

DELPHI

F-3548SPECIAL

P. O. Box 431

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ENGINEERING SPECIFICATION NO.**M5143**

TITLE **THIN WALL – TXL CABLE, AUTOMOTIVE, LOW TENSION, CROSS LINKED
POLYETHYLENE, INSULATED - DELPHI EMPALME**

1. **GENERAL**

This specification covers a cross-linked polyethylene insulated cable for use in low tension automotive wiring circuits. Reference Specification ESB-MIL123-A

2. **MANUFACTURE**

2.1 **Conductors:** The conductors shall be constructed of bare copper wire bunched stranded in accordance with SAE J-1128.

2.1.1 See Para. 4 of this specification for sizes and dimensions.

2.1.2 Splices are permitted in the individual strands and in the conductor as a whole provided that they do not increase the diameter, have a length greater than 7mm, decrease the break strength by more than 20%, or increase the resistance of the conductor.

2.2 **Insulation:** The cross-linked polyethylene insulation, homogeneous in character, shall be placed concentrically within SAE tolerance about the conductors. Insulation shall adhere closely to but strip readily from the conductors leaving them reasonably clean and in suitable condition for soldering. (See Para. 4 of this specification for dimensions.)

3. **PROPERTIES**3.1 **Properties of Conductor**

3.1.1 The conductors shall meet all requirements of SAE J-1128 with wire size and stranding as shown in Para. 4 of this specification.

3.1.2 Before Stranding - The wire must meet the requirements of ASTM B-1 and B-3 for tensile strength, elongation, resistivity, dimensions and finish.

3.1.3 0.35mm² (22 Ga.) shall be constructed from annealed copper strands (Ref. ASTM B-3).

DQ/ae

Date	Change Notice	Change
07/23/07	293502	Add New Codes
08/02/07	293811	Add New Codes

3.2 Properties Of The Insulation– Cable must meet requirements of ESB-MIL123-A.

3.3 Color and Print

- 3.3.1 The color of the cable shall be as specified by code number on the purchase order (see the code sheet in this specification). The colors shall target the recommended color information referenced in SAE J-1128.
- 3.3.2 The cable shall be printed with a permanent identification marking approximately every 320mm along the entire length of the cable*. The size of the marking shall be appropriate to the diameter of the cable so that the marking is easily distinguishable and legible. The shape of the marking shall be approved by Delphi. The color of the marking shall be determined by the base color of the cable:

<u>INSULATION COLOR</u>	<u>MARKING COLOR</u>
BLACK	WHITE OR BLACK
BLUE DK	BLACK
BLUE LT	BLACK
BROWN	BLACK
GRAY	BLACK
GREEN DK	BLACK
GREEN LT	BLACK
ORANGE	BLACK
PINK	BLACK
PURPLE	BLACK
RED	BLACK
TAN	BLACK
WHITE	BLACK
YELLOW	BLACK

*Delphi cable manufacturing plants are not required to print identification marks except for .35mm² CV cable.

3.3.2.1 Delphi will assign each XLPE cable vendor a unique identification code to verify the manufacturer of the cable.

3.3.3 Cables requiring stripes shall be extruded with two continuous solid stripes of the color specified. The stripes shall be on opposite sides of the cable. The stripe color shall completely mask the base cable color. See Table II for stripe width dimensions.

3.4 Cable Performance Requirements– Cable must meet requirements of ESB-MIL123-A.

3.5 No separators are permitted.

3.6 Insulation Strip Force

<u>AWG</u>	<u>Wire Size</u> (mm ²)	<u>Strip Force</u> (5 Readings)	
		<u>Single Min. Value</u>	
		<u>Lb.</u>	<u>(N)</u>
22	0.35	2.2	10
20	0.5	2.2	10
18	0.8	4.5	20
16	1	4.5	20
14	2	4.5	20
12	3	4.5	20
10	5	4.5	20
8	8	4.5	20

3.7 Shrinkage - Cut a cable in the middle of a section at least 1.0 m (3 ft) in length and immediately check for insulation shrinkage. No shrinkage is allowed.

3.8 All finished cable shall be cadmium free.

4. **DIMENSIONS**

Conductor and finished cable dimensions are shown in Table I and Table II. Check dimensions per EST-459.

TABLE I - CONDUCTOR DIMENSIONS

<u>WIRE SIZE</u>		<u>NO. OF STRANDS</u>	<u>NOM. SIZE OF STRAND*</u>		<u>LENGTH OF LAY*</u> (mm) <u>LH</u>		<u>NOM. DIA. OF STRANDED COND*.</u> (mm)	<u>MAX. RESISTANCE*</u> (mOHMS/METER)@20°C
<u>AWG</u>	<u>(mm²)</u>		<u>AWG</u>	<u>(mm)</u>	<u>MIN.</u>	<u>MAX.</u>		
22	0.35	7	30	.254	15	25	.762	53.6
20	0.5	7	28	.320	18	55	.965	31.5
18	0.8	19	32	.234	18	55	1.14	22.7
16	1.0	19	29	.287	30	55	1.45	15.7
14	2.0	19	27	.361	34	55	1.80	9.29
12	3.0	19	25	.455	34	55	2.29	5.90
10	5.0	19	23	.574	34	55	2.87	3.72

*Reference dimension

TABLE II - FINISHED CABLE DIMENSIONS

<u>AWG</u>	<u>WIRE SIZE</u> (mm ²)	<u>STRIPE WIDTH (mm)</u>		<u>MIN. WALL THICKNESS (mm)</u>		<u>FINISHED CABLE O.D. (mm)</u>
		<u>MIN.</u>	<u>MAX.</u>	<u>INDIVIDUAL</u>	<u>NOMINAL</u>	
22	0.35	.3	.8	.305	.406	1.57
20	0.5	.3	.9	.305	.406	1.78
18	0.8	.3	1.0	.305	.406	1.98
16	1.0	.4	1.1	.305	.406	2.26
14	2.0	.4	1.3	.305	.406	2.62
12	3.0	.5	1.6	.381	.457	3.20
10	5.0	.6	1.9	.432	.533	3.94

NOTE: THE TOLERANCE ON THE FINISHED CABLE O.D. SHALL BE $\pm .08\text{mm}$ FOR THE AVERAGE OF 5 READINGS OVER 1M (3 FT.) LENGTH. THE TOLERANCE FOR AN INDIVIDUAL MEASUREMENT SHALL BE $\pm .13\text{mm}$.

5. PACKAGING

- 5.1 Unless otherwise specified on the purchase order, all cable shall be supplied in barrels.
- 5.2 Slipper compound may be used as required to facilitate barrel packing and/or reduce tangles. Use Gem Gravure Type SC slipper compound (regular #5000) mixed with an equal part of water, or other slipper compounds approved by Delphi. The compound should be dripped onto an applicator pad to evenly coat the cable insulation prior to being barrel packed.

6. MARKING

Each cable pack shall be identified by a suitable identification ticket secured to the leading end of the cable and attached to the inside of the barrel with the following information:

Name of Manufacturer
Net Weight of Material - Footage
Lot Number
Purchase Order Number*
M5143 - Code Number

*Not required for cable manufactured by Delphi.

7. FACTORY ACCEPTANCE

Material as supplied under this specification shall comply with processing and physical requirements so required by Delphi.

8. CERTIFICATION AND TESTING

Delphi may request at any time and receive from the supplier samples of the insulating compound for testing at Delphi. Test results pertinent to this cable, which demonstrate conformance to this specification, are subject to recall on demand by Delphi.

9. IN-PROCESS TEST

All cable shall be spark tested at 2000 Volts at the final cable handling process prior to the cable being packaged for shipment. All spark failures shall be removed. No package shall have average continuous lengths of less than 3048m (10,000 ft.). The leading end of each length of cable shall be identified with an easily distinguishable tape flag at least 12.7mm (0.5 in) in length. The flagged end may then be dropped into the barrel. Twisted cable splices or knots in the cable are unacceptable.

10. REJECTION

All material, which does not conform to the above requirements, shall be rejected.

11. MATERIAL CHANGE

The supplier must notify the Cable Engineer, Delphi in writing and obtain written approval prior to making any change in the basic formulation, composition and/or manufacturing process of this material originally approved and supplied under this specification.

12. RESTRICTED AND REPORTABLE MATERIALS

All materials supplied to this specification must comply with Delphi specification 10949001 "Substances of Concern and Recycled Content".

CODE SHEET

NOTE: Each reel of finished cable shall be identified with the Delphi part number and the M5143 Code Number as specified in Para. 6, Marking.

SOLID COLOR CABLE

	<u>0.35mm² (22)</u>	<u>0.5mm² (20)</u>	<u>0.8mm² (18)</u>	<u>1.0mm² (16)</u>	<u>2.0mm² (14)</u>	<u>3.0mm² (12)</u>	<u>5.0mm² (10)</u>
BLACK	001	101	201	301	401	501	601
BLUE DK	002	102	202	302	402	502	602
BLUE LT	003	103	203	303	403	503	603
BROWN	004	104	204	304	404	504	604
GRAY	005	105	205	305	405	505	605
GREEN DK	006	106	206	306	406	506	606
GREEN LT	007	107	207	307	407	507	607
ORANGE	009	109	209	309	409	509	609
PINK	010	110	210	310	410	510	610
PURPLE	011	111	211	311	411	511	611
RED	012	112	212	312	412	512	612
TAN	013	113	213	313	413	513	613
WHITE	008	108	208	308	408	508	608
YELLOW	014	114	214	314	414	514	614

<u>COLOR</u>	<u>STRIPE</u>	<u>0.35mm² (22)</u>	<u>0.5mm² (20)</u>	<u>0.8mm² (18)</u>	<u>1.0mm² (16)</u>	<u>2.0mm² (14)</u>	<u>3.0mm² (12)</u>	<u>5.0mm² (10)</u>
BLACK	BLUE DK	A02	B02	C02	D02	E02	F02	G02
BLACK	BLUE LT	048	148	248	348	448	548	648
BLACK	GRAY	A60	B60	C60	D60	E60	F60	G60
BLACK	GREEN DK	A01	B01	C01	D01	E01	F01	G01
BLACK	GREEN LT	015	115	215	315	415	515	615
BLACK	ORANGE	018	118	218	318	418	518	618
BLACK	PINK	016	116	216	316	416	516	616
BLACK	PURPLE	053	153	253	353	453	553	653
BLACK	RED	017	117	217	317	417	517	617
BLACK	TAN	060	160	260	360	460	560	660
BLACK	WHITE	019	119	219	319	419	519	619
BLACK	YELLOW	020	120	220	320	420	520	620
BLUE DK	BLACK	066	166	266	366	466	566	666
BLUE DK	BROWN	A03	B03	C03	D03	E03	F03	G03
BLUE DK	GRAY	072	172	272	372	472	572	672
BLUE DK	GREEN DK	A16	B16	C16	D16	E16	F16	G16
BLUE DK	GREEN LT	A42	B42	C42	D42	E42	F42	G42
BLUE DK	ORANGE	A54	B54	C54	D54	E54	F54	G54
BLUE DK	RED	022	122	222	322	422	522	622
BLUE DK	TAN	A96	B96	C96	D96	E96	F96	G96
BLUE DK	WHITE	021	121	221	321	421	521	621
BLUE DK	YELLOW	A04	B04	C04	D04	E04	F04	G04
BLUE LT	BLACK	023	123	223	323	423	523	623
BLUE LT	GRAY	A43	B43	C43	D43	E43	F43	G43
BLUE LT	ORANGE	024	124	224	324	424	524	624
BLUE LT	PINK	A78	B78	C78	D78	E78	F78	G78
BLUE LT	PURPLE	A44	B44	C44	D44	E44	F44	G44
BLUE LT	RED	054	154	254	354	454	554	654
BLUE LT	TAN	A67	B67	C67	D67	E67	F67	G67
BLUE LT	WHITE	025	125	225	325	425	525	625
BLUE LT	YELLOW	026	126	226	326	426	526	626
BROWN	BLACK	A05	B05	C05	D05	E05	F05	G05
BROWN	BLU DK	A51	B51	C51	D51	E51	F51	G51
BROWN	BLU LT	058	158	258	358	458	558	658
BROWN	GRAY	086	186	286	386	486	586	686
BROWN	GREEN DK	A28	B28	C28	D28	E28	F28	G28
BROWN	GREEN LT	057	157	257	357	457	557	657
BROWN	ORANGE	075	175	275	375	475	575	675
BROWN	PINK	076	176	276	376	476	576	676
BROWN	PURPLE	056	156	256	356	456	556	656
BROWN	RED	027	127	227	327	427	527	627
BROWN	WHITE	028	128	228	328	428	528	628
BROWN	YELLOW	055	155	255	355	455	555	655

<u>COLOR</u>	<u>STRIPE</u>	<u>0.35mm² (22)</u>	<u>0.5mm² (20)</u>	<u>0.8mm² (18)</u>	<u>1.0mm² (16)</u>	<u>2.0mm² (14)</u>	<u>3.0mm² (12)</u>	<u>5.0mm² (10)</u>
GRAY	BLACK	049	149	249	349	449	549	649
GRAY	BLUE DK	068	168	268	368	468	568	668
GRAY	BLUE LT	096	196	296	396	496	596	696
GRAY	GREEN DK	069	169	269	369	469	569	669
GRAY	ORANGE	077	177	277	377	477	577	677
GRAY	PURPLE	A46	B46	C46	D46	E46	F46	G46
GRAY	RED	045	145	245	345	445	545	645
GRAY	TAN	A97	B97	C97	D97	E97	F97	G97
GRAY	WHITE	046	146	246	346	446	546	646
GRAY	YELLOW	063	163	263	363	463	563	663
GREEN DK	BLACK	A06	B06	C06	D06	E06	F06	G06
GREEN DK	BLUE DK	A15	B15	C15	D15	E15	F15	G15
GREEN DK	GREEN LT	A93	B93	C93	D93	E93	F93	G93
GREEN DK	ORANGE	051	151	251	351	451	551	651
GREEN DK	PURPLE	079	179	279	379	479	579	679
GREEN DK	RED	078	178	278	378	478	578	678
GREEN DK	WHITE	029	129	229	329	429	529	629
GREEN DK	YELLOW	030	130	230	330	430	530	630
GREEN LT	BLACK	031	131	231	331	431	531	631
GREEN LT	BLUE DK	A26	B26	C26	D26	E26	F26	G26
GREEN LT	BLUE LT	A22	B22	C22	D22	E22	F22	G22
GREEN LT	BROWN	082	182	282	382	482	582	682
GREEN LT	GRAY	A47	B47	C47	D47	E47	F47	G47
GREEN LT	GREEN DK	A25	B25	C25	D25	E25	F25	G25
GREEN LT	ORANGE	A24	B24	C24	D24	E24	F24	G24
GREEN LT	PURPLE	A23	B23	C23	D23	E23	F23	G23
GREEN LT	RED	098	198	298	398	498	598	698
GREEN LT	TAN	A69	B69	C69	D69	E69	F69	G69
GREEN LT	WHITE	032	132	232	332	432	532	632
GREEN LT	YELLOW	A57	B57	C57	D57	E57	F57	G57
ORANGE	BLACK	034	134	234	334	434	534	634
ORANGE	BLUE DK	A08	B08	C08	D08	E08	F08	G08
ORANGE	BLUE LT	A07	B07	C07	D07	E07	F07	G07
ORANGE	GREEN DK	A29	B29	C29	D29	E29	F29	G29
ORANGE	GREEN LT	085	185	285	385	485	585	685
ORANGE	RED	A62	B62	C62	D62	E62	F62	G62
ORANGE	WHITE	A20	B20	C20	D20	E20	F20	G20
ORANGE	YELLOW	A63	B63	C63	D63	E63	F63	G63

<u>COLOR</u>	<u>STRIPE</u>	<u>0.35mm² (22)</u>	<u>0.5mm² (20)</u>	<u>0.8mm² (18)</u>	<u>1.0mm² (16)</u>	<u>2.0mm² (14)</u>	<u>3.0mm² (12)</u>	<u>5.0mm² (10)</u>
PINK	BLACK	035	135	235	335	435	535	635
PINK	BLUE DK	067	167	267	367	467	567	667
PINK	BLUE LT	A92	B92	C92	D92	E92	F92	G92
PINK	GREEN DK	A38	B38	C38	D38	E38	F38	G38
PINK	GREEN LT	A14	B14	C14	D14	E14	F14	G14
PINK	ORANGE	A94	B94	C94	D94	E94	F94	G94
PINK	WHITE	036	136	236	336	436	536	636
PINK	YELLOW	A21	B21	C21	D21	E21	F21	G21
PURPLE	BLUE LT	A35	B35	C35	D35	E35	F35	G35
PURPLE	GRAY	A49	B49	C49	D49	E49	F49	G49
PURPLE	GREEN DK	A09	B09	C09	D09	E09	F09	G09
PURPLE	GREEN LT	A37	B37	C37	D37	E37	F37	G37
PURPLE	ORANGE	A85	B85	C85	D85	E85	F85	G85
PURPLE	RED	A32	B32	C32	D32	E32	F32	G32
PURPLE	TAN	A71	B71	C71	D71	E71	F71	G71
PURPLE	WHITE	037	137	237	337	437	537	637
PURPLE	YELLOW	052	152	252	352	452	552	652
RED	BLACK	038	138	238	338	438	538	638
RED	BLUE DK	A19	B19	C19	D19	E19	F19	G19
RED	BLUE LT	A10	B10	C10	D10	E10	F10	G10
RED	BROWN	A17	B17	C17	D17	E17	F17	G17
RED	GREEN DK	A13	B13	C13	D13	E13	F13	G13
RED	GREEN LT	047	147	247	347	447	547	647
RED	ORANGE	A80	B80	C80	D80	E80	F80	G80
RED	PINK	039	139	239	339	439	539	639
RED	PURPLE	A18	B18	C18	D18	E18	F18	G18
RED	WHITE	040	140	240	340	440	540	640
RED	YELLOW	091	191	291	391	491	591	691
TAN	BLACK	041	141	241	341	441	541	641
TAN	BLUE DK	A64	B64	C64	D64	E64	F64	G64
TAN	BLUE LT	A87	B87	C87	D87	E87	F87	G87
TAN	GREEN LT	A86	B86	C86	D86	E86	F86	G86
TAN	ORANGE	092	192	292	392	492	592	692
TAN	PURPLE	A98	B98	C98	D98	E98	F98	G98
TAN	RED	093	193	293	393	493	593	693
TAN	YELLOW	050	150	250	350	450	550	650
TAN	WHITE	042	142	242	342	442	542	642

<u>COLOR</u>	<u>STRIPE</u>	<u>0.35mm² (22)</u>	<u>0.5mm² (20)</u>	<u>0.8mm² (18)</u>	<u>1.0mm² (16)</u>	<u>2.0mm² (14)</u>	<u>3.0mm² (12)</u>	<u>5.0mm² (10)</u>
WHITE	BLACK	033	133	233	333	433	533	633
WHITE	BLUE DK	A11	B11	C11	D11	E11	F11	G11
WHITE	BLUE LT	A53	B53	C53	D53	E53	F53	G53
WHITE	GREEN LT	A52	B52	C52	D52	E52	F52	G52
WHITE	GREEN DK	059	159	259	359	459	559	659
WHITE	ORANGE	081	181	281	381	481	581	681
WHITE	PINK	A81	B81	C81	D81	E81	F81	G81
WHITE	PURPLE	070	170	270	370	470	570	670
WHITE	RED	080	180	280	380	480	580	680
WHITE	TAN	A91	B91	C91	D91	E91	F91	G91
WHITE	YELLOW	A27	B27	C27	D27	E27	F27	G27
YELLOW	BLACK	043	143	243	343	443	543	643
YELLOW	BLUE DK	065	165	265	365	465	565	665
YELLOW	BLUE LT	A59	B59	C59	D59	E59	F59	G59
YELLOW	GRAY	061	161	261	361	461	561	661
YELLOW	GREEN DK	071	171	271	371	471	571	671
YELLOW	GREEN LT	064	164	264	364	464	564	664
YELLOW	ORANGE	A36	B36	C36	D36	E36	F36	G36
YELLOW	PURPLE	A12	B12	C12	D12	E12	F12	G12
YELLOW	RED	044	144	244	344	444	544	644
YELLOW	WHITE	062	162	262	362	462	562	662