



SURFACE VEHICLE STANDARD

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60 V and 600 V Single-Core Cables

RATIONALE

The changes to this document reflect the latest review and format changes as per the SAE document standard guidelines. Definitions were updated and Figure 4 was revised to include all conductor sizes less than 6 mm². The values for minimum sandpaper length for Thin and Ultra thin wall cables in Figure 7 were revised to reflect current capabilities for the proper wall thickness. Older values were based upon a thicker walled cable than specified in SAE J2183. Removed unnecessary ASTM Publications and IEC documents. Removed Note 1 from Figure 2.

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FOREWORD

The SAE Standard is functionally equivalent to ISO 6722.

1. SCOPE

This Standard specifies the test methods, dimensions, and requirements for single-core 60 V cables intended for use in road vehicle applications where the nominal system voltage ≤ 60 V DC (25 V AC). It also specifies additional test methods and/or requirements for 600 V cables intended for use in road vehicle applications where the nominal system voltage is > 60 V DC (25 V AC) to ≤ 600 V DC (600 V AC). Where practical, this standard uses ISO 6722 for test methods, dimensions, and requirements. This standard covers ISO conductor sizes which usually differ from SAE conductor sizes. It also covers the individual cores in multi-core cables. See ISO 6722 for "Temperature Class Ratings".

2. REFERENCES

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE EA-1128 Wire Color Charts

SAE Dictionary of Materials and Testing

2.1.2 ASTM Publications

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B 1	Standard Specification for Hard-Drawn Copper Wire
ASTM B 3	Standard Specification for Soft or Annealed Copper Wire
ASTM B 33	Standard Specification for Tinned Soft or Annealed Copper Wire
ASTM B 193	Standard Test Method for Resistivity of Electrical Conductor Materials
ASTM B 298	Standard Specification for Silver-Coated Soft or Annealed Copper Wire
ASTM B 354	Definitions of Terms Relating to Uninsulated Metallic Electrical Conductors
ASTM B 355	Standard Specification for Nickel-Coated Soft or Annealed Copper Wire
ASTM B 452	Standard Specification for Copper-Clad Steel Wire for Electronic Application
ASTM D 471	Standard Test Method for Rubber Property—Effect of Liquids
ASTM E 145	Standard Specification for Gravity-Convection and Forced-Ventilation Ovens
ASTM F 1251	Standard Terminology Relating to Polymeric Biomaterials in Medical and Surgical Device

2.1.3 ISO Publications

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ISO 6722 Road vehicles—60 V and 600 V single-core cables—Dimensions, test methods and requirements

2.1.4 IEC Publications

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

IEC 216-4-1 Guide for the determination of thermal endurance properties of electrical insulating materials—Part 4: Ageing ovens—Section 1: Single-chamber ovens

IEC 811-2-1 Common test methods for insulating and sheathing materials of electrical cables—Part 2: Methods specific to elastomeric compounds—Section 1: Ozone resistance test—Hot set test—Mineral oil immersion test

IEC, Electricity, Electronics and Telecommunications, Multilingual Dictionary

2.2 Related Specifications

The following publications are provided for information purposes only and are not a required part of this specification.

2.2.1 SAE Publications

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J156 Fusible Links

SAE J1067 Seven Conductor Jacketed Cable for Truck Trailer Connections

SAE J1127 Low Voltage Battery Cable

SAE J1128 Low Voltage Primary Cable

SAE J1292 Automobile, Truck, Truck-Tractor, Trailer, and Motor Coach Wiring

SAE J1654 High Voltage Primary Cable

SAE J1673 High Voltage Automotive Wiring

SAE J1678 Low Voltage Ultra Thin Wall Primary Cable

SAE J2394 Seven Conductor Cable for ABS Power

SAE J2501 Round, Screened and Unscreened, 60 V and 600 V Multi-Core Sheathed Cables—Basic and High Performance Test Methods and Requirements

2.2.2 ASTM Publications

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

- ASTM B 8 Concentric-Lay-Stranded Copper conductors, Hard, Medium-Hard, or Soft
- ASTM B 174 Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors
- ASTM B 263 Method for Determination of Cross-Sectional Area of Standard Conductors
- ASTM B 787 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation

2.2.3 ISO Publications

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

- ISO 14572 Road vehicles—Round, screened and unscreened, 60 V and 600 V multi-core sheathed cables—Test methods and requirements for basic and high performance cables
- ISO 16553 Road vehicles—Data cables—Test methods and requirements

3. DEFINITIONS

3.1 60 Volt (V) Cable

Cable intended for use in road vehicle applications where the nominal system voltage ≤ 60 V DC (25 V AC). AC tests are performed at 60 Hz. Applications at higher frequencies may require additional testing.

3.2 600 Volt (V) Cable

Cable intended for use in road vehicle applications where the nominal system voltage is > 60 V DC (25 V AC) to ≤ 600 V DC (600 V AC). AC tests are performed at 60 Hz. Applications at higher frequencies may require additional testing.

3.3 3000 h Temperature Class Rating

Letter designation (class) based on the maximum test temperature (rating) at which a primary cable successfully passes the minimum requirements of 3000 h of heat aging.

3.4 Additional Mass (ref. "Resistance to Abrasion" Test)

Mass which is applied to the support rod. The combination of the forces exerted by the additional mass and the 0.63 N exerted by the remaining apparatus (bracket, support rod, and pivoting arm) is applied to the cable.

3.5 Cable

See primary cable.

3.6 Cable Family

Cable group with multiple conductor sizes having the same conductor strand coating, insulation formulation, and wall thickness type.

3.7 Coated Wire

Wire comprised of a given metal covered with a relatively thin application of a different metal. (ASTM B 354)

3.8 Conductor

Wire or combination of wires not insulated from one another, suitable for carrying an electrical current. (ASTM B 354)

3.9 Conductor Size

See SAE conductor size

3.10 Core

One of the components in an assembly. A component may be an uninsulated conductor, an insulated conductor, a twisted pair, a shielded assembly, a coaxial cable, or any finished cable.

3.11 Decimals

Decimal points are shown as “.” instead of “,” commonly used in ISO standards.

3.12 Fluid Compatibility

Ability of a cable to resist the effects of various fluids found in surface vehicles.

3.13 Low Voltage

Usually considered to be 60 V DC (25 V AC).

3.14 Minimum Wall (Thickness)

Lowest allowable insulation thickness at any point.

3.15 Nominal

Suitable approximate value used to designate or identify a component

3.16 Plastic

Any of numerous polymeric materials that are usually thermoplastic or thermosetting, of high molecular weight and that can be molded, cast, extruded, drawn, laminated, or otherwise fabricated into objects, powders, beads, films, filaments, fibers, or other shapes. (ASTM F 1251)

3.17 Primary Cable

Single or multi-stranded, single conductor, insulated cable used to carry electric current, by attachment to the low voltage side of an ignition coil in surface vehicles.

3.18 Resistance to Ozone

Ability of a material to withstand the deteriorating effect of ozone (surface cracking). SAE, Dictionary of Materials and Testing.

3.19 SAE Conductor Size

System that indicates the cross sectional area of the conductor. The Metric SAE Conductor Size is the approximate area of the conductor. The English SAE Conductor Size number indicates that the area of the conductor approximates the area of the American Wire Gauge for the equivalent size.

3.20 Separator

Thin layer used as a barrier to prevent mutually detrimental effects between different components of a cable such as between the conductor and insulation or between the insulation and the sheath. (IEC, Electricity, Electronics and Telecommunications, Multilingual Dictionary)

3.21 Strip Force

Peak axial force required to overcome the adhesion between the conductor and the insulation.

3.22 Strand

See wire.

3.23 TCR

See "3000 h Temperature Class Rating".

3.24 Thermoplastic

Plastic capable of being softened by heating and hardened by cooling through a temperature range characteristic of the plastic and, in the softened state, capable of being repeatedly shaped by flow into articles by molding, extrusion or forming. (IEC, Electricity, Electronics and Telecommunications, Multilingual Dictionary)

3.25 Thermoset

Plastic which, when cured by heat or other means, changes into a substantially infusible and insoluble product. Note. – Thermosets are often called thermosetting before curing and thermoset after cure. (IEC, Electricity, Electronics and Telecommunications, Multilingual Dictionary)

3.26 Wire (Strand)

Rod or filament of drawn or rolled metal whose length is great in comparison with the major axis of its cross section. (ASTM B 354)

4. GENERAL REQUIREMENTS

See ISO 6722.

4.1 Conductors

See ISO 6722.

4.2 Cables

The cables shall be submitted to the tests as specified in Figure 1.

4.3 General Test Conditions

See ISO 6722.

4.4 Ovens

See ISO 6722. The ovens shall meet the requirements of IEC 216-4-1.

4.5 Representative Conductor Sizes for Testing

When a test is required, all combinations of conductor size, wall thickness, and insulation formulation shall meet the appropriate requirements. However, if testing representative conductor sizes is permitted, compliance for a cable family may be demonstrated by testing examples of large and small conductor sizes only. Permission to show compliance for a cable family by testing "Representative conductor sizes" shall be established by agreement between customer and supplier.

Clause	Test Description	See ISO	In Process Tests ⁽¹⁾	Certification		If Required ⁽³⁾	
				Initial	Periodic ⁽²⁾	Initial	Periodic ⁽²⁾
5	Dimensions						
5.1	Outside Cable Diameter	6722		X	X		
5.2	Insulation Thickness	6722		X	X		
6	Electrical characteristics						
6.1	Conductor Resistance	6722		X	X		
6.2	Withstand Voltage	6722		Note 4	Note 4		
6.3	Insulation Faults	6722	Note 4				
6.4	Insulation Volume Resistivity	6722				X	X
7	Mechanical characteristics						
7.1	Resistance to Pinch			X	X		
7.2	Strip Force	6722				X	X
8	Low temperature characteristics						
8.1	Winding			X	X		
9	Resistance to Abrasion						
9.1	Sandpaper abrasion			X	X		
10	Heat aging						
10.1	Long Term Aging 3000 h	6722		X			
10.2	Short Term Aging, 240 h	6722		X	X		
10.3	Thermal Overload	6722				X	X
11	Resistance to Chemicals						
11.1	Fluid Compatibility			Note 5	Note 5		
11.2	Resistance to Ozone	6722				Note 5	
11.3	Resistance to Hot Water	6722				Note 5	
11.4	Temperature and Humidity Cycling					Note 5	
12	Resistance to Flame Propagation	6722		X	X		

NOTE 1: A test made on all cable during or after manufacture.
 NOTE 2: The frequency of periodic testing shall be established by agreement between customer and supplier.
 NOTE 3: The usage of "if required" tests shall be established by agreement between customer and supplier.
 NOTE 4: Some cables are rated at 60 V and others at 600 V. See 3, 6.2, and 6.3 for details.
 NOTE 5: Compliance for a cable family may be demonstrated by testing examples of large and small conductor sizes only. See 4.5 of details

FIGURE 1 - TESTS
REF. 4.2

5. DIMENSIONS

5.1 Outside Cable Diameter

See ISO 6722 for "Test sample", "Apparatus", and "Procedure". No single value shall exceed the appropriate maximum cable diameter specified in SAE J2183, Figure 2.

5.2 Insulation Thickness

See ISO 6722 for "Test sample", "Apparatus", and "Procedure". No single value shall be less than the appropriate minimum insulation thickness specified in SAE J2183, Figure 2.

6. ELECTRICAL CHARACTERISTICS

6.1 Conductor Resistance

See ISO 6722.

6.2 Withstand Voltage

See ISO 6722.

6.3 Insulation Faults

See ISO 6722.

6.4 Insulation Volume Resistivity

See ISO 6722.

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ISO Conductor Size mm ²	Thick wall				Thin wall				Ultra thin wall			
	Insulation Thickness		Outside Cable Diameter Maximum mm	Insulation Thickness Minimum mm	Insulation Thickness		Outside Cable Diameter Maximum mm	Insulation Thickness Minimum mm	Insulation Thickness		Outside Cable Diameter Maximum mm	Insulation Thickness Minimum mm
	Nominal mm	Minimum mm			Nominal mm	Minimum mm			Nominal mm	Minimum mm		
0.13	--	--	--	0.25	0.20	1.05	0.20	0.20	0.16	0.95	0.16	
0.22	--	--	--	0.25	0.20	1.20	0.20	0.20	0.16	1.05	0.16	
0.35	--	--	--	0.25	0.20	1.40	0.20	0.20	0.16	1.20	0.16	
0.50	0.60	0.48	2.30	0.28	0.22	1.70	0.20	0.20	0.16	1.40	0.16	
0.75	0.60	0.48	2.50	0.30	0.24	1.90	0.20	0.20	0.16	1.60	0.16	
1	0.60	0.48	2.70	0.30	0.24	2.10	0.20	0.20	0.16	1.75	0.16	
1.5	0.60	0.48	3.00	0.30	0.24	2.40	0.20	0.20	0.16	2.10	0.16	
2	0.60	0.48	3.30	0.35	0.28	2.80	0.25	0.25	0.20	2.40	0.20	
2.5	0.70	0.56	3.60	0.35	0.28	3.00	0.25	0.25	0.20	2.70	0.20	
3	0.70	0.56	4.10	0.40	0.32	3.40	0.30	0.30	0.25	3.00	0.25	
4	0.80	0.64	4.40	0.40	0.32	3.80	0.35	0.35	0.25	3.40	0.25	
5	0.80	0.64	4.90	0.40	0.32	4.20	0.40	0.40	0.25	3.80	0.25	
6	0.80	0.64	5.00	0.40	0.32	4.30	0.40	0.40	0.25	4.20	0.25	
10	1.00	0.80	6.50	0.60	0.48	6.00	0.60	0.60	0.25	6.00	0.25	
16	1.00	0.80	8.30	0.65	0.52	7.90	0.65	0.65	0.25	7.90	0.25	
25	1.30	1.04	10.40	0.65	0.52	9.40	0.65	0.65	0.25	9.40	0.25	
35	1.30	1.04	11.60	0.65	0.52	10.40	0.65	0.65	0.25	10.40	0.25	
50	1.50	1.20	13.50	0.65	0.52	11.60	0.65	0.65	0.25	11.60	0.25	
70	1.50	1.20	15.50	0.65	0.52	13.50	0.65	0.65	0.25	13.50	0.25	
95	1.60	1.28	18.00	0.65	0.52	15.50	0.65	0.65	0.25	15.50	0.25	
120	1.60	1.28	19.70	0.65	0.52	18.00	0.65	0.65	0.25	18.00	0.25	

FIGURE 2 - OUTSIDE CABLE DIAMETER AND INSULATION THICKNESS
REF. 5.1 & 5.2

7. MECHANICAL CHARACTERISTICS

7.1 Resistance to Pinch

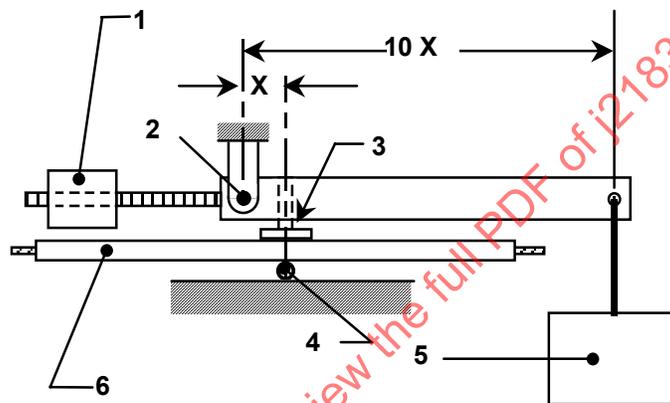
This test is only applicable to cable with an ISO Conductor Size $\leq 6 \text{ mm}^2$.

7.1.1 Test Sample

25 mm of insulation shall be removed from one end of a 900 mm sample of finished cable.

7.1.2 Apparatus

The apparatus shall be as shown in Figure 3. The counter balance shall be adjusted so that no force shall be exerted on the sample until a mass is applied to the end of the lever with a mechanical advantage of 10.



- Key**
- 1 Counter Balance
 - 2 Pivot
 - 3 Anvil
 - 4 Rod
 - 5 Applied Mass
 - 6 Test Sample

FIGURE 3 - APPARATUS FOR "RESISTANCE TO PINCH"
REF. 7.1

7.1.3 Procedure

The sample shall then be placed taut without stretching across a 3 mm diameter steel rod as shown in Figure 3. The sample shall then be subjected to an increasing force applied through the steel anvil by increasing the applied mass at a rate of 2.3 kg per min. At the moment the insulation is pinched through, the test shall stop. The applied mass shall then be recorded. After each reading the sample shall be moved 50 mm and rotated clockwise 90 deg. Four readings shall be obtained for each sample. The mean of the four readings shall determine the pinch resistance of the cable under test.

7.1.4 Requirement

The minimum value for each cable type and size is shown in Figure 4.

7.2 Strip Force

See ISO 6722.

ISO Conductor Size mm ²	60 V			600 V
	Wall Thickness			
	Ultra thin kg	Thin kg	Thick kg	kg
0.13				2.3
0.22	0.3	1.2		2.3
0.35	0.4	1.2		2.3
0.5	0.5	1.5	2.3	2.3
0.75	0.7	1.5	2.7	2.7
1	0.9	2.0	2.7	2.7
1.5	1.1	2.0	3.6	3.6
2	1.3	2.5	3.6	3.6
2.5	1.3	2.5	3.6	3.6
3	NA	2.5	3.6	3.6
4	NA	2.5	4.5	4.5
5	NA	3.0	4.5	4.5
6	NA	3.0	5.0	5.0

FIGURE 4 - MINIMUM RESISTANCE TO PINCH
REF. 7.1

8. LOW TEMPERATURE CHARACTERISTICS

8.1 Winding

8.1.1 Test Sample

Prepare two test samples of 600 mm and remove 25 mm of insulation from each end.

8.1.2 Apparatus

A freezing chamber at $(-40 \pm 2)^\circ\text{C}$. Either a rotatable or stationary mandrel may be used. The mandrel size shall be as specified in Figure 5.

Rotatable Mandrel - When a rotatable mandrel is used, the masses shall conform to Figure 5.

Stationary Mandrel - When a stationary mandrel is used, no mass is used.

ISO Conductor Size a mm ²	Mandrel Diameter, Multiple of Outside Diameter of Test Sample		Mass kg	Winding Speed s ⁻¹	Minimum Number of Turns
	Ref. 8.1, 10.1, 11.1, 11.2,11.3	Ref. 10.2, 10.3, 11.4			
a ≤ 0.75	5.0 ± 1.0	1.5 ± 0.3	0.5	0.2	3
0.75 < a ≤ 1.5	5.0 ± 1.0	1.5 ± 0.3	2.5	0.2	3
1.5 < a ≤ 6	5.0 ± 1.0	1.5 ± 0.3	5	0.2	2
6 < a ≤ 10	5.0 ± 1.0	1.5 ± 0.3	8	0.2	0.5
10 < a ≤ 25	5.0 ± 1.0	1.5 ± 0.3	10	0.2	0.5
25 < a ≤ 35	5.0 ± 1.0	1.5 ± 0.3	20	0.2	0.5
35 < a ≤ 120	5.0 ± 1.0	1.5 ± 0.3	30	0.2	0.5

FIGURE 5 - WINDING
REF. 8.1, 10.1, 10.2, 10.3, 11.1

8.1.3 Procedure

The test samples and mandrel shall be conditioned for a minimum of 4 h in the freezing chamber.

Rotatable Mandrel - When a rotatable mandrel is used, the test samples shall be fixed on the mandrel. The free ends are loaded with the specified mass. Position the mandrel with the test samples hanging vertically.

Stationary Mandrel - When a stationary mandrel is used, the test samples shall be wrapped around the mandrel by hand.

Wind at least the minimum number of turns specified in Figure 5 around the mandrel within the freezing chamber at winding speed as specified in Figure 5. Care shall be taken to ensure that there is continuous contact between the test samples and the mandrel.

After the cold winding, allow the test sample to return to room temperature, and make a visual inspection of the insulation. If no exposed conductor is visible, perform the "Withstand voltage" test; however, the following changes shall be made to the procedure in 6.2:

- The test sample shall be immersed in the salt solution for a minimum of 10 minutes prior to the application of the voltage.
- The 1 kV (rms) voltage shall be applied for 1 minute.
- The voltage shall not be "ramped up" after the application of the 1 kV (rms) voltage.

8.1.4 Requirement

After winding, no conductor shall be visible. During the "Withstand voltage" test, breakdown shall not occur.

9. RESISTANCE TO ABRASION

9.1 Sandpaper Abrasion

9.1.1 Test Sample

Prepare a test sample of 1 m and remove 25 mm of insulation from each end.

9.1.2 Apparatus

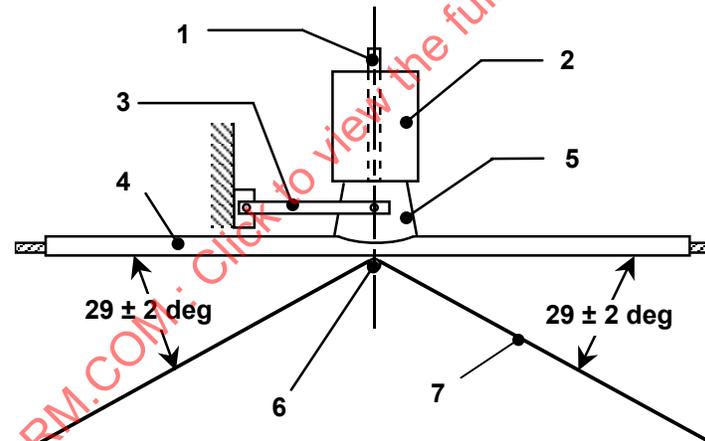
The resistance to sandpaper abrasion shall be measured using 150J garnet sandpaper with 10 mm conductive strips perpendicular to the edge of the sandpaper spaced a maximum of every 75 mm. The DC resistance of the conductive strips shall be $15\,000\ \Omega$ (when measured across the width of the sandpaper) or low enough to allow the apparatus to detect exposed conductor. The sandpaper shall approach and exit the sample from below at an angle of (29 ± 2) deg to the axis of the cable and shall be supported by a pin (6.9 ± 0.1) mm in diameter. The pivoting arm (see Figure 6) shall have a suitable bracket to maintain the cable position over an unused portion of the sandpaper. A total force of (0.63 ± 0.05) N shall be exerted on the test sample by the combination of the bracket, support rod, and pivoting arm. The total vertical force exerted on the test sample shall be the combination of the force exerted by the support bracket, pivoting arm, support rod and additional mass. See Figure 7 for additional masses.

9.1.3 Procedure

Mount the specimen taut, without stretching, in a horizontal position using an area of the abrasion tape not previously used. Place the additional mass and bracket on top of the cable. Draw the sandpaper under the specimen at a rate of (1500 ± 75) mm/min and record the length of sandpaper necessary to expose the core. Move the test sample 50 mm and rotate the test sample clockwise 90° . Repeat the procedure for a total of 4 readings. The mean of the readings shall determine the resistance to sandpaper abrasion.

9.1.4 Requirement

The resistance to sandpaper abrasion shall meet or exceed the "Minimum length of sandpaper" requirements in Figure 7.



Key

- 1 Support Rod
- 2 Additional Mass
- 3 Pivoting Arm
- 4 Test Sample
- 5 Bracket
- 6 Tape Supporting Pin
- 7 Sandpaper Abrasion Tape

FIGURE 6 - APPARATUS FOR "SANDPAPER ABRASION"

REF. 9.1

ISO Conductor Size mm ²	60 V Cables						600 V Cables	
	Thick wall		Thin wall		Ultra thin wall		Additional Mass Kg	Minimum Length of Sandpaper mm
	Additional Mass kg	Minimum Length of Sandpaper mm	Additional Mass kg	Minimum Length of Sandpaper mm	Additional Mass kg	Minimum Length of Sandpaper mm		
0.13			0.1	175	0.05	100	0.5	400
0.22			0.1	200	0.05	125	0.5	400
0.35			0.1	225	0.05	150	0.5	400
0.5	0.5	400	0.2	200	0.1	150	0.5	400
0.75	0.5	410	0.2	225	0.1	175	0.5	410
1	0.5	420	0.2	250	0.1	200	0.5	420
1.5	0.5	430	0.2	275	0.1	225	0.5	430
2	0.5	450	0.2	325	0.1	275	0.5	450
2.5	1.5	280	0.5	250	0.2	125	1.5	280
3	1.5	330	0.5	300			1.5	330
4	1.5	400	0.5	350			1.5	400
5	1.5	450	0.5	430			1.5	450
6	1.5	500	0.5	500			1.5	500
10	4.0	250	2.0	250			4.0	250
16	4.0	350	2.0	300			4.0	350
25	4.0	400	2.0	350			4.0	400
35	4.0	450					4.0	450
50	4.0	500					4.0	500
70	4.0	550					4.0	550
95	4.0	600					4.0	600
120	4.0	650					4.0	650

The total vertical force exerted on the test sample shall be the combination of the force exerted by the support bracket, pivoting arm, support rod, and additional mass.

FIGURE 7 - SANDPAPER ABRASION
REF. 9.1

10. HEAT AGING

10.1 Long Term Aging, 3000 h

See ISO 6722.

10.2 Short Term Aging, 240 h

See ISO 6722.

10.3 Thermal Overload

See ISO 6722.

11. RESISTANCE TO CHEMICALS

When any "Resistance to chemicals" test is specified, compliance for a cable family may be demonstrated by "Testing representative conductor sizes", see 4.5.

11.1 Fluid Compatibility

The tests are intended to qualify cables for limited exposure to fluids. Additional tests shall be necessary to qualify cables for continuous immersion.

11.1.1 Test Sample

See ISO 6722.

11.1.2 Apparatus

The apparatus for measuring the cable diameter shall be the same as that shown in 5.1. Vessels shall be filled with the fluids at the temperatures shown in Figure 8. See Figure 5 for masses and mandrels. Either a rotatable or stationary mandrel may be used.

Fluid	Specification	Test Temp. °C	Test Duration h	Maximum OD Change %
Gasoline	ASTM D 471, Ref. Fuel C	23 ± 5	20	15
Diesel Fuel	90% ASTM D 471, IRM 903 + 10% p-xylene	23 ± 5	20	15
Engine Oil	ASTM D 471, IRM-902	50 ± 3	20	15
Ethanol	85% Ethanol + 15% ASTM D 471, Ref. Fuel C	23 ± 5	20	15
Power Steering	ASTM D 471, IRM-903	50 ± 3	20	30
Auto Trans.	Dexron III	50 ± 3	20	25
Engine Coolant	50 % ethylene glycol + 50 % distilled water	50 ± 3	20	15
Battery Acid	H ₂ SO ₄ Specific Gravity = 1.260 ± .005	23 ± 5	20	5

Solutions are determined as % by volume.

FIGURE 8 - FLUID COMPATIBILITY
REF. 11.1

11.1.3 Procedure

See ISO 6722.

11.1.4 Requirement

See ISO 6722.

11.2 Resistance to Ozone

See ISO 6722.

11.3 Resistance to Hot Water

See ISO 6722.