IGI CABLE

TECHNICAL DATA SHEET

UNISIL®

Cable Construction:

- Conductor – Tinned copper, Class 5 and Class 6 as per IEC 60228 and DIN VDE 0295
- Insulation – Modified Silicone Rubber Insulation
- Braiding – Fibre Glass and Synthetic yarn
- Thermal Class C coating
- Colour – White (Tracer colour can be provided in the braiding or colours can be provided for large orders)

Industrial Glass Insulation
Gala No. 4,5,6, Bldg. No. E-9, Harihar Compound, Mankoli Naka,
Dapode, Bhiwandi, Thane 421302, Maharashtra, India

mail@igicables.com
+91 922 368 5020
www.igicables.com

International Standards:

IEC 60092 • IEC 60331 • IEC 60332-1 • IEC 60332-3

Mechanical Strength:

1) Abrasion: Synthetic yarn braid provides very high abrasion resistance.
2) Crush: Silicone rubber compresses under the weight and retains shape when weight is lifted thereby providing very high crush resistance.
3) Cut: Combination of fibre glass yarn and synthetic yarn provides high cut resistance.

Temperature:

1) Woking temperature – -50°C to 180°C
2) Conductor temperature – 180°C (Max)
3) Short Circuit Temperature – 250°C

Flexibility:

Bending radius – 5 x D as per UL 758

Flame Retardancy:

1) Very High Flame Retardancy (V0 – UL 94 & UL 1581) This cable passed V0, which is the most difficult flame test that exists. Burning stops within 10 seconds after flame is removed when cable is suspended vertically with no dropping of flaming particles.
2) Smoke Density – Negligible
3) Zero Halogen

Voltage:

1) Rated Voltage – 1.1 kV (we also provide cables up to 15 kV)
2) Test Voltage – 3.2 kV as per UL 758

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AWG Size	Conductor Area (Sq. mm.)	Nominal Conductor Diameter (mm)	Nominal Insulation Thickness (mm)	Fibre Glass Yarn Braid Thickness (mm)	Synthetic Yarn Braid Thickness (mm)	Nominal Overall Diameter (mm)
UniSil 22	0.347	0.8	0.5	0.15	0.15	2.40
UniSil 20	0.556	1.0	0.5	0.15	0.15	2.60
UniSil 18	0.966	1.3	0.6	0.15	0.15	3.10
UniSil 16	1.17	1.45	0.65	0.15	0.15	3.35
UniSil 14	2.05	1.95	0.8	0.15	0.15	4.15
UniSil 12	3.22	2.4	1	0.15	0.15	5.00
UniSil 10	5.33	3.15	1	0.15	0.15	5.75
UniSil 8	8.76	4.1	1.1	0.15	0.15	6.90
UniSil 6	13.3	5.2	1.2	0.15	0.15	8.20
UniSil 4	21.5	6.5	1.3	0.15	0.15	9.70
UniSil 2	33.3	8.1	1.4	0.15	0.15	11.50
UniSil 1	40.7	9.2	1.4	0.15	0.15	12.60
UniSil 0	53	10.3	1.4	0.15	0.15	13.70
UniSil 00	68.3	11.8	1.6	0.15	0.15	15.60
UniSil 000	84.2	13.2	1.8	0.15	0.15	17.40
UniSil 0000	109	15.0	2.0	0.15	0.15	19.60
UniSil 120	120	15.7	2.0	0.15	0.15	20.30
UniSil 150	150	17.4	2.0	0.15	0.15	22.00
UniSil 240	240	21.0	2.5	0.15	0.15	26.60

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UNISIL CABLE SPECIFICATIONS

ELECTRICAL AND MECHANICAL PROPERTIES OF UNISIL CABLE

Silicone Rubber (SR)					
Electrical Properties			**Mechanical Properties**		
Density	g/m^3	1.1 - 1.5	Tensile Strength	N/mm^2	230.6
Break-Down Voltage	KV/mm (20°C)	15 - 20	Elongation at Break	%	200 minimum
Specific Volume Resistivity	Ohm-cm 20°C	10^{15}	Shore A- hardness	-	60-70
Dielectric loss-factor	tan δ	6×10^{-3}	Corrosion Behaviour*	-	Moderate
Dielectric constant	50Hz/20°C	3 - 4	Abrasion Resistance**	-	High
Thermal Properties			**Notes**		
Working Temperature – Permanent	°C	-50 to +180	*Corrosion Behaviour – Please refer to our chart that details the chemical resistance of silicone rubber.		
Working Temperature – Short Time	°C	+230			
Flame Resistance	UL1581	V0			
Oxygen Index LOI	($\%O_2$)	25 - 35			
Heating Value H_0	$MJ \cdot kg^{-1}$	17-19			
Thermal Conductivity	$W \cdot K^{-1} \cdot m^{-1}$	0.22	**Abrasion Resistance – A braiding of 'Synthetic Yarn' is used to provide a superior abrasion strength and a braiding of Fibre Glass Yarn is used to provide superior resistance to mechanical damage.		
Corrosive gasses in case of fire	-	No			
Radiation resistance max	Mrad	50			
Halogen-Free		Yes			
Weather Resistance		Good			
Cold Resistance		Very good			

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CHEMICAL RESISTANCE FOR SILICONE RUBBER

Substance	Test period 7 days Temperature	Classification of requirement	Substance	Test period 7 days Temperature	Classification of requirement
Acetamide	150 °C	R	Potassium permanganate solution	20 °C	R
Acetone	20 °C	CR	Carbolineum	20 °C	R
Aniline	100 °C	R	Cooking salt solution 10%	20 °C	R
Petrol	20 °C	CR	Carbon tetrachloride	20 °C	CR
Brake fluid AT	100 °C	CR	Compressor oil, light	150 °C	R
Butanol	117 °C	R	Ball bearing fat	150 °C	R
Butyl acetate	20 °C	CR	Linseed oil	100 °C	R
Calcium hydroxide, (saturated)	20 °C	R	Methanol	65 °C	CR
Chlorobenzene	20 °C	CR	Methylene chloride	20 °C	NR
Chloroform	20 °C	NR	Mineral oil ASTM No. 1	150 °C	R
Clophene	150 °C	R	Mineral oil ASTM No. 3	150 °C	CR
Vapour up to 2,5 atu	138 °C	R	Mineral oil SEA 10	150 °C	R
Diphenyl	150 °C	R	Mineral oil SEA 20	150 °C	R
Diesel oil	20 °C	CR	Mineral oil SEA 30	150 °C	R
Dinamo oil	150 °C	CR	Motor oil viscose static	150 °C	R
Mineral oil	20 °C	CR	Sodium 20%	20 °C	R
Acetic acid	20 °C	R	Soda 50%	20 °C	R
Hydrofluoric acid 5%	20 °C	NR	Nitrobenzene	20 °C	R
Gear oil DTE BB	150 °C	R	Oleic acid	150 °C	NR
Gear oil DTE HH	150 °C	R	Olive oil	150 °C	R

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Substance	Test period 7 days Temperature	Classification of requirement	Substance	Test period 7 days Temperature	Classification of requirement
Gear oil DTE extra heavy	150 °C	R	Perchlor	20 °C	NR
Gear oil Type SEA 90	150 °C	R	Petroleum ether	20 °C	NR
Prestone	20 °C	R	Petroleum	20 °C	CR
Glycerine	100 °C	R	Phenol	60 °C	R
Hexaethoxydisiloxane	20 °C	R	Phosphoric acid 30%	20 °C	R
High pressure compressor oil	150 °C	CR	Pyridine	20 °C	CR
Isopropyl alcohol	82 °C	R	Regulator oil	150 °C	CR
Potassium 20%	20 °C	CR	Castor oil	150 °C	R
Potassium hydroxide 50%	20 °C	R	Hydrochloride acid 10%	20 °C	R
Nitric acid conc.	20 °C	NR	Styrol	20 °C	CR
Nitric acid 10%	20 °C	CR	Turpentine oil	20 °C	CR
Sulfuric acid, conc.	20 °C	NR	Toluene	20 °C	CR
Sulfuric acid, 10%	20 °C	R	Transformer oil	150 °C	CR
Shock absorber oil	20 °C	R	Tri	20 °C	NR
Tri glycol	20 °C	R	Vaseline	150 °C	R

R – Resistant

CR – Conditionally Resistant

NR – Non-Resistant

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CURRENT RATING CHART FOR UNISIL

Maximum Permissible Heat Rise within the conductor dictates the Current Rating.

'Permissible Heat Rise' = 'Maximum rated temperature of equipment' (or maximum temperature rating of cable, whichever is lower) *minus* 'the ambient Temperature'.

Maximum rated temperature of cable is 180°C. We can pass current to the point such that the conductor temperature reached 180°C with the assumption that the equipment the cable is connecting to, can sustain that temperature, if not, that the maximum temperature the equipment can sustain should be considered for the examples given below.

Example 1 - The Ambient temperature, when the equipment is placed indoors is generally not more than 25°C[a] and the rated temperature of equipment is equal to or greater than 180°C[b]. Then, **Heat rise that is sustainable = 180°C[b] - 25°C[a] = 155°C****. The Ambient temperature in coastal Maharashtra generally doesn't exceed 40°C[c], when the equipment is placed outdoors. **Thus, Heat rise that is sustainable = 180°C[b] - 40°C[c] = 140°C ***.

Example 2 - The ambient temp. when the equipment is placed indoors is generally not more than 25°C[a] and the equipment used can sustain a maximum temperature of 110°C[b]. **Heat rise that is sustainable = 110°C[b] - 25°C[a] = 85°C■■**. The Ambient temp. in coastal Maharashtra generally doesn't exceed 40°C[c] (when the equipment is placed outdoors). **Thus, Heat rise that is sustainable = 110°C[b] - 40°C[c] = 70°C ■.**

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AWG Sizes	Nominal cross Section (mm^2)	Calculation of Current Rating (A) of 1.1kV at **Permissible Heat Rise** as per IEC 60287-1-1																	
		0°C	10°C	20°C	30°C	40°C	50°C	60°C	**70°C** ▪	**80°C** ▪▪	90°C	100° C	110° C	120° C	130° C	**140° C** *	**150° C** **	160° C	170° C
UniSil 22	0.347	2	3	4	5	6	6	7	7	8	8	9	9	10	10	10	11	11	12
UniSil 20	0.556	3	5	6	8	9	10	11	11	12	13	14	15	16	16	17	17	18	19
UniSil 18	0.966	6	9	11	14	15	17	19	20	21	23	24	26	27	28	29	30	32	33
UniSil 16	1.17	7	11	13	16	19	20	23	24	26	28	30	31	33	34	35	37	38	40
UniSil 14	2.05	10	15	19	23	26	28	32	34	36	39	42	44	46	48	49	51	54	56
UniSil 12	3.22	14	22	27	33	38	43	46	50	54	57	60	64	67	70	73	76	78	81
UniSil 10	5.33	20	31	39	46	53	60	64	70	75	80	84	89	94	98	102	106	110	114
UniSil 8	8.76	28	43	55	65	74	83	91	99	106	113	119	126	132	138	144	149	155	160
UniSil 6	13.3	36	55	71	83	95	106	117	127	135	145	153	161	169	177	184	191	198	205
UniSil 4	21.5	49	75	96	113	130	145	158	172	184	196	208	219	229	240	250	260	269	279
UniSil 2	33.3	62	94	121	143	164	183	200	217	232	247	262	276	289	303	315	327	340	351
UniSil 1	40.7	72	108	139	165	188	210	230	249	267	285	301	317	333	348	362	376	390	403
UniSil 0	53	88	133	170	201	230	257	281	304	326	348	368	387	406	424	442	459	476	492
UniSil 00	68.3	100	153	195	232	265	296	325	351	377	401	424	447	469	490	510	530	549	569
UniSil 000	84.2	117	178	227	269	308	344	377	408	437	465	493	519	544	568	592	615	637	660
UniSil 0000	109	137	208	266	316	361	402	441	477	512	544	576	607	636	664	692	718	745	770
UniSil 120	120	146	221	282	335	382	426	467	505	542	576	610	642	673	703	732	760	788	814
UniSil 150	150	168	225	324	385	439	489	536	579	621	661	699	735	770	805	838	870	901	932
UniSil 185	185	193	292	372	441	504	561	614	665	712	758	802	844	884	924	962	999	1035	1070
UniSil 240	240	231	350	445	527	602	670	733	793	850	904	956	1005	1053	1100	1145	1189	1231	1273

- *One single cable in free air without a heat source in the surrounding area*
- *DC supply or AC supply (F < 60 Hz).*

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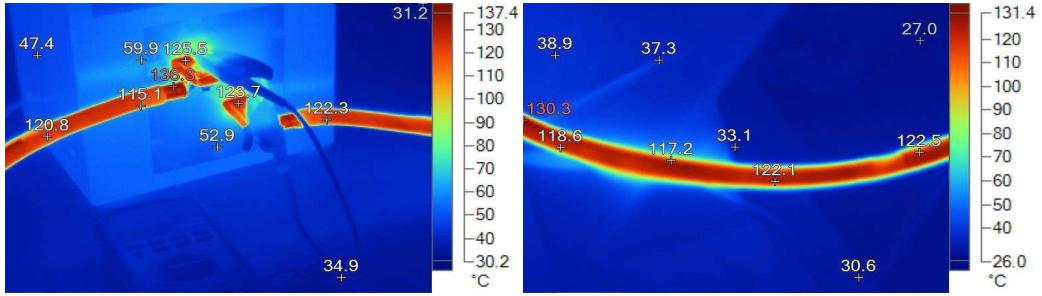
INHOUSE TESTING OF AMPACITY TO MEASURE DEVIATION BETWEEN THE AMPACITY CLAIMED IN THE STANDARD AND ACTUAL TEST RESULTS.

Test 1

UniSil 70mm^2 of 2 meters length
Current passed **523A** for 2 hours
ON Time: 13:45 PM

Time	Ambient	Point 1	Point 2	Point 3	Point 4
13:48	30.7	40.0	54.4	43.4	46.9
14:00	30.9	82.5	88.7	88.3	77.1
14:15	31.5	104.1	109.6	112.2	94.5
14:30	32.0	109.6	116.3	117.1	98.4
14:45	32.5	110.4	121.9	119.1	101.7
15:15	33.3	111.3	125.8	120.3	104.6
15:30	33.5	111.4	126.7	119.6	103.9

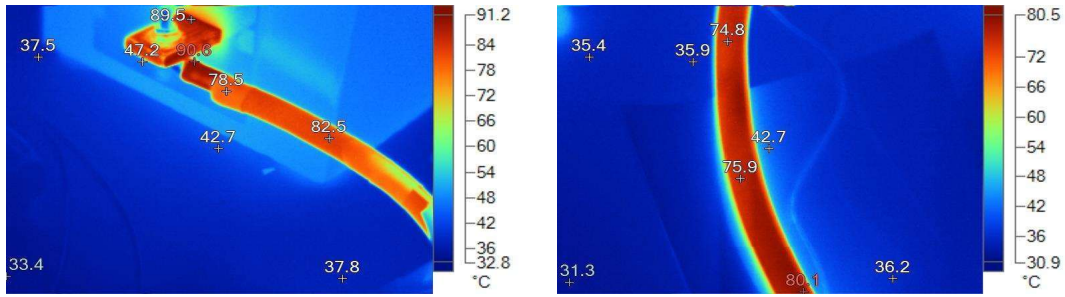


Maximum temperature observed 126.7°C, using the thermocouple method and around 136.8°C, using the thermography method. **Heat Rise as per standard should have been 140°C. Maximum recorded Heat rise is 103.3°C.** (Calculation = 136.8°C using thermography minus 33.5°C Ambient).

Test 2

UniSil 70mm^2 of 2 meters length
Current passed **350A** for 2 hours
ON Time: 15:45 PM

Time	Ambient	Point 1	Point 2	Point 3	Point 4
15:50	33.3	37.8	61.6	37.5	59.0
16:15	33.4	60.1	75.2	60.7	71.4
16:30	33.6	71.6	80.0	72.8	76.1
16:45	33.6	71.6	81.4	72.0	76.0
17:00	33.7	72.0	80.9	73.0	76.2
17:15	33.7	72.0	81.0	73.1	76.1



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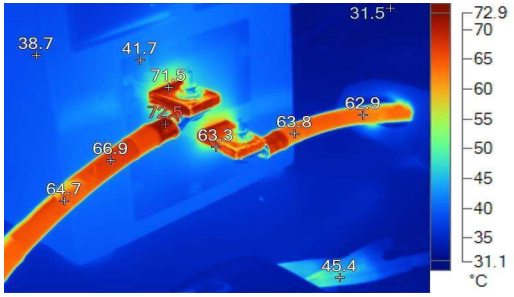
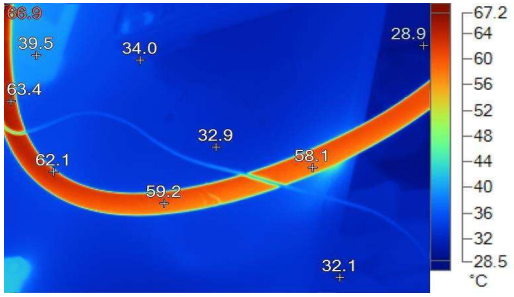
Maximum temperature observed 81°C, using the thermocouple method and around 90.5°C, using the thermography method.
Heat Rise as per standard should have been 65°C. Maximum recorded Heat rise is 56.8°C. (Calculation = 90.5°C using thermography minus 33.7°C Ambient).

Test 3

UniSil – **0000AWG** = **109mm²** of 2 meters length
Current passed 350A for 2 hours
ON time: 11:00 AM (Thermocouple connected around 11:50. So, readings started from 12:00)

Time	Ambient	Point 1	Point 2	Point 3	Point 4
12:00	29.5	54.1	54.7	51.4	51.0
12:10	29.8	55.4	55.7	51.4	55.1
12:20	30.2	56.1	56.0	51.0	56.6
12:30	30.0	57.1	57.2	51.2	56.3
12:40	31.0	51.8	57.5	51.7	56.1
12:50	31.0	58.0	58.3	52.1	57.1
13:00	31.7	58.1	58.2	52.1	58.5





Maximum temperature observed 58.5°C, using the thermocouple method and around 72.5°C, using the thermography method.
Heat Rise as per standard should have been 45°C. Maximum recorded Heat rise is 40.8°C. (Calculation = 72.5°C using thermography minus 31.7°C Ambient).

Observations:

- Current Ratings are anywhere between accurate and conservative in laboratory conditions.
- We request you to please use it as a reference point and select the cable on trial-and-error basis as multiple factors impact current carrying capacity of cable.

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