

MICC alloy wire catalogue

Thermocouple Alloy wire is used at temperatures up to 1260°C (2300°F). MICC thermocouple alloy wire is supplied with bright or oxidized surface according to standard or special EMF requirements.

Each individual lead is calibrated against platinum and the EMF values are shown on each coil or spool

Type of Thermocouple Alloy Wire				
Type	Alloy	Working Environment	Temperature (°C)	
K	NiCr	Oxidizing	-200	1260
	NiSi	Inert		
N	NiCrSi	Oxidizing	-200	1260
	NiSi	Oxidizing		
E	NiCr	Oxidizing	-200	900
	CuNi	Oxidizing		
J	Fe	Oxidizing	-40	750
	CuNi	Reducing, inert, vacuum		
T	Cu	Oxidizing, vacuum	-200	350
	CuNi	Reducing, inert		



Temperature of Thermocouple Alloy Wire						
Type	Φ3.26mm	Φ1.63mm	Φ1.00mm	Φ0.80mm	Φ0.50mm	Φ0.30mm
K	1050°C	930°C	900°C	860°C	800°C	750°C
E	860°C	800°C	750°C	700°C	660°C	620°C
T		400°C	360°C	320°C	280°C	250°C
J	760°C	760°C	720°C	680°C	650°C	600°C
N	1100°C	1010°C	960°C	930°C	890°C	840°C

Standards of Thermocouple Alloy Wire	
MICC thermocouple alloys are supplied according to the following standards shown below. we can supply different EMF values.	
ASTM	(American Society for Testing and Materials) E 230
ANSI	(American National Standard Institute) MC 96.1
IEC	(European Standard by the International Electrotechnical Commission 584)-1/2/3
DIN	(Deutsche Industrie Normen) EN 60584 -1/2
BS	(British Standards) 4937.1041, EN 60584 -1/2
NF	(Norme Française) EN 60584 -1/2 - NFC 42323 - NFC 42324
JIS	(Japanese Industrial Standards) C 1602 - C 1610
GOST	(Unification of the Russian Specifications) 3044

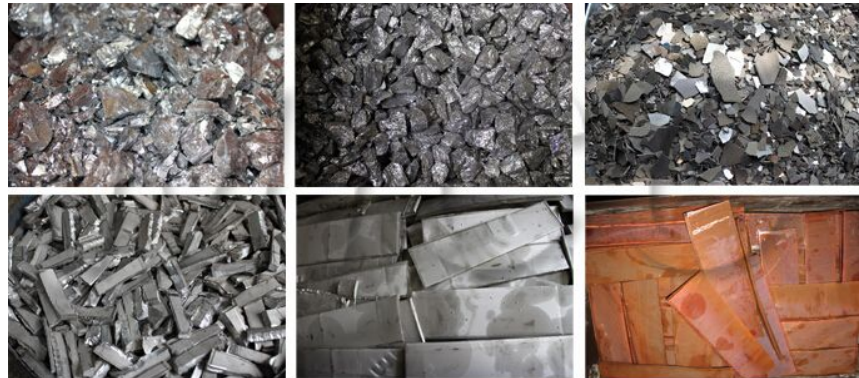
IEC Standard					
Type	Operating temperature range			Tolerance	
	Long	short	Grade	Temperature	Tolerance
K	1200	1300	I	-40~1100'	±1.5°C or ±0.4%t
			II	-40~1300'	±2.5°C or ±0.75%t
N	1200	1300	I	-40~1100'	±1.5°C or ±0.4%t
			II	-40~1300'	±2.5°C or ±0.75%t
E	750	900	I	-40~800'	±1.5°C or ±0.4%t
			II	-40~900'	±2.5°C or ±0.75%t
J	600	750	I	0~75	±1.5°C or ±0.4%t
			II		±2.5°C or ±0.75%t
T	300	350	I	-40~350'	±0.5°C or ±0.4%t
			II		±1°C or ±0.75%t
			III	-200~40'	±1°C or ±1.5%t

ANSI E-230 Standard			
Type	Temperature range	limits of error	
		standard	special
T	(0 to 133)°C [32 to 270]°F	±1°C [2°F]	±0.5°C [1°F]
	(133 to 350)°C [270 to 662]°F	±0.75%	±0.4%
J	(0 to 293)°C [32 to 559]°F	±2.2°C [4°F]	±1.1°C [2°F]
	(293 to 750)°C [559 to 1382]°F	±0.75%	±0.4%
E	(0 to 340)°C [32 to 644]°F	±1.7°C [3°F]	±1°C [2°F]
	(240 to 900)°C [644 to 1652]°F	±0.5%	±0.4%
K	(0 to 293)°C [32 to 559]°F	±2.2°C [4°F]	±1.1°C [2°F]
	(293 to 1250)°C [559 to 2282]°F	±0.75%	±0.4%
N	(0 to 293)°C [32 to 559]°F	±2.2°C [4°F]	±1.1°C [2°F]
	(293 to 1250)°C [559 to 2282]°F	±0.75%	±0.4%



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1. Raw Material



2. Hot Rolling & Annealing



3. Vacuum Melting



4. Acid Washing



MICC alloy wire catalogue

5. Annealing



6. Drawing



7. Testing



8. Shipping





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Main property of Fe-Cr-Al electric heating alloy							
property	type	1Cr13Al4	OCr25Al5	OCr21Al6	OCr21Al6Nb	OCr27Al7Mo2	OCr23Al5
Main chemical composition%	Cr	12~15	23~26	12~22	21.0~23.0	26.5~27.8	20.5~23.5
	Al	4~6	4.5~5.5	5~7	5~7	6~7	4.2~5.3
	Fe	Rest	Rest	Rest	Rest	Rest	Rest
	Re	Opportune	Opportune	Opportune	Opportune	Opportune	Opportune
	Mn	≤0.7	≤0.7	≤0.7	≤0.7	≤0.2	≤0.7
	Nb	~	~	~	0.5	~	~
Max continuous Temp.of element(°C)		950	1250	1250	1350	1400	1250
Density (g/cm ³)		7.4	7.1	7.1	7.1	7.1	7.25
resistivity(mm ² /m)		1.25±0.08	1.42±0.07	1.42±0.07	1.45±0.07	1.53±0.07	1.35±0.06
Temp coeff of resistance(*10 ⁻⁵ /°C)		15	5	5	5	-1	5
Melting point (°C)		1450	1500	1500	1510	1520	1500
Tensile strength(Mpa)		588~735	637~784	637~784	637~784	686~784	637~784
Elongation(%)		>16	>12	>12	>12	>12	>12
Variation of area(%)		65~75	65~75	65~75	65~75	65~75	65~75
Bending frequency		>5	>5	>5	>5	>5	>5
Hargness		200~260	200~260	200~260	200~260	200~260	200~260
Micrographic structure		F	F	F	F	F	F
Magnetic property		Magnetic	Magnetic	Magnetic	Magnetic	Magnetic	Magnetic

Main property of Fe-Cr-Al electric heating alloy						
property	type	Cr20Ni80	Cr30Ni70	Cr15Ni60	Cr20Ni35	Cr20Ni30
Main chemical composition%	Ni	Rest	Rest	55~61	34~37	30~34
	Cr	20~23	28~31	15~18	18~21	18~21
	Fe			Rest	Rest	Rest
Max continuous Temp.of element(°C)		1200	1200	1150	1100	1100
resistivity(mm ² /m)		1.09	1.09	1.12	1	1.04
Density(g/cm ³)		8.4	8.4	8.2	7.9	7.9
Thermal conductivity(KJ/M.h°C)		60.3	60.3	45.2	43.8	43.8
Coefficient of liner expansion(a*10 ⁻⁵ /°C)		18	18	17	19	19
Melting point (°C)		1400	1400	1390	1390	1390
Elongation(%)		720	720	720	720	720
Micrographic structure		Austenitic	Austenitic	Austenitic	Austenitic	Austenitic
Magnetic property		NONE	NONE	NONE	NONE	NONE

Main property of series of constantan electric alloys								
Type	Main chemical composition(%)				Resistivity Ω/m(20°C)	Max continuous operating Temp.(°C)	Thermal EMF VS Copper	Elongation
	Cu	Mn	Ni	Si				
6J40	Rest	1~2	39~41	~	0.48±0.03	500	45	6~15
6J44	Rest	1	44	~	0.45±0.03	100	45	6~15

Main property of series of manganese bronze electric alloys								
Type	Main chemical composition(%)				Resistivity Ω/m(20°C)	Max continuous operating Temp.(°C)	Thermal EMF VS Copper	Elongation
	Cu	Mn	Ni	Si				
6J12	Rest	11~13	2~3	~	0.47±0.05	~	1	6~15
6J8	Rest	8~10	~	1~2	0.25±0.05	~	2	6~15
6J13	Rest	11~13	2~5	~	0.44±0.03	500	2	6~15

Main property of series of copper nickel electric alloys								
Type	Main chemical composition(%)				Resistivity Ω/m(20°C)	Max continuous operating Temp.(°C)	Eloyation	
	Cu	Mn	Ni	Si				
CuNi1	Rest	~	1	~	0.03	200	6~15	
CuNi2	Rest	~	2	~	0.05	220	6~15	
CuNi6	Rest	~	6	~	0.1	220	6~15	
CuNi8	Rest	3	8	~	0.12	250	6~15	
CuMn3	Rest	~	~	~	0.12	200	6~15	
CuNi10	Rest	0.3	11	~	0.15	250	6~15	
CuNi14	Rest	0.5	14.2	~	0.2	300	6~15	
CuNi19	Rest	0.5	19	~	0.25	300	6~15	
CuNi23	Rest	1	23	~	0.3	300	6~15	
CuNi30	Rest	1	30	~	0.35	350	6~15	
CuNi34	Rest	1	34	~	0.4	350	6~15	



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A series of Fe-Cr-Al alloys with their diameters and characteristics (a conversion)									
Diameter (mm)	Surface per meter (cm ² /m)	1Cr13Al4		OCr25Al5		OCr21Al6		OCr21Al4	
		Resistivity Ω*m1.25±0.08		Resistivity Ω*m1.42±0.07		Resistivity Ω*m1.42±0.07		Resistivity Ω*m1.23±0.08	
		Resistance per meter at 20°C (Ω/m)	Length per kilogram (m/kg)	Resistance per meter at 20°C (Ω/m)	Length per kilogram (m/kg)	Resistance per meter at 20°C (Ω/m)	Length per kilogram (m/kg)	Resistance per meter at 20°C (Ω/m)	Length per kilogram (m/kg)
0.04	1.26	979	108342	1114	111388	1114	111388	995	107642
0.05	1.57	626	69348	713	71428	713	71428	637	68870
0.06	1.88	435	48146	495	49504	495	49504	442	47824
0.07	2.2	320	35373	364	36363	364	36363	325	35137
0.08	2.51	245	27078	279	27839	279	27839	249	26896
0.09	2.83	193	21399	220	21978	220	21978	196	21254
0.10	3.14	159.2	17206	180.6	17905	180.6	17905	156.6	17452
0.12	3.77	110.5	11949	125.6	12360	125.6	12360	108.8	12033
0.15	4.71	70.7	7647	80.4	7891	80.4	7891	69.6	7692
0.17	5.34	55.1	5954	62.6	6153	62.6	6153	54.2	5988
0.19	5.97	44.1	4766	50.1	4918	50.1	4918	43.4	4785
0.21	6.6	36.1	3901	41	4037	41	4037	35.5	3937
0.25	7.85	25.5	2753	28.9	2844	28.9	2844	25.1	2770
0.27	8.48	21.8	2360	24.8	2437	24.8	2437	21.5	2375
0.29	9.11	18.9	2046	21.5	2113	21.5	2113	18.6	2058
0.31	9.74	16.6	1790	18.8	1849	18.8	1849	16.3	1802
0.35	11	13	1405	14.8	1452	14.8	1452	12.8	1414
0.40	12.57	9.95	1075	11.3	1111	11.3	1111	9.79	1082
0.45	14.14	7.86	850	8.93	878	8.93	878	7.73	855
0.50	15.71	6.37	688	7.23	711	7.23	711	6.26	694
0.60	18.85	4.42	480	5.02	494	5.02	494	4.35	480
0.70	22	3.25	351	3.69	362	3.69	362	3.2	353
0.80	25.1	2.49	269	2.83	278	2.83	278	2.45	270
0.90	28.3	1.96	212	2.23	220	2.23	220	1.93	213
1.00	31.4	1.59	172	1.808	177.9	1.808	177.9	1.57	173
1.20	37.7	1.11	119	0.256	123.5	0.256	123.5	1.09	120
1.40	44	0.812	87.8	0.922	90.8	0.922	90.8	0.799	88.4
1.60	50.3	0.622	67.2	0.706	69.5	0.706	69.5	0.612	67.7
1.80	56.5	0.491	53.1	0.558	54.9	0.558	54.9	0.483	53.56
2.00	62.8	0.398	43	0.452	44.5	0.452	44.5	0.392	43.33
2.20	69.1	0.329	35.5	0.374	36.8	0.374	36.8	0.324	35.8
2.50	78.5	0.255	27.5	0.289	28.4	0.289	28.4	0.251	27.71
2.80	88	0.203	21.9	0.231	22.7	0.231	22.7	0.2	22.08
3.00	94.2	0.1768	19.1	0.201	19.8	0.201	19.8	0.174	19.25
3.50	110	0.1299	14	0.1476	14.5	0.1476	14.5	0.1278	14.14
4.00	125.7	0.0995	10.75	0.113	11.1	0.113	11.1	0.0979	10.82
4.50	141.4	0.0786	8.5	0.893	8.78	0.893	8.78	0.0773	8.55
5.00	157.1	0.0637	6.88	0.0723	7.11	0.0723	7.11	0.0626	6.93
5.50	172.8	0.0526	5.69	0.0598	5.87	0.0598	5.87	0.0518	5.72
6.00	1885	0.0442	4.78	0.0502	4.94	0.0502	4.94	0.0435	4.81
6.50	204	0.0377	4.07	0.0428	4.21	0.0428	4.21	0.0371	4.09
7.00	220	0.0325	3.51	0.0369	3.63	0.0369	3.63	0.032	3.53



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A series of Ni-Cr,Ni-Cr-Fe with their diameters and characteristics (a conversion)										
Dia (mm)	Cr20Ni80		Cr30Ni70		Cr15Ni60		Cr20Ni55		Cr20Ni30	
	Resistance per meter at 20°C (Ω/m)	Length per kilogram (g/m)	Resistance per meter at 20°C (Ω/m)	Length per kilogram (g/m)	Resistance per meter at 20°C (Ω/m)	Length per kilogram (g/m)	Resistance per meter at 20°C (Ω/m)	Length per kilogram (g/m)	Resistance per meter at 20°C (Ω/m)	Length per kilogram (g/m)
0.04	867.4	0.0156	939	0.0152	891.3	0.0154	827.6	0.0124	827.6	0.0124
0.05	555.1	0.0163	601	0.0159	570.4	0.0161	529.7	0.0136	529.7	0.0136
0.06	385.5	0.0235	417.3	0.0228	396.1	0.0232	367.8	0.022	367.8	0.022
0.07	283.2	0.0319	306.6	0.0313	291	0.0316	270.2	0.0226	270.2	0.0226
0.08	216.8	0.0417	234.8	0.0408	222.8	0.0412	206.9	0.0324	206.9	0.0324
0.09	171.3	0.0528	185.5	0.0538	176.1	0.0542	163.5	0.0476	163.5	0.0476
0.10	138.8	0.06597	150.2	0.06362	142.6	0.0644	133.3	0.0616	133.3	0.0616
0.12	96.38	0.095	104.3	0.09161	99.03	0.09274	92	0.0893	92	0.0893
0.15	61.68	0.1484	66.77	0.1431	63.38	0.1449	58.8	0.14	58.8	0.14
0.17	48.02	0.1907	51.99	0.1839	49.34	0.1861	45.8	0.179	45.8	0.179
0.19	38.44	0.2382	41.62	0.2297	39.5	0.2325	36.6	0.224	36.6	0.224
0.21	31.47	0.2909	34.07	0.2806	32.34	0.284	30.1	0.273	30.1	0.273
0.25	22.21	0.4123	24.04	0.3976	22.82	0.4025	21.2	0.388	21.2	0.388
0.27	19.04	0.4809	20.16	0.4638	19.56	0.4695	18.2	0.453	18.2	0.453
0.31	14.44	0.634	15.63	0.6114	14.84	0.6189	13.8	0.596	13.8	0.596
0.35	11.33	0.8082	12.26	0.7793	11.64	0.7889	10.8	0.76	10.8	0.76
0.40	8.674	1.056	9.39	1.018	8.913	1.03	8.27	0.993	8.27	0.993
0.45	6.835	1.336	7.419	1.288	7.042	1.304	6.54	1.26	6.54	1.26
0.50	5.551	1.469	6.01	1.59	5.704	1.61	5.3	1.55	5.3	1.55
0.60	3.855	2.375	4.173	2.29	3.961	2.318	3.67	2.24	3.67	2.24
0.70	2.832	3.233	3.066	3.117	2.91	3.156	2.7	3.04	2.7	3.04
0.80	2.168	4.222	2.349	4.072	2.228	4.122	2.07	3.97	2.07	3.97
0.90	1.713	5.344	1.855	5.153	1.761	5.217	1.64	5.02	1.64	5.02
1.00	1.388	6.597	1.502	6.362	1.426	6.44	1.32	6.2	1.32	6.2
1.20	0.964	9.5	1.043	9.161	0.99	9.274	0.92	8.93	0.92	8.93
1.40	0.708	12.93	0.766	12.47	0.727	12.62	0.676	12.1	0.676	12.1
1.60	0.542	16.89	0.587	16.29	0.557	16.49	0.517	15.9	0.517	15.9
1.80	0.428	21.38	0.464	20.61	0.44	20.87	0.409	20.1	0.409	20.1
2.00	0.347	26.39	0.376	25.45	0.357	25.76	0.331	24.8	0.331	24.8
2.20	0.287	31.39	0.31	30.79	0.296	31.17	0.274	30	0.274	30
2.50	0.274	33.4	0.298	32.21	0.282	32.6	0.212	38.8	0.212	38.8
2.80	0.177	51.72	0.192	49.88	0.182	50.49	0.169	48.7	0.169	48.7
3.00	0.154	59.38	0.169	57.26	0.158	57.96	0.147	55.9	0.147	55.9
3.50	0.113	80.82	0.126	77.93	0.116	78.89	0.108	76	0.108	76
4.00	0.087	105.6	0.094	101.8	0.089	103	0.083	99.3	0.083	99.3
4.50	0.069	133.6	0.074	128.8	0.07	130.4	0.065	125.6	0.065	125.6
5.00	0.056	164.9	0.06	159	0.057	161	0.053	155.1	0.053	155.1
5.50	0.04588	199.6	0.04967	192.4	0.4714	194.8	0.0437	188	0.0437	188
6.00	0.039	235	0.042	229	0.04	231.8	0.037	223.6	0.037	223.6
6.50	0.033	275	0.036	268.8	0.034	272.1	0.031	262.3	0.031	262.3
7.00	0.028	319	0.031	311.7	0.029	315.6	0.027	304.1	0.027	304.1



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Technical parameters of constantan electric alloys sheet resistance						
Diameter		Cross sectional area	6J40(Ω/m)		6J44(Ω/m)	
standard	tolerance		standard	range	standard	range
0.1	±0.03	0.0078544	61.1	56.7~65.5	62.4	57.9~66.9
0.112	±0.05	0.009852	48.7	45.7~51.6	49.7	46.6~52.7
0.125		0.01227	39.1	36.8~4103	39.9	37.6~42.1
0.14		0.01539	31.2	29~33.3	31.8	29.6~33.9
0.16		0.02011	23.9	22.3~25.5	24.4	22.8~26
0.18	±0.005	0.02545	18.9	17.6~20.2	19.3	18~20.6
0.2		0.03124	15.3	14.4~16.2	15.6	14.7~16.5
0.224		0.03941	12.2	11.5~12.9	12.4	11.7~13.1
0.25		0.04909	9.78	9.2~10.3	9.98	9.39~10.51
0.28	±0.01	0.06158	7.8	7.33~8.26	7.96	7.48~8.43
0.315		0.07793	6.16	5.86~6.46	6.29	5.98~6.6
0.355		0.09898	4.85	4.61~5.09	4.95	4.11~5.19
0.4		0.01257	3.82	3.63~4.01	3.9	3.71~4.09
0.45	±0.015	0.0159	3.02	2.87~3.17	3.08	2.93~3.23
0.5		0.01963	2.44	2.32~2.56	2.5	2.38~2.62
0.56		0.02463	1.95	1.88~2.02	1.99	1.92~2.04
0.63		0.03117	1.54	1.48~1.6	1.57	1.51~1.63
0.71	±0.015	0.03959	1.21	0.17~1.25	1.24	1.2~1.28
0.75		0.04418	1.09	1.05~1.13	1.11	1.07~1.15
0.8		0.05027	0.955	0.917~0.993	0.975	0.936~1.014
0.85		0.05674	0.846	0.813~0.879	0.864	0.83~0.898

Technical parameters of manganese bronze electric alloys sheet resistance								
Diameter		Cross sectional area	6J12(Ω/m)		6J8(Ω/m)		6J13(Ω/m)	
standard	tolerance		standard	range	standard	range	standard	range
0.1	±0.03	0.0078544	59.8	56~64.3	44.6	41.5~47.66	56	52~60
0.112	±0.05	0.009852	47.7	44.8~49.5	35.5	33.5~37.5	44.7	41.1~47.3
0.125		0.01227	38.3	36.1~40.5	28.5	27~30	35.9	33.9~38
0.14		0.01539	30.5	28.5~32.3	22.7	21.2~24.2	28.6	26.6~30.6
0.16		0.02011	23.4	21.9~25	17.4	16.2~18.6	21.9	20.4~23.4
0.18	±0.005	0.02545	18.5	17~19.6	13.8	12.9~14.7	17.3	16.1~18.5
0.2		0.03124	15	14.1~15.9	11.1	10.5~11.7	14	13.2~14.8
0.224		0.03941	11.9	11.2~12.6	8.88	8.35~9.41	11.2	10.6~11.8
0.25		0.04909	9.57	9~10.1	7.13	6.71~7.55	8.96	8.42~9.49
0.28	±0.01	0.06158	7.63	7.2~8	5.68	5.34~6.02	7.15	6.73~7.57
0.315		0.07793	6.03	5.73~6.3	4.49	4.27~4.71	5.65	5.37~5.93
0.355		0.09898	4.75	4.52~4.98	3.54	3.37~3.71	4.45	4.23~4.67
0.4		0.01257	3.74	3.56~3.92	2.97	2.66~2.92	3.5	3.33~3.67
0.45	±0.015	0.0159	2.96	2.82~3.1	2.2	2.09~2.31	2.77	2.64~2.9
0.5		0.01963	2.39	2.28~2.5	1.78	1.7~1.86	2.24	2.13~2.35
0.56		0.02463	0.91	1.84~1.98	1.42	1.37~1.47	1.79	1.72~1.86
0.63		0.03117	0.51	1.45~1.57	1.12	1.08~1.16	1.41	1.36~1.46
0.71	±0.015	0.03959	1.19	1.15~1.23	0.884	0.849~0.919	1.11	1.07~1.15
0.75		0.04418	1.06	1.02.1.1~	0.729	0.761~0.823	1	0.96~1.04
0.8		0.05027	0.935	0.898~0.972	0.696	0.669~0.723	0.875	0.84~0.91
0.85		0.05674	0.828	0.795~0.861	0.617	0.593~0.641	0.775	0.774~0.806