

ENGINEERING MATERIAL SPECIFICATION

Material Name	Specification Number
CABLE, LOW TENSION, VINYL INSULATED (85 °C), BARE	ESB-M1L56-A2
CABLE, LOW TENSION, VINYL INSULATED (85 °C), TINNED	ESB-M1L57-A2

1. SCOPE

The materials defined by these specifications are stranded vinyl covered low tension cables. The vinyl covering shall be 85 °C classification.

2. APPLICATION

These specifications were released originally for material used for automotive electrical harnesses.

3. REQUIREMENTS

3.0 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements For Production Materials (WSS-M99P1111-A).

3.1 WIRE SIZE

Shall be specified on the engineering drawing and/or release according to the SAE wire size numbers appearing in Table I.

Example: # 16 gage ESB-M1L56-A2

3.2 COLOR

The color of the vinyl cover shall be specified on the engineering drawing and/or release by a numerical suffix following the letter suffix of the materials desired. The numerical color coding suffixes shall correspond to the following:

0 - Black	5 - Green
1 - Brown	6 - Blue
2 - Red	7 - Violet
3 - Orange	8 - Gray
4 - Yellow	9 - White or natural

Example: #16 gage ESB-M1L56-A2 shall designate a stranded 16 gage, brown vinyl covered, soft or annealed bare copper conductor, corresponding to the requirements of this specification.

Date	Action	Revisions
2003 04 25	Revised	Para 3.0 inserted; Para 3.8, 3.9, 3.10, 3.11, 3.12, 4 deleted
1993 08 13	NB00I10043054277	Released J.M. Showalter

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The first color coding numerical suffix shall be the base or body color of the finished cable and the second number shall designate the tracer or other auxiliary marking.

3.3 CABLE QUALITY

Shall meet all of the requirements listed herein and must be equal to the original approved purchase sample.

ESB-M1L56-A2 similar to M-1L17-A
ESB-M1L57-A2 similar to M-1L17-B

3.4 WIRE QUALITY

The strands of the conductors prior to stranding shall consist of the following grades of wire:

ESB-M1L56-A2: ESF-M2L1-A, soft or annealed bare copper wire
ESB-M1L57-A2: ESF-M2L3-A, soft or annealed tinned copper wire

3.5 CABLE CONSTRUCTION

See Tables I & II

The cross sectional area of stranded conductors shall not be less than 98% of the values specified in Table I.

3.6 INSULATION QUALITY

The insulating material shall be a good grade vinyl chloride copolymer which will pass the following test requirements:

The material shall adhere closely to, but strip readily from the conductors, leaving them reasonably clean and in suitable condition for soldering.

Insulation thickness shall be in accordance with Table II for various wire sizes and shall be determined by measuring the diameter over the insulation, then removing the insulation and measuring the diameter of the conductor. Half of the difference of the two measurements shall be considered as the wall thickness.

3.6.2 Mechanical Properties

A test specimen of the thermoplastic insulation prepared as in the SAE J200 section on sampling shall be used. The dumbbell cut sample shall have marks placed upon it 50 mm apart. The sample shall then be stretched at the rate of 305 mm/minute. The tensile strength shall be calculated upon the original cross section of the test specimen before stretching. Testing shall be conducted at 23 +/- 2 °C. Care should be exercised in cutting samples to obtain uniform cross section. The properties shall be as follows:

Tensile Strength, min	15.9 Mpa
Elongation, min	125%

3.6.2 High Temperature Resistance

Remove 25 mm of insulation from each end of a 610 mm sample of the finished cable. The sample shall be suspended around a cylindrical mandrel having a diameter specified in Table III. Each end of the conductor shall have suspended from it, the weight shown in Table III. This condition shall be maintained for 120 h in a mechanical convection oven maintained at a temperature of 120 +/- 2 °C. When cool, the weight shall be removed from the specimen and it shall be taken off the mandrel, bent in the reverse direction around a mandrel of the diameter specified for the bend test in Table III at a rate not to exceed one complete turn/minute and then be subjected to the dielectric test, para 3.6.3.

3.6.3 Dielectric Test

A specimen of the cable 610 mm long shall be formed into a loop. Remove 25 mm of insulation from each end of the wire and twist the ends together. The loop thus formed shall be immersed in water containing 5% salt by weight at 23 +/- 2 °C, so that not more than 152 mm of each end of the specimen protrudes above the solution. After being immersed for 5 h and while still immersed, the specimen shall withstand the application of 1000 volts (rms) at 60 Hz between the conductor and the water for 1 minute without rupture of the insulation.

3.6.4 Oil Absorption Test

A specimen 610 mm long shall be immersed to within 38 mm from the ends in a mixture of equal parts of M14J167 hydrocarbon thinner and ESE-M2C36 heavy duty lubricating oil at a temperature of 48 - 50 °C for a period of 20 h. The sample shall then be removed from the solution, examined for deterioration of the insulation compound and gaged for swelling. The outside diameter of the insulation of the cable shall not increase more than 15%. The sample shall then be bent around a mandrel (Table III) and checked for cracking. After the bend test, the cable shall be subjected to the dielectric test, para 3.6.3.

3.6.5 Cold Bend Test

A straight specimen shall be reduced to a temperature of - 40 °C at a rate not to exceed 50 °C /minute. After maintaining this temperature for 3 h and while still at this low temperature, the cable shall be wrapped around the mandrel specified in Table III for 180 ° at the uniform rate of one turn in 10 s. The insulation shall be removed for a distance of 25 mm from each end of the specimen and the specimen subjected to the dielectric test, para 3.6.3.

3.6.6 Flame Test

A 610 mm specimen shall be suspended in a vertical position within a partial enclosure which allows a flow of sufficient air for complete combustion but is free from drafts. The tip of a 50 mm gas flame with an inner cone one-third its height shall then be applied to the end of the specimen for 15 s. After removal of the flame the specimen shall not continue to burn for more than 30s.