of mandrel shall comply with the following table 3.

Table 3

Conductor diameter (mm)	Elongation or Mandrel diameter
0.30 ~ 0.35	20% or to its breaking point, whichever is less
0.36 ~ 2.00	1 D (D : overall diameter)
2.05 ~ 2.50	2 d (d : Conductor diameter)

6.5 Adherence
This shall comply with 9. of JIS C 3003

6.6 Resistance to abrasion
This shall comply with 10. of JIS C 3003

6.7 Dielectric breakdown voltage
This shall comply with 11. (2) of JIS C 3003

6.8 Resistance to cut through
This shall comply with 12. (2) of JIS C 3003

6.9 Resistance of Heat shock
This Shall comply with 13.1 of JIS C 3003.
The heating temperature shall be 220±5℃/1hr, and elongation and diameter of mandrel shall comply with Table 4.

Conductor diameter (mm)	Elongation or Mandrel diameter
0.30 ~ 0.35	1 d (d : Conductor diameter)
0.36 ~ 0.75	2d (d : Conductor diameter)
0.80 ~ 2.00	3 d (d : Conductor diameter)
2.05 ~ 2.50	4 d (d : Conductor diameter)

6.10 Resistance to solvent
This shall comply with 14.1 (2) of JIS C 3003.

6.11 Resistance to chemicals
This shall comply with 15.1 of JIS C 3003.
Two test pieces shall be taken, and one shall be use for chemicals (1) and the other for (2), as given below.
(1) Sulfuric acid (H2 OS4) specified in JIS K 8951, dilute to specific gravity 1.20 with distilled water or desalted water added.
(2) Aqueous solution (about 1%) of sodium hydroxide(NaOH) specified in JIS K 8576.

6.12 Conductor resistance
This shall comply with 19. of JIS C 3003.

6.13 Spring Elongation Number (S.E.N)
This shall comply with 21.(1) of JIS C 3003.

7. INSPECITION
Inspection shall be made on the following items by the testing methods of 6. and the wire shall be comply with the requirements of 3,4 and 5. The items may be omitted partly agreements between the parties concerned.

(1) Appearance
(2) Dimension
(3) Pinhole
(4) Flexibility
(5) Adherence
(6) Resistance to abrasion
(7) Dielectric Breakdown Voltage
(8) Resistance to cut through
(9) Resistance to Heat Shock
(10) Resistance to Solvent
(11) Resistance to Chemicals
(12) Conductor Resistance
(13) Spring Elongation Number (S.E.N)

8. PACKING AND NET WEIGHT PER COIL

8.1 Packing
The wire shall be wound, without slackness or tangle, on a bobbin of suitable size according to the conductor diameter, or shall be coiled, without tangle, in a container of suitable size, and shall be suitable packaged so as not to be damaged or entangled in transportation.

8.2 Net Weight
The net weight shall comply with Table 5, unless otherwise agree upon between the parties concerned.

Table 5

Conductor diameter (mm)	Bobbin	Standard weight (kg)
0.30 ~ 0.50	DIN - 200	10kg +/-2kg
0.55 ~ 2.50	DIN - 250	20kg +/-2kg
0.30 ~ 2.50	PT25	25kg +/-2kg

9. MARKING
The bobbin or container shall be marked at a suitable place with the following items.
9.1 Class or symbol
9.2 Conductor diameter
9.3 Manufacturing No.
9.4 Net Weight
9.5 Manufacturer's name or mark
9.6 Year and month of manufacture

10. DESIGNATION
The product shall be designated by class and conductor diameter or symbol and conductor diameter.
Example : Class H Polyesterimide Polyamideimide enamelled copper wire 1.00mm
or H EI/AIW 1.00mm

Appendix 1 : 1EI/AIW

Conductor (mm)		Min.Film Thickness. (mm)	Maximum Overall diameter (mm)	Maximum Conductor Resistance Ω/km (20℃)	Scrape Grams to Fail (gf ↑)	
Diameter	Tolerance				Average	Minimum
2.50	±0.020	0.033	2.678	28.35	1,490	1,270

Refrigerant Resistance Of Various Enameled Wire

Type	Freon					
	R11	R12	R21	R22	R134a	R1234YF
EIW	@	@	#	@	@	@
EI-AIW	@	@	@	O	O	@
AIW	@	@	@	@	O	O

Notes : O : Acceptable For Use
: Not Recommendable
@ : Usable After Examining

Appendix 1 : 1EI/AIW

Conductor (mm)		Min.Film Thickness.	Maximum Overall diameter (mm)	Maximum Conductor Resistance Ω/km (20℃)	Scrape Grams to Fail (gf ↑)	
Diameter	Tolerance	(mm)			Average	Minimum
0.30	±0.010	0.021	0.374	262.9	595	510
0.31	±0.010	0.021	0.384	240.8	595	510
0.32	±0.010	0.021	0.394	230.0	595	510
0.33	±0.010	0.014	0.404	209.3	595	510
0.34	±0.010	0.014	0.414	197.0	635	540
0.35	±0.010	0.014	0.424	191.2	635	540
0.36	±0.010	0.014	0.434	175.4	635	540
0.37	±0.010	0.014	0.446	170.6	675	575
0.38	±0.010	0.014	0.456	157.2	675	575
0.39	±0.010	0.014	0.466	149.1	675	575
0.40	±0.010	0.015	0.480	145.3	675	575
0.41	±0.010	0.015	0.490	134.8	675	575
0.42	±0.010	0.015	0.500	128.4	720	615
0.43	±0.010	0.015	0.510	122.4	720	615
0.44	±0.010	0.015	0.521	117.4	720	615
0.45	±0.010	0.016	0.532	114.2	720	615
0.47	±0.010	0.016	0.543	102.7	770	655
0.48	±0.010	0.016	0.556	98.40	770	655
0.49	±0.010	0.016	0.564	94.37	770	655
0.50	±0.010	0.017	0.586	91.43	770	655
0.55	±0.020	0.017	0.646	78.15	820	670
0.60	±0.020	0.017	0.698	65.26	880	750
0.65	±0.020	0.018	0.752	55.31	880	750
0.70	±0.020	0.019	0.804	47.47	940	800
0.75	±0.020	0.020	0.860	41.19	1,000	850
0.80	±0.020	0.021	0.914	36.08	1,000	850
0.85	±0.020	0.022	0.966	31.87	1,070	910

Appendix 1 : 1EI/AIW

Conductor (mm)		Min.Film Thickness.	Maximum Overall diameter (mm)	Maximum Conductor Resistance Ω/km (20℃)	Scrape Grams to Fail (gf ↑)	
Diameter	Tolerance	(mm)			Average	Minimum
0.90	±0.020	0.023	1.02	28.35	1,070	910
0.95	±0.020	0.024	1.072	25.38	1,150	980
1.00	±0.030	0.025	1.138	23.33	1,150	980
1.05	±0.030	0.025	1.19	20.37	1,150	980
1.10	±0.030	0.026	1.242	19.17	1,230	1,045
1.15	±0.030	0.026	1.292	17.04	1,230	1,045
1.20	±0.030	0.026	1.342	16.04	1,310	1,115
1.25	±0.030	0.026	1.395	14.39	1,310	1,115
1.30	±0.030	0.027	1.448	13.61	1,400	1,190
1.35	±0.030	0.027	1.458	12.32	1,400	1,190
1.40	±0.030	0.027	1.548	11.7	1,400	1,190
1.45	±0.030	0.027	1.601	10.66	1,400	1,190
1.50	±0.030	0.028	1.654	10.16	1,490	1,270
1.55	±0.030	0.028	1.704	9.317	1,490	1,270
1.60	±0.030	0.028	1.754	8.738	1,490	1,270
1.65	±0.030	0.028	1.805	8.212	1,490	1,270
1.70	±0.030	0.029	1.906	7.732	1,490	1,270
1.75	±0.030	0.029	1.864	7.293	1,490	1,270
1.80	±0.030	0.029	1.956	6.89	1,490	1,270
1.85	±0.030	0.029	2.009	6.519	1,490	1,270
1.90	±0.030	0.030	2.062	6.178	1,490	1,270
1.95	±0.030	0.030	2.112	5.863	1,490	1,270
2.00	±0.030	0.030	2.162	5.6	1,490	1,270
2.10	±0.030	0.031	2.266	5.074	1,490	1,270
2.20	±0.030	0.032	2.368	4.619	1,490	1,270
2.30	±0.030	0.032	2.468	4.223	1,490	1,270
2.40	±0.030	0.033	2.574	3.875	1,490	1,270