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TECHNICAL SPECIFICATION FOR ALUMINUM CLAD STEEL WIRE

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1. PROFILE OF ZTT AS WIRE FACTORY



Aluminum Clad Steel Wire Factory of Zhongtian Technologies Co., Ltd.(hereinafter abbr. ZTT AS Wire Factory) is one of the subsidiary factory of ZTT Group, which can supply raw material for the electric conductor and the special electric optical cable (OPGW). ZTT AS Wire Factory has been equipped with “Holton Conform” continuous extrusion and cladding machine

imported from Britain and “Mario Frigerio” ACS drawing machine produced in Italy.

Therefore, we can produce different kind of AS wires from 10% IACS to 40% IACS AS wire and we also try to find new ways for manufacturing such as exciting AS wet drawing crafts. These make ZTT AS product approaching world advanced level in AS appearance and concentricity. And we apply the patent right for it.

AS Wire Factory of ZTT has strict quality control, and try our best to satisfy the customers, and we devote ourselves to making ZTT Brand been well known all round the world.



“Holton Conform 2000”
continuous-extrusion and cladding
machines imported from Britain



“Mario Frigerio”
AS wire drawing machines
made in Italy

2. ZTT AS WIRE PRODUCTION EQUIPMENTS AND MANUFACTURING PROCESS

2.1 ZTT AS Wire Production Equipments List

Item	Equipment Name	Type	Supplier	No.
1	Pretensioning line	4*700	Hangzhou Super-Strength Co., Ltd	1
2	Heat Treatment Furnace	18 bore	Wuxi Xinrun Co., Ltd	1
3	18 caput Heat Treatment winding and unwinding Line	/	Hangzhou Super-Strength Co., Ltd	1set
4	Continuous Extrusion and Cladding Line	/	Holton Conform, England	2
5	Continuous Extrusion and Cladding Line	/	Changzhou, China	2
6	Wire Drawing Machine	8*700+4*630	Mario Frigerio SpA, Italy	2
7	Wire Drawing Machine	8*700	Wuhan, China	2
8	Tubular Strander Line	7 tray	Sichuan Deyang Company	3
9	Cage Strander Line	37 tray	Hefei Huaxin Company	1
10	Rewinding Machine	/	Shanghai Huiyuan Company	7

2.2 ZTT AS Wire Manufacturing Process

High Carbon Steel Wire Rods



Pretensioning Line and Heat Treatment Process



Continuous Extrusion and Cladding Line



Wire Drawing Line



Products Inspection and Warehousing

3. ZTT AS WIRE TEST ITEMS AND TEST EQUIPMENTS

3.1 Standard of ZTT AS Wire

3.1.1 International Standard:

IEC 61232-1993: Aluminium-clad steel wires for electrical purposes.

ASTM B415-98(2002): Standard Specification for Hard-Drawn Aluminum-Clad Steel Wire

ASTM B502-1998: Standard Specification for Aluminum-Clad Steel Core Wire for Aluminum Conductors, Aluminum-Clad Steel Reinforced

3.1.2 Chinese Standard:

GB/T 17937-1999: Aluminium-clad steel wires for electrical purposes

3.2 ZTT AS Wire Test Items:

3.2.1 Surface Quality

3.2.2 Diameter

3.2.3 Tensile Strength

3.2.4 Elongation at break

3.2.5 Torsion

3.2.6 Resistivity

3.2.7 Minimum Thickness of Aluminum Coating

3.2.8 Stress at 1% Elongation

3.3 ZTT AS Wire Test Equipment List

Item	Equipment Name	Type	Supplier	No.
1	Hydraulic Pressure Test Machine Controlled by Computer	WEW-10C	Shanghai Hualong Test Equipment Company	1
2	Wire Torsion Test Machine	SXN-6	Shanghai Hualong Test Equipment Company	1
3	Digital Image Test Machine	23JA	Shanghai Exactitude Instruments Company	1
4	DC Galvanometer	AZ/9	Hangzhou Fuyang Company	1
5	Standard resistor	BZ3	Hangzhou Fuyang Company	3
6	DC Exactitude Electrical Source	FB871/9	Hangzhou Fuyang Company	1
7	Bridge Clamp	DQ-1	Hangzhou Fuyang Company	1
8	Double Aim Bridge	QJ36	Hangzhou Fuyang Company	1

4. PERFORMANCE OF ZTT AS WIRE

4.1 Min. Thickness of Aluminum Coating

Class	Min. Thickness of Aluminum Coating	Class	Min. Thickness of Aluminum Coating
LB14	5% of AS wire nominal diameter	LB27	14% of AS wire Nominal diameter
LB20	8% of AS wire nominal diameter (When diameter is less than 1.8mm)	LB30	15% of AS wire Nominal diameter
	10% of AS wire nominal diameter (When diameter is not less than 1.8mm)	LB35	20% of AS wire Nominal diameter
LB23	11% of AS wire Nominal diameter	LB40	25% of AS wire Nominal diameter

4.2 Density, Section Ratio of Aluminum and Steel, weight Ratio of Aluminum and Steel

Class	LB14	LB20		LB23	LB27	LB30	LB35	LB40
		A	B					
Nominal Density at 20°C(g/cm ³)	7.14	6.59	6.53	6.27	5.91	5.61	5.15	4.64
Section Ratio of Aluminum(%)	13	25	25	30	37	43	52	62
Section Ratio of Steel	87	75	75	70	63	57	48	38
Weight Ratio of Aluminum (%)	5	10.4	10.4	12.9	16.9	20.7	27.3	36.1
Weight Ratio of Steel (%)	95	89.6	89.6	87.1	83.1	79.3	72.7	63.9

4.3 Conductivity

The conductivity of an aluminum clad steel wire is designed according to the 61% IACS aluminum and 9% IACS steel.

For example: The following shows the conductivity design of LB30

$$61% \times 0.43 + 9% \times 0.57 = 31.36\% \text{ IACS}$$

And considering the relative accuracy, the minimum design is 30%IACS. (Resistivity: 57.47 nΩ.m)

Class	LB14	LB20		LB23	LB27	LB30	LB35	LB40
		A	B					
Conductivity (%IACS)	14	20.3	20.3	23	27	30	35	40

4.4 Physical Constant

Class	LB14	LB20		LB23	LB27	LB30	LB35	LB40
Type	-	A	B	-	-	-	-	-
Final Modulus of Elasticity (GPa)	170	162	155	149	140	132	122	109
Thermal Elongation Coefficient ($K^{-1} \times 10^{-6}$)	12.0	13.0	12.6	12.9	13.4	13.8	14.5	15.5
Temperature Coefficient (K^{-1})	0.0034	0.0036	0.0036	0.0036	0.0036	0.0038	0.0038	0.0040

4.5 Tensile Strength and Resistivity

Class	Type	Nominal Diameter		Min Tensile Strength (MPa)	Min stress at 1% elongation (MPa)	Max resistivity value at 20°C (nΩ.m)
		More than	Less than and equal			
LB14	-	1.49	2.25	1620	1450	123.15 (comply with 14%IACS)
		2.25	3.00	1590	1410	
		3.00	3.50	1550	1380	
		3.50	4.75	1520	1340	
		4.75	5.50	1500	1270	
LB20	A	1.24	3.25	1340	1200	84.80 (comply with 20.3%IACS)
		3.25	3.45	1310	1180	
		3.45	3.65	1270	1140	
		3.65	3.95	1250	1100	
		3.95	4.10	1210	1100	
		4.10	4.40	1180	1070	
		4.40	4.60	1140	1030	
		4.60	4.75	1100	1000	
		4.75	5.50	1070	1000	
	B	1.24	5.50	1320	1100	
LB23	-	2.50	5.00	1220	980	74.96 (comply with 23%IACS)
LB27	-	2.50	5.00	1080	800	63.86 (comply with 27%IACS)
LB30	-	2.50	5.00	880	650	57.47 (comply with 30%IACS)
LB35	-	2.50	5.00	810	590	49.26 (comply with 35%IACS)
LB40	-	2.50	5.00	680	500	43.10 (comply with 40%IACS)