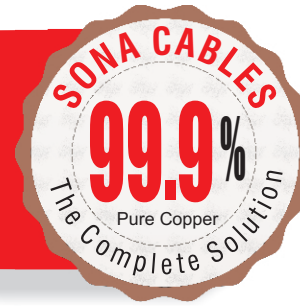


# ENAMELLED COPPER WIRE



**SONA**<sup>TM</sup>  
The Complete Solution



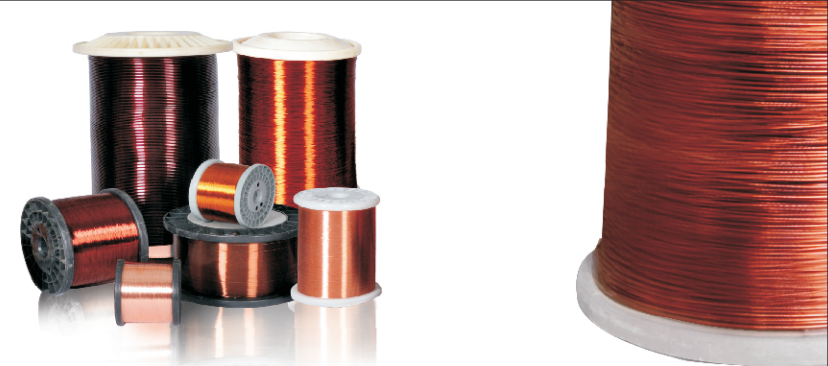
**58** Years of  
Engineering  
Excellence  
Since 1960

**UNIVERSAL METALS (PVT.) LTD.**

The Leading Manufacturers of Copper Rod, Wires and Cables in Pakistan



# ENAMELLED COPPER WIRE



PRODUCT NAME	SONAFLEX	SONAWELD/155	SONAWELD/180	SONAMIDE	SONACOAT	SONATER
<b>Description</b>	Polyvinyl Acetal-Phenolic	Polyurethane	Polyurethane	Modified Polyester-imide	Modified Polyester-imide/polyamide	Polyester
<b>Sizes Available</b>	0.40-4.5mm	0.20-1.00mm	0.20-1.00mm	0.20-3.0mm	0.4-2.5mm	0.2-3.5mm
<b>Standard Type</b>	Single Coat	Single Coat	Single Coat	Single Coat	Double Coat	Single Coat
<b>Insulation Class</b>	A	F	H	H	H	F
<b>Temperature Index °c</b>	120	155	180	200	200	155
<b>Heat Shock 1/2h.1d.°c</b>	155	155	180	180	180	155
<b>Pencil Hardness</b>	5H	5H	5H	5H	5H	5H
<b>Angle of Spring Back</b>	37	37	37	37	43	38
<b>General Properties</b>	SONAFLEX is composed of Polyvinyl Acetal and Phenolic resins and so is a synthetic enamel which is extremely tough and flexible. The enamel film has a good dielectric strength and excellent hot oil resistance. The adhesion and abrasion scrape resistance of SONAFLEX is excellent. It is resistant to common solvents and have good electrical properties and can be used with all solvents commonly encountered in impregnating varnishes as per BS 4516:Part 1:1969.	SONAWELD / 155 is a magnetic wire which is coated with Polyurethane Resins & it allows soldering quite easily even without stripping off the enamel. SONAWELD/155 has limited flexibility and adhesion which is achieved on heavier sizes. It has equivalent physical and electrical properties of most other synthetic films. SONAWELD / 155 resist to chemicals & most common solvents including those used in synthetic baking varnishes and have excellent resistance to moisture.	Flexibility and adhesion properties of the SONAWELD/180 magnet wires are excellent and above all the cut through temperature (-250°C plus range); of SONAWELD/180 is well above maximum process conditions which are found in coil work, impregnation processes and standard pre-heat varnish cycles. SONAWELD/180 magnet wire, strip-out readily without excessive build up of solder dross associated with other solderable type resin coatings. It solders consistently at temperatures as low as 390°C. SONAWELD/180 has improved salt water resistance in comparison to most other solderable wire and has solvent resistance properties for varnishes, encapsulates and treating resins purposes. It also have low dissipation factor even under high frequencies and thus it can be utilized for RF coil application and can even have strong dielectric strength under highly humid conditions.	SONAMIDE magnet wires are coated with modified polyester resin and have properties which most of coil applications requires except where serve windings are involved. The removal of enamel takes place by immersing the wire in 850°F 950° F solder pot, very carefully, as poor immersion techniques could lead to overcuring problems.	SONACOAT is the special product of Universal Metals (Pvt) Ltd, in which the basecoat is of polyester varnish which have excellent mechanical properties and on the overcoat polyamide varnish is used which have excellent electrical properties. Properties of SONACOAT make it operable in most of coil applications except in condition where severe windings are required such as in-slot stator winding. The electrical properties are influenced slightly by the hygroscopic nature of the topcoat.	SONATER wires, manufactured with thermal stability, are fine and ultra - fine magnet wires with insulated polyester based enamel (varnish). SONATER has very good electrical properties, physical and chemical properties including its high flexibility, impregnating resistance, good abrasion resistance, good refrigerants (Freon) and so makes it suitable for small coil operations at high temperatures.
<b>Typical Application</b>	Common uses are: Oil-Filled Transformers Industrial Motors Random Wound Coils Solenoids and Electrical Appliances Winding Purposes Including Oil Filled Equipments	SONAWELD/155 is used where solder ability is important & where serve loads are not experienced like in coil motor windings. It is also used in electronic devices and communication apparatus. Common uses are: Small Motors Relays Electronic Coils	SONAWELD/180 magnet wire is designed for its usage in high thermal resistance and low soldering temperatures. Application of SONAWELD/180 magnet wire requires a lot of care and it does not posses overload resistance properties of most of non-solderable Class 105, 130, 155 and 180 resin systems. Common uses are: Relays Automotive Coils Specialty Power Transformers	SONAMIDE is required for those special coils whose applications involve solderability as well as high thermal resistance. It is normally used in high capacity motors, transformers, and generators and chokes etc. And is not recommended for in slot motor winding or where high winding stresses are involved. Most commonly used in: Special Transformer Coils Shaded Pole Motor Coils Automotive Coils Electronic Coils	SONACOAT, too, is required in the conditions where solderability with high thermal resistance are needed. Thus this coat is modified by addition of polyamide overcoat to the high temperature modified polyester basecoat. Specific applications are: Shaded Pole Motor Coils Special Control Coils Automotive Coils Power Transformer Generator Turbines High Temperature Magnet Coil	This ultra-fine magnet wire is mostly used where fine wires are required & solderability is not a requirement. Applications are: Class F Insulation For Motors Magnetic Coils, Chokes, Motors etc. Small Appliances and Power Tool Motors Continuous Operation Coils Encapsulated Coils Sub-Fractional Instrument and Servo-Motors



Dimension of Enamelled Wires (R-20)											Elongation
Nominal Conductor diameter mm	Conductor tolerance ±	Section mm <sup>2</sup>	Weight g/m	Minimum increase due to the insulation mm			Maximum overall diameter mm			Elongation minimum %	
				Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3		
0,180	0,003	0,02545	0,2262	0,013	0,025	0,036	0,204	0,217	0,229	20	
0,190	0,003	0,02835	0,2521	0,014	0,027	0,039	0,216	0,228	0,240	21	
0,200	0,003	0,03142	0,2793	0,014	0,027	0,039	0,226	0,239	0,252	21	
0,212	0,003	0,03530	0,3138	0,015	0,029	0,043	0,240	0,254	0,268	21	
0,224	0,003	0,03941	0,3503	0,015	0,029	0,043	0,252	0,266	0,280	21	
0,236	0,004	0,04374	0,3889	0,017	0,032	0,048	0,267	0,283	0,298	22	
0,250	0,004	0,04909	0,4364	0,017	0,032	0,048	0,281	0,297	0,312	22	
0,265	0,004	0,05515	0,4903	0,018	0,033	0,050	0,297	0,314	0,330	22	
0,280	0,004	0,06158	0,5474	0,018	0,033	0,050	0,312	0,329	0,345	22	
0,300	0,004	0,07069	0,6284	0,019	0,035	0,053	0,334	0,352	0,360	23	
0,315	0,004	0,07793	0,6928	0,019	0,035	0,053	0,349	0,367	0,384	23	
0,335	0,004	0,08814	0,7836	0,020	0,038	0,057	0,372	0,391	0,408	23	
0,355	0,004	0,09898	0,8799	0,020	0,038	0,057	0,392	0,411	0,428	23	
0,375	0,005	0,11040	0,9819	0,021	0,040	0,060	0,414	0,434	0,453	24	
0,400	0,005	0,12570	1,117	0,021	0,040	0,060	0,439	0,459	0,478	24	
0,425	0,005	0,14190	1,261	0,022	0,042	0,064	0,466	0,488	0,508	25	
0,450	0,005	0,15900	1,414	0,022	0,042	0,064	0,491	0,513	0,533	25	
0,475	0,005	0,17720	1,575	0,024	0,045	0,067	0,519	0,541	0,562	25	
0,500	0,005	0,1963	1,746	0,024	0,045	0,068	0,544	0,566	0,587	25	
0,530	0,006	0,22206	1,961	0,025	0,047	0,071	0,576	0,600	0,623	26	
0,560	0,006	0,2463	2,190	0,025	0,047	0,071	0,606	0,630	0,653	26	
0,600	0,006	0,2827	2,514	0,027	0,050	0,075	0,649	0,674	0,698	27	
0,630	0,006	0,3117	2,771	0,027	0,050	0,075	0,679	0,704	0,728	27	
0,670	0,007	0,3526	3,134	0,028	0,053	0,080	0,722	0,749	0,774	28	
0,710	0,007	0,3959	3,520	0,028	0,053	0,080	0,762	0,789	0,814	28	
0,750	0,008	0,4418	3,927	0,030	0,056	0,085	0,805	0,834	0,861	28	
0,800	0,008	0,5027	4,469	0,030	0,056	0,085	0,855	0,884	0,911	28	
0,850	0,009	0,5675	5,054	0,032	0,060	0,090	0,909	0,939	0,968	29	
0,900	0,009	0,6362	5,656	0,032	0,060	0,090	0,959	0,989	1,018	29	
0,950	0,010	0,7088	6,301	0,034	0,063	0,095	1,012	1,044	1,074	30	
1,000	0,010	0,7854	6,982	0,034	0,063	0,095	1,062	1,094	1,124	30	
1,060	0,011	0,8825	7,845	0,034	0,065	0,098	1,124	1,157	1,188	30	
1,120	0,011	0,9852	8,758	0,034	0,065	0,098	1,184	1,217	1,248	30	
1,180	0,012	1,094	9,722	0,035	0,067	0,100	1,246	1,279	1,311	31	
1,250	0,013	1,227	10,91	0,035	0,067	0,100	1,316	1,349	1,381	31	
1,320	0,013	1,368	12,17	0,036	0,069	0,103	1,388	1,422	1,455	32	
1,400	0,014	1,539	13,69	0,036	0,069	0,103	1,468	1,502	1,535	32	
1,500	0,015	1,767	15,71	0,038	0,071	0,107	1,570	1,606	1,640	32	
1,600	0,016	2,011	17,87	0,038	0,071	0,107	1,670	1,706	1,740	32	
1,700	0,017	2,270	20,18	0,039	0,073	0,110	1,772	1,809	1,844	32	
1,800	0,018	2,545	22,62	0,039	0,073	0,110	1,872	1,909	1,944	32	
1,900	0,019	2,835	25,21	0,040	0,075	0,113	1,974	2,012	2,048	33	
2,000	0,020	3,142	27,93	0,040	0,075	0,113	2,074	2,112	2,148	33	
2,120	0,021	3,530	31,38	0,041	0,077	0,116	2,196	2,235	2,272	33	
2,240	0,022	3,941	35,03	0,041	0,077	0,116	2,316	2,355	2,392	33	
2,360	0,024	4,374	38,89	0,042	0,079	0,119	2,438	2,478	2,516	33	
2,500	0,025	4,909	43,64	0,042	0,079	0,119	2,578	2,618	2,656	33	
2,650	0,027	5,515	49,03	0,43	0,081	0,123	2,730	2,772	2,811	34	
2,800	0,028	6,158	54,74	0,043	0,081	0,123	2,880	2,922	2,961	34	
3,000	0,030	7,069	62,84	0,045	0,084	0,127	3,083	3,126	3,166	34	
3,150	0,032	7,793	69,28	0,045	0,084	0,127	3,233	3,276	3,316	34	
3,350	0,034	8,814	78,36	0,046	0,086	0,130	3,435	3,479	3,521	35	
3,550	0,036	9,898	87,99	0,046	0,086	0,130	3,635	3,679	3,721	35	
3,750	0,038	11,04	98,19	0,047	0,089	0,134	3,838	3,883	3,926	35	
4,000	0,040	12,57	111,7	0,047	0,089	0,134	4,088	4,133	4,176	35	
4,250	0,043	14,19	126,1	0,049	0,092	0,138	4,341	4,387	4,431	36	
4,500	0,045	15,90	141,4	0,049	0,092	0,138	4,591	4,637	4,681	36	
4,750	0,048	17,72	157,5	0,050	0,094	0,142	4,843	4,891	4,936	36	
5,000	0,050	19,63	174,6	0,050	0,094	0,142	5,093	5,141	5,186	36	

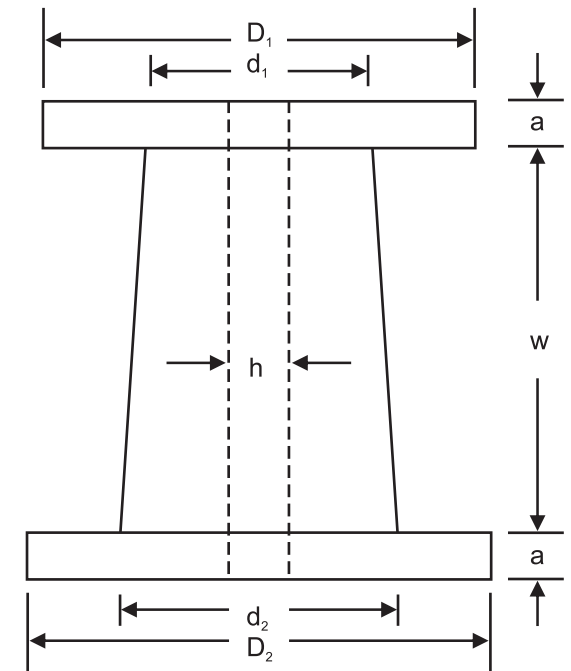


Breakdown Voltage						Electrical Resistances			Nominal Conductor Diameter Mm
Minimum breakdown voltage (r.m.s. Value) V						Resistance at 20°C Ω/m <sup>1</sup>			
Grade 1 and Grade 1B		Grade 2 and Grade 2B		Grade 3 and Grade 3B		Minimum	Nominal	Maximum	
Room Temperature	Elevated Temperature	Room Temperature	Elevated Temperature	Room Temperature	Elevated Temperature				
1700	1300	3300	2500	4700	3500	0,6444	0,6718	0,7007	0,180
1800	1400	3500	2600	5100	3800				0,190
1800	1400	3500	2600	5100	3800	0,5237	0,5441	0,5657	0,200
1900	1400	3700	2800	5200	3900				0,212
1900	1400	3700	2800	5200	3900	0,4188	0,4338	0,4495	0,224
2100	1600	3900	2900	5500	4100				0,236
2100	1600	3900	2900	5500	4100	0,3345	0,3482	0,3628	0,250
2200	1700	4000	3000	5800	4400				0,265
2200	1700	4000	3000	5800	4400	0,2676	0,2776	0,2882	0,280
2200	1700	4100	3100	6100	4600	-	-	-	0,300
2200	1700	4100	3100	6100	4600	0,2121	0,2193	0,2270	0,315
2300	1700	4300	3200	6400	4800				0,335
2300	1700	4300	3200	6400	4800	0,1674	0,1727	0,1782	0,355
2300	1700	4400	3300	6600	5000				0,375
2300	1700	4400	3300	6600	5000	0,1316	0,1360	0,1407	0,400
2300	1700	4400	3300	6800	5100				0,425
2300	1700	4400	3300	6800	5100	0,1042	0,1075	0,1109	0,450
2400	1800	4600	3500	7000	5300				0,475
2400	1800	4600	3500	7000	5300	0,08462	0,08706	0,08959	0,500
2500	1900	4600	3500	7100	5300	-	-	-	0,530
2500	1900	4600	3500	7100	5300	0,06736	0,06940	0,07153	0,560
2600	2000	4800	3600	7100	5300				0,600
2600	2000	4800	3600	7100	5300	0,05335	0,05484	0,05638	0,630
2600	2000	4800	3600	7200	5400				0,670
2600	2000	4800	3600	7200	5400	0,04198	0,04318	0,04442	0,710
2600	2000	4900	3700	7400	5600				0,750
2600	2000	4900	3700	7400	5600	0,03305	0,03401	0,03500	0,800
2700	2000	5000	3800	7600	5700				0,850
2700	2000	5000	3800	7600	5700	0,02612	0,02687	0,02765	0,900
2700	2000	5000	3800	7600	5700	-	-	-	0,950
2700	2000	5000	3800	7600	5700	0,02116	0,02176	0,02240	1,000
2700	2000	5000	3800	7600	5700				1,060
2700	2000	5000	3800	7600	5700		0,01735		1,120
2700	2000	5000	3800	7600	5700				1,180
2700	2000	5000	3800	7600	5700		0,01393		1,250
2700	2000	5000	3800	7600	5700				1,320
2700	2000	5000	3800	7600	5700		0,01110		1,400
2700	2000	5000	3800	7600	5700				1,500
2700	2000	5000	3800	7600	5700		0,008502		1,600
2700	2000	5000	3800	7600	5700	-	-	-	1,700
2700	2000	5000	3800	7600	5700		0,006718		1,800
2700	2000	5000	3800	7600	5700				1,900
2700	2000	5000	3800	7600	5700		0,005441		2,000
2700	2000	5000	3800	7600	5700				2,120
2700	2000	5000	3800	7600	5700		0,004338		2,240
2700	2000	5000	3800	7600	5700				2,360
2700	2000	5000	3800	7600	5700		0,003482		2,500
1300	1000	2500	1900	3800	2900				2,650
1300	1000	2500	1900	3800	2900		0,002776		2,800
1300	1000	2500	1900	3800	2900				3,000
1300	1000	2500	1900	3800	2900		0,002193		3,150
1300	1000	2500	1900	3800	2900				3,350
1300	1000	2500	1900	3800	2900		0,001727		3,550
1300	1000	2500	1900	3800	2900				3,750
1300	1000	2500	1900	3800	2900		0,001360		4,000
1300	1000	2500	1900	3800	2900				4,250
1300	1000	2500	1900	3800	2900		0,001075		4,500
1300	1000	2500	1900	3800	2900				4,750
1300	1000	2500	1900	3800	2900		0,0008706		5,000

# ENAMELLED COPPER WIRE



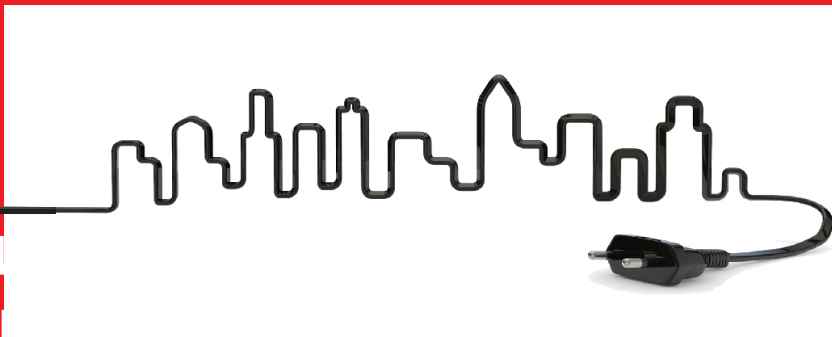
Spool Type	Standard Net Weight (kg)	Flange Diameter		Barrel Diameter		Inside width w (mm)	Flange Thickness w (mm)	Bore diameter h (mm)
		D1 (mm)	D2 (mm)	d1 (mm)	d2 (mm)			
PT - 4	4	124	140	74	86	170	15	26
PT - 10	10	160	180	96	110	200	15	29
PT - 15	15	180	200	96	110	200	15	30
PT - 25	25	215	230	110	130	250	15	30
PT - 45	45	236	250	140	160	335	32	100
PT - 90	90	300	315	180	200	425	36	100
PT - 200	200	315	400	224	250	530	50	100





# SONA™

The Complete Solution



**UNIVERSAL**

-  47-B-1, Gulberg III, Lahore - Pakistan
-  +92-42-111-117-662  +92 42 35778216
-  [info@universalmetals.com.pk](mailto:info@universalmetals.com.pk)  [www.universalmetals.com.pk](http://www.universalmetals.com.pk)

