

WHA YU INDUSTRIAL CO., LTD. (HEAD OFFICE)
TAI HWA ELECTRONIC CO., LTD.(CHINA)
SHANGHAI HUA YU ELECTRONIC CO., LTD.(CHINA)
AEON TECH CO., LTD. (CHINA)

SPECIFICATION FOR APPROVAL

CUSTOMER: 研華股份有限公司

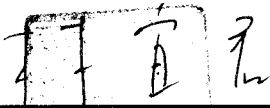
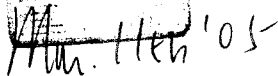
PART NAME: RF Antenna Assembly

PART NO.:

REVISION:

W. Y. P/NO.: C449-510006-A

REV.: X2

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :		

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RF Antenna Cable Assembly

Specification

1. Electrical Properties :

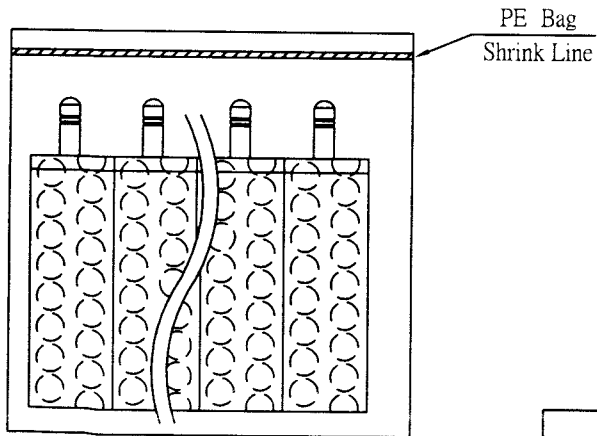
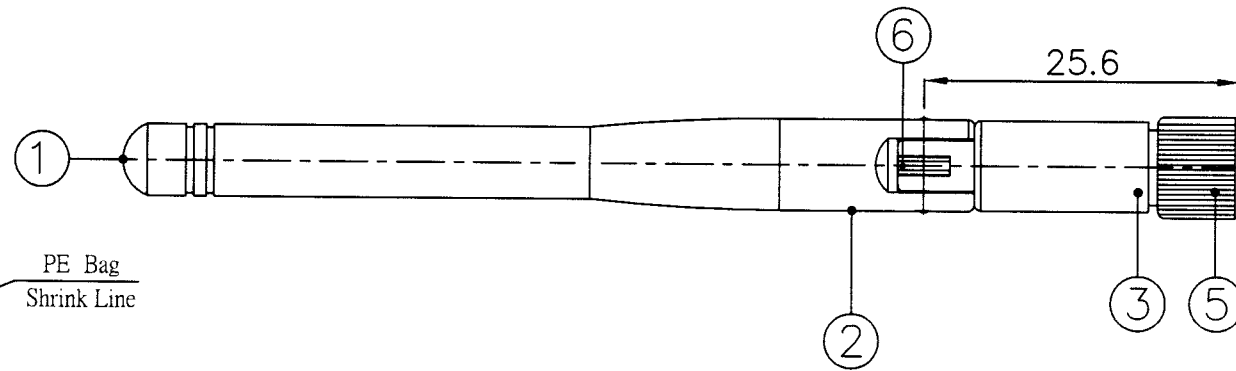
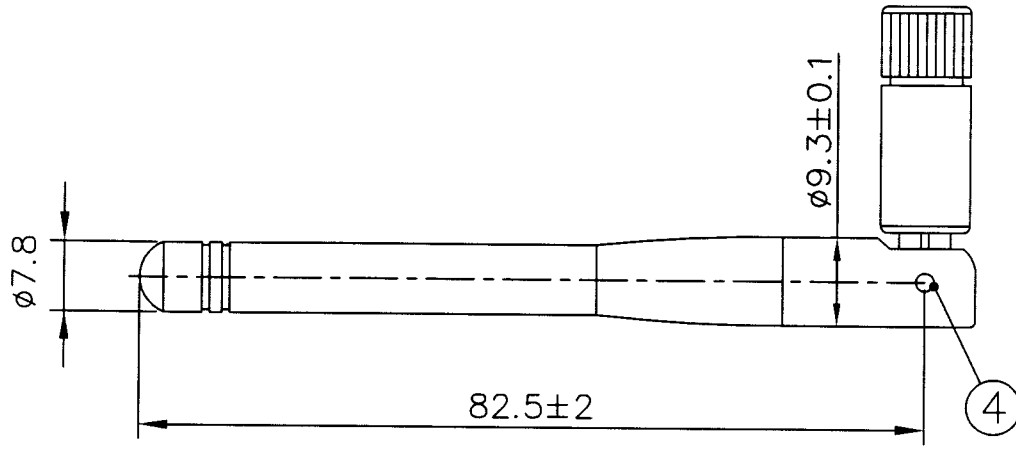
- 1.1 Frequency Rang..... 2.4GHz ~ 2.5GHz
- 1.2 Impedance 50Ω Nominal
- 1.3 VSWR 1.92 Max.
- 1.4 Return Loss..... -10 dB Maximum
- 1.5 Electrical Wave..... $1/2 \lambda$ Diople
- 1.6 Gain(peak)..... 1.8dBi
- 1.7 Admitted Power..... 1W

2. Physical Properties :

- 2.1 Cable..... RG-178 Coaxial Cable
- 2.2 Antenna Cover..... TPE
- 2.3 Antenna Base..... PC
- 2.4 Antenna Base..... PBT
- 2.5 Operating Temp. $-20^{\circ}\text{C} \sim +65^{\circ}\text{C}$
- 2.6 Storage Temp. $-30^{\circ}\text{C} \sim +75^{\circ}\text{C}$
- 2.7 Color Black
- 2.8 Connector..... SMA Plug Reverse

CG-

REV	DATE	DESCRIPTION
X1	1/24-2005	New Issue



Packing : 20 pcs/bag

CUSTOMER'S SINGATURE

6	Cable	RG-178 , Translucent Brown ; 50 Ω	1	
5	Connector	SMA Straight Plug/Reverse	1	
4	Rivet	Brass , Cr Plated (Black)	2	
3	Antenna Base	PBT ; Color : Black	1	
2	Antenna Base	PC ; Color : Black	1	
1	Antenna Cover	TPE ; Color : Black	1	
NO	DESCRIPTION		QTY	REMARK

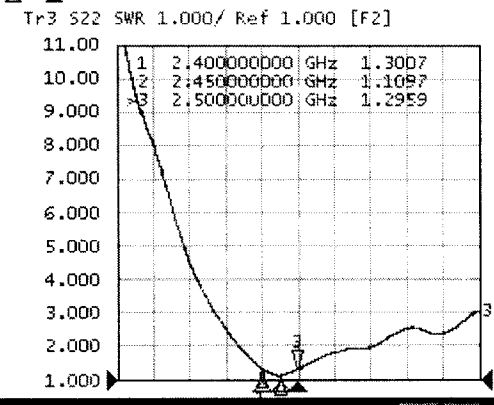
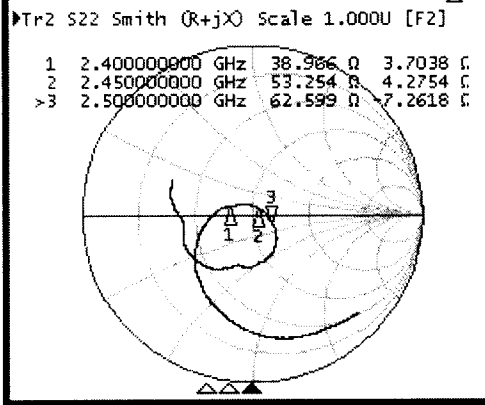
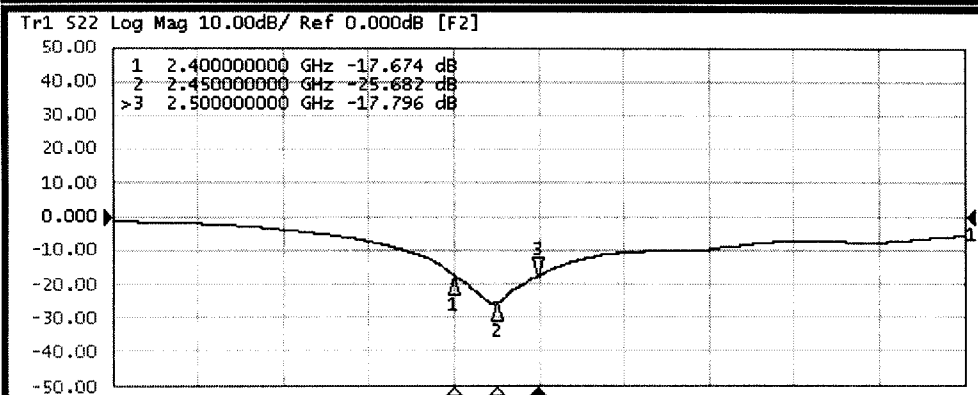
XX.	±3.0	APPROVED	吳忠達 24-05
X.	±2.0	CHECKED	吳忠達 24-05
.X	±1.0		
.XX	±0.5		
.XXX	±0.1		程淑娟 24-05

CUSTOMER: 研華股份有限公司		
PART NO :		
PARTNAME: RF Antenna Assembly		
W.Y P/NO : C449-510006-A		
REV	UNIT	FILE :
X1	m/m	SHEET : 1/1

Wha Yu
INDUSTRIAL CO.,LTD.

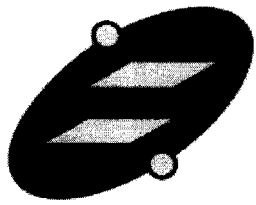
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1 Start 2 GHz IFBW 70 kHz Stop 3 GHz

- System
- Abort Printing
- Printer Setup
- Invert Image ON
- Dump Screen Image
- E5091A Setup
- Misc Setup
- Backlight ON
- Firmware Revision

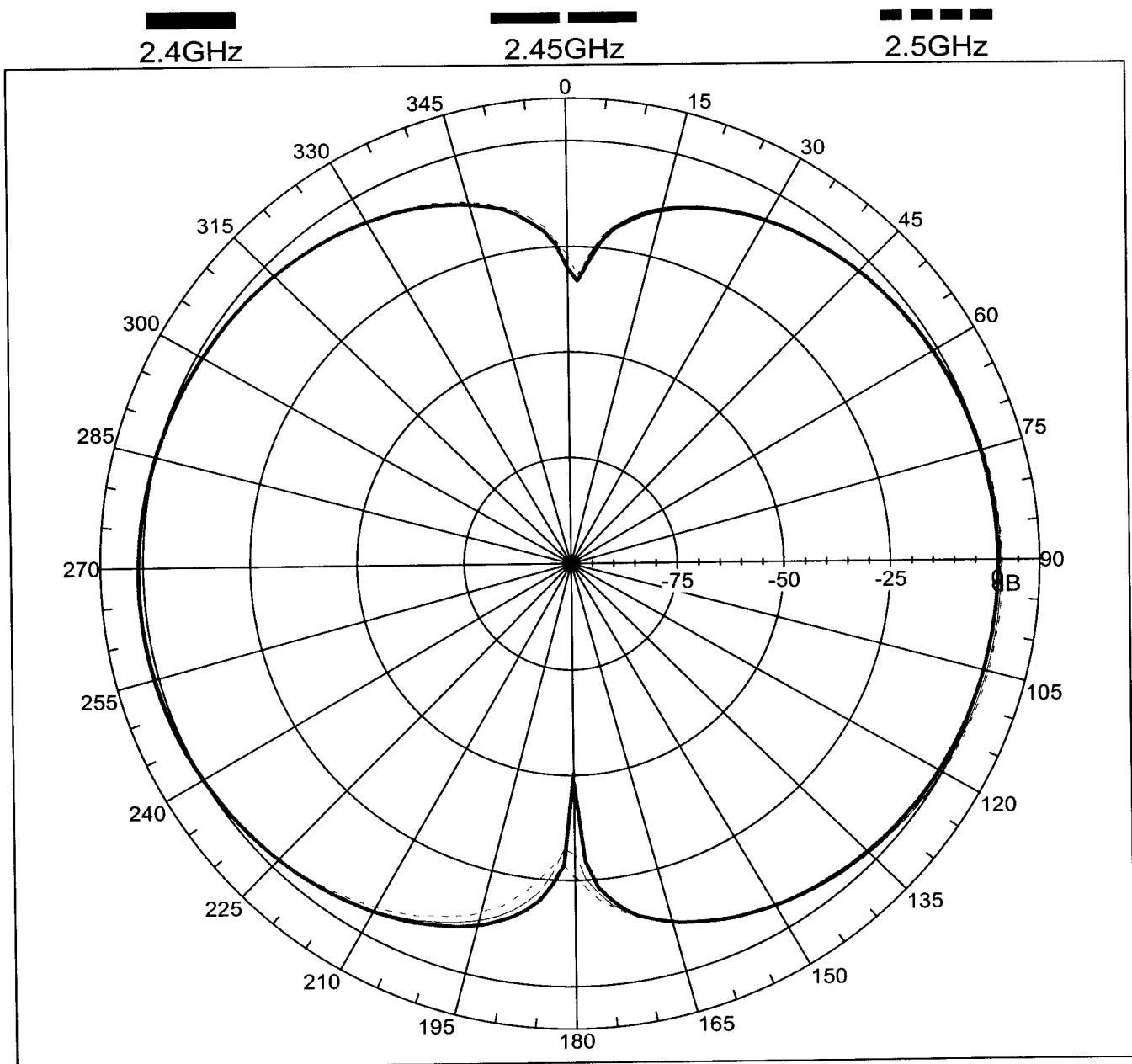


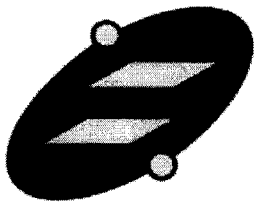
譚裕實業股份有限公司

WHA YU INDUSTRIAL CO., LTD

C449-510006-A

Far-field amplitude of 2.4GHz small dipole antenna-E-plane.nsi



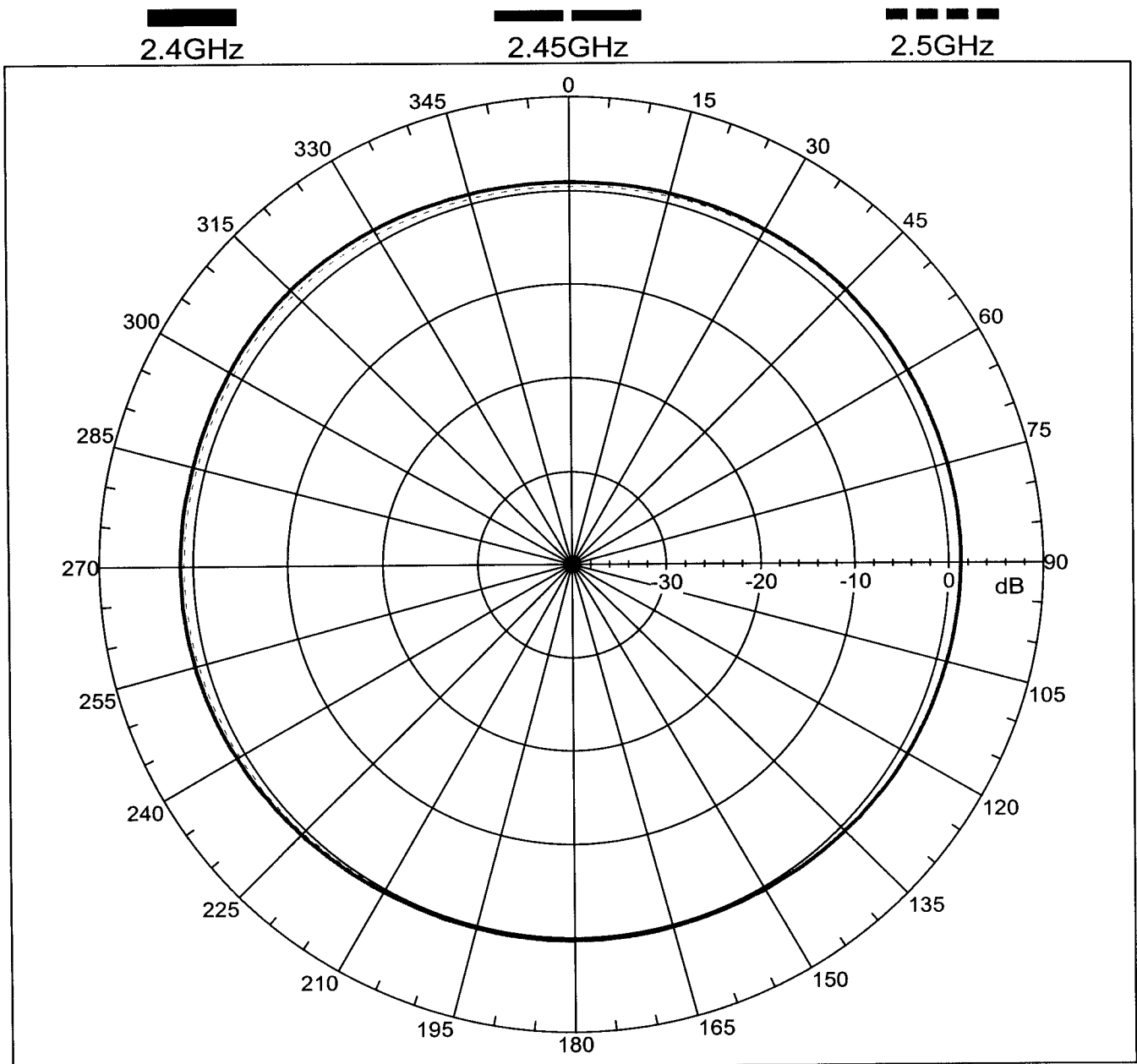


譚裕實業股份有限公司

WHA YU INDUSTRIAL CO., LTD

C449-510006-A

Far-field amplitude of 2.4GHz small dipole antenna-H-plane.nsi

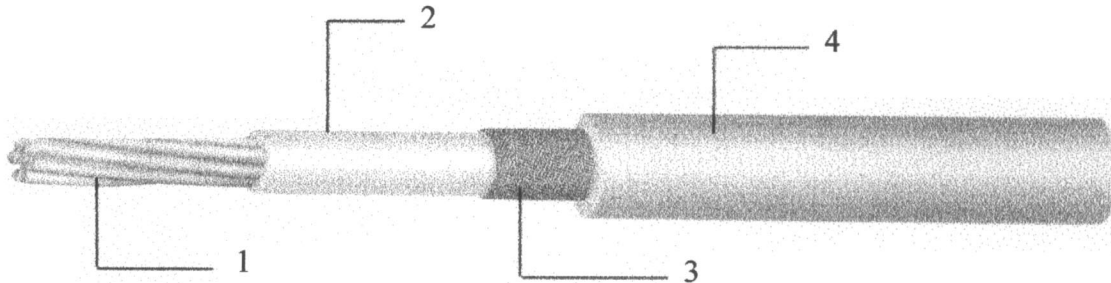


RG 178 B/U	FEP INSULATED HIGH-FREQUENCY COAXIAL CABLE	PAGE	1 / 2
PRODUCT STANDARD		ISSUED	21. Oct. 2003
		REVISED	

I - Scope

This specification presents a FEP insulated high-frequency coaxial cable AWG 30, 1.8 mm O.D. for internal wiring of electronic equipment, such as Computer / Notebook with wireless communication systems.

II - Construction



Item		Unit	Details
1. Inner Conductor	Material	—	CP-AG
	Composition	No./mm	AWG 30 or 7 × 0.1
	Dia. (approx.)	mm	0.305
2. Dielectric	Material	—	Extruded FEP
	Nom. O.D.	mm	0.84 ± 0.05
	Color	—	Natural
3. Outer Conductor	Material	—	Silver coated copper
	Composition	—	Braided (16 / 3 / 0.1)
	Dia. (approx)	mm	1.29 ± 0.07
4. Jacket	Material	—	Extruded FEP
	Dia.	mm	1.80 ± 0.08
	Color	—	Standard color is Light Orange

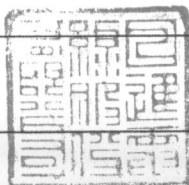
Note :		MADE BY	<i>Shen Bin</i>
		APPROVALS	<i>Shen Bin</i>

RG 178 B/U	FEP INSULATED HIGH-FREQUENCY COAXIAL CABLE	PAGE	2 / 2
PRODUCT STANDARD		ISSUED	21. Oct. 2003
		REVISED	

III – Characteristics

Item	Unit	Specified Value	Note
Temperature Rating	°C	-55 ~ +200	
Voltage Lasting	V	1000	
Dielectric strength	—	Dielectric core: No breakdown at AC 3 kv for 0.2 sec.	Spark test
		Jacket: No breakdown at AC 3 kv for 0.2 sec.	Spark test
Characteristic Impedance	Ω	50 ± 2	TDR method
Capacitance	pF / ft	29.4	
Attenuation. (Max.)	dB/100ft	16.0	100.0 MHz
		33.0	400.0 MHz
		52.0	1.0 GHz
		94.0	3.0 GHz
Approx. Weight	g / m	7.68	

Note :



MADE BY

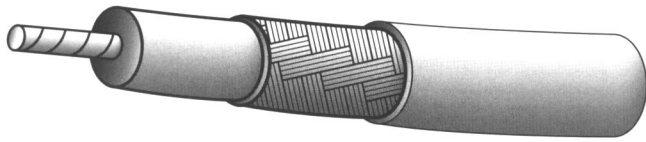
Chuebe Lin

APPROVALS

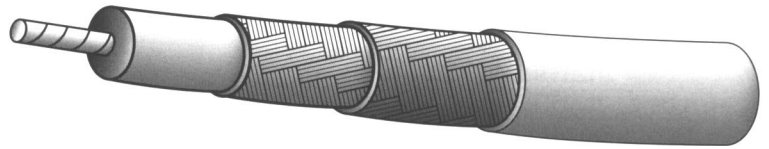
Shen Bin Chao

Mil-C-17 Coaxial Cable QPL Approved

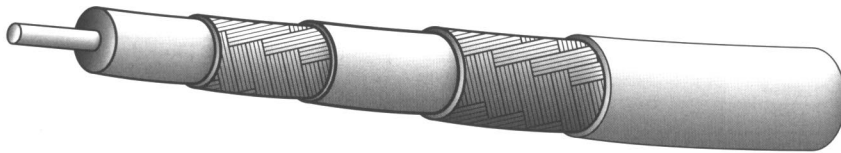
Single braid



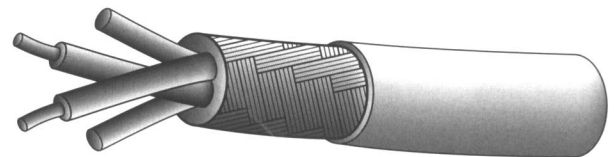
Double braid



Triax



Twinax



Harbour supplies a complete line of high temperature, high performance QPL approved MIL-C-17 coax cables for the military, commercial and industrial applications. The specific M17 constructions referenced are manufactured in accordance with the most recent revision of the MIL-C-17 specification. The MIL-C-17 specification defines complete physical and electrical characteristics for each M17 part number, including dimensional parameters, dielectric materials, shield construction, maximum attenuation, and VSWR levels.

VSWR Sweep Testing

When selecting a 50 ohm coaxial cable, constructions with VSWR requirements are recommended. Manufacturing and sweep testing cables with concern for VSWR ensures a quality cable free of spikes over the referenced frequency range. (Note the test frequencies specified in the electrical characteristics section.)

Precision PTFE Dielectrics

All of the high temperature, high performance coax cables listed have PTFE dielectrics with high dielectric strength and low capacitance in proportion to the dielectric constant. All PTFE dielectrics are manufactured with tolerances tighter than the MIL-C-17 specification to ensure uniformity of electrical characteristics, especially impedance, attenuation and VSWR.

Tape wrapped PTFE Constructions

Harbour also manufactures PTFE tape wrapped cables to a previous revision of the MIL-C-17 specification. These constructions can withstand operating temperatures up to 250° C. versus 200° C. for FEP jacketed cables. Also, PTFE tape wrapped cables are generally more flexible than their FEP jacketed counterparts.

UL Approvals

All of Harbour's M17 part numbers manufactured to the MIL-C-17 specification may be ordered with UL and FT4 approvals.

Mil-C-17 Coaxial Cables

Physical Characteristics:

M17 Number	Center Conductor	PTFE Dielectric Diameter	Shield	Jacket	Overall Diameter	Minimum Recommended Bend Radius	Operating Temp. (%C)	Weight (lbs./MFT)	Comments
M17/60-RG142	.037" SCCS	.116"	SPC(2)	FEP	.195"	1.0"	-55 +200	43.0	
M17/93-RG178	.0120"(7/.004")SCCS	.033"	SPC	FEP	.071"	0.4"	-55 +200	6.3	
M17/93-00001	.0120"(7/.004")SCCS	.033"	SPC	PFA	.071"	0.4"	-55 +230	6.3	M17/93-RG178 w/extended temp. range
M17/94-RG179	.0120"(7/.004")SCCS	.063"	SPC	FEP	.100"	0.4"	-55 +200	10.8	
M17/95-RG180	.0120"(7/.004")SCCS	.102"	SPC	FEP	.141"	0.7"	-55 +200	19.8	
M17/110-RG302	.0253"SCCS	.146"	SPC	FEP	.202"	1.0"	-55 +200	40.0	
M17/111-RG303	.037"SCCS	.116"	SPC	FEP	.170"	0.9"	-55 +200	31.0	
M17/112-RG304	.059" SCCS	.185"	SPC(2)	FEP	.280"	1.4"	-55 +200	94.0	
M17/113-RG316	.0201"(7/.0067")SCCS	.060"	SPC	FEP	.098"	0.5"	-55 +200	12.2	
M17/127-RG393	.094"(7/.0312")SC	.285"	SPC(2)	FEP	.390"	2.0"	-55 +200	165.0	
M17/128-RG400	.0384"(19/.008")SC	.116"	SPC(2)	FEP	.195"	1.0"	-55 +200	50.0	
M17/131-RG403	.0120"(7/.004")SCCS	.033"	SPC(2)	FEP(2)	.116"	0.6"	-55 +200	15.0	Triaxial M17/93-RG178
M17/152-00001	.0201"(7/.0067")SCCS	.060"	SPC(2)	FEP	.114"	0.6"	-55 +200	18.5	Double shielded M17/113-RG316
M17/158-00001	.037"SCCS	.116"	SPC(2)	FEP	.195"	1.0"	-55 +200	56.0	Unswep M17/60-RG142
M17/169-00001	.0120"(7/.004")SCCS	.033"	SPC	FEP	.071"	0.4"	-55 +200	6.3	Unswep M17/93-RG178
M17/170-00001	.037"(SCCS	.116"	SPC	FEP	.170"	0.9"	-55 +200	39.0	Unswep M17/111-RG303
M17/172-00001	.0201"(7/.0067")SCCS	.060"	SPC	FEP	.098"	0.5"	-55 +200	11.5	Unswep M17/113-RG316
M17/174-00001	.094"(7/.0312")SCCS	.285"	SPC(2)	FEP	.390"	2.0"	-55 +200	175.0	Unswep M17/127-RG393
M17/175-00001	.0384"(19/.008")SC	.116"	SPC(2)	FEP	.390"	1.0"	-55 +200	50.0	Unswep M17/128-RG400
M17/176-00002	.0235"(19/.005")SPA(2)	.042"	SPA	PFA	.129"	0.6"	-55 +230	18.0	Controlled impedance twinax
PTFE Tape Wrap Jacketed RG Cables									
RG 187 A/U	.0120"(7/.004)SCCS	.063	SPC	PTFE	.100"	0.5"	-55 +250	10.0	Flexible, 250° C. rated
RG 188 A/U	.0201"(7/.0067)SCCS	.060	SPC	PTFE	.100"	0.5"	-55 +250	11.0	Flexible, 250° C. rated
RG 195 A/U	.0120"(7/.004)SCCS	.102	SPC	PTFE	.141"	0.7"	-55 +250	18.0	Flexible, 250° C. rated
RG 196 A/U	.0120"(7/.004)SCCS	.034	SPC	PTFE	.067"	0.4"	-55 +250	6.0	Flexible, 250° C. rated

Electrical Characteristics:

M17 Number	Impedance (ohms)	Capacitance (pF/ft)	Max. Operating Voltage (RMS)	Maximum attenuation (dB/100ft) @						Max Frequency (GHz)
				100 MHz	400 MHz	1 GHz	3 GHz	5 GHz	10 GHz	
M17/60-RG142	50 +/- 2	29.4	1900	5.5	11.7	19.0	35.0	48.0	-	17.4
M17/93-RG178	50 +/- 2	29.4	1000	16.0	33.0	52.0	94.0	-	-	3.0
M17/93-00001	50 +/- 2	29.4	1000	16.0	33.0	52.0	94.0	-	-	3.0
M17/94-RG179	75 +/- 3	19.4	1200	-	21.0	-	-	-	-	-
M17/95-RG180	95 +/- 5	16.4	1500	-	17.0	-	-	-	-	-
M17/110-RG302	75 +/- 3	19.4	2300	-	8.0	-	26.0	-	-	-
M17/111-RG303	50 +/- 2	29.4	1900	3.9	8.0	15.0	28.0	-	-	-
M17/112-RG304	50 +/- 3	29.4	3000	2.7	6.4	11.1	22.0	30.0	-	8.0
M17/113-RG316	50 +/- 2	29.4	1200	11.0	21.0	38.0	58.0	-	-	3.0
M17/127-RG393	50 +/- 2	29.4	2500	2.4	5.0	8.8	18.0	24.6	37.0	11.0
M17/128-RG400	50 +/- 2	29.4	1900	4.5	10.5	17.0	38.0	50.0	78.0	12.4
M17/131-RG403	50 +/- 2	29.4	1000	-	37.0	-	-	-	-	10.0
M17/152-00001	50 +/- 2	29.4	1200	11.5	24.0	40.0	75.0	110.0	170.0	12.4
M17/158-00001	50 +/- 2	29.4	1900	-	9.5	-	-	-	-	-
M17/169-00001	50 +/- 2	29.4	1000	-	29.0	-	-	-	-	-
M17/170-00001	50 +/- 2	29.4	1900	-	8.6	-	-	-	-	-
M17/172-00001	50 +/- 2	29.4	1200	-	21.0	-	-	-	-	-
M17/174-00001	50 +/- 2	29.4	2500	-	5.0	-	-	-	-	-
M17/175-00001	50 +/- 2	29.4	1900	-	10.5	-	-	-	-	-
M17/176-00001	77 +/- 7	19.0	1000	-	-	-	-	-	-	-
PTFE Tape Wrap Jacketed RG Cables										
RG 187 A/U	75 +/- 3	19.4	1200	-	21.0	-	-	-	-	3
RG 188 A/U	50 +/- 2	29.4	1200	11.0	21.0	38.0	58.0	-	-	3
RG 195 A/U	95 +/- 5	15.4	1500	-	17.0	-	-	-	-	3
RG 196 A/U	50 +/- 2	29.4	1000	-	29.0	-	-	-	-	-

"Maximum frequencies" are those as referenced on individual slant sheets of the MIL-C-17 specification. No values are given for unswept constructions as the specification recommends these cables should not be used above 400 MHz. (All figures referenced above are nominal unless otherwise specified.)

Arnitel

polyether esters
polyetherester
esters de polyether

天線桿套材質特性表



Units Einheiten Unites	EM400	EM460	EL550	EL630	EL740	PL380
	1.12	1.16	1.20	1.23	1.27	1.18
°C	195	185	202	212	221	197
μm/m.k	220	160	180	140	110	150
°C	\	\	110	115	120	\
°C	130	150	180	200	200	145
°C	\	50	85	115	150	\
%	0.30	0.30	0.20	0.20	0.15	0.40
%	0.75	0.70	0.55	0.60	0.90	7.0
*	HB	HB	HB	HB	HB	HB
Mpa	55	110	220	375	900	60
Mpa	4.0	7.1	13.2	20.2	26.9	3.5
Mpa	5.4	9.0	15.7	23	22.6	5.2
Mpa	8.4	11.4	16.6	22.0	26.3	8.5
Mpa	17	21	32	40	45	16
%	700	800	600	600	360	450
kJ/m ²	NB	NB	NB	NB	NB	NB
kJ/m ²	NB	NB	NB	NB	200	NB
kJ/m ²	NB	NB	NB	NB	9	NB
kJ/m ²	NB	NB	20	4	4	NB
	38	45	55	63	74	38
MV/m	\	\	\	\	\	\
Ω.cm	5*10 ¹⁴	10 ¹⁴	10 ¹⁴	10 ¹⁴	10 ¹²	10 ¹²
Ω	>10 ¹³	>10 ¹⁴	>10 ¹⁴	>10 ¹⁴	>10 ¹⁰	>10 ¹³
\	4.1	\	\	3.8	\	4.7
\	4.0	4.4	4.0	3.4	3.3	4.4
x10 ¹⁴	10	\	\	3.8	\	310
x10 ¹⁴	170	350	400	350	300	350
\	800	800	600	600	600	800
\	600	600	600	800	800	600

Arnitel

2.2 Product coding

The structure of the Arnitel productcodes is illustrated with the following example:

U M 55 1 - V

Thermoplastic elastomer type:

- E = polyether ester; polyether = PTHF
- P = polyether ester; polyether = PEO/PPO
- U = polyester ester; (with extra urethane linkages)

Indication of viscosity range or processing technique

- L, M = injection moulding and extrusion
- B = blow moulding grade

Indication of hardness (Shore D)

Serial number

Indication of additives, performance

- H = heat-stabilized
- L = light/UV stabilized
- V = flame-retardant (not V-0)
- S = flame-retardant (V-0)

Figure 2.2: Arnitel product coding

2.3 Product portfolio

The Arnitel productrange is available with a hardness from 38 to 74 Shore D. The general Arnitel grades are shown in table 2.2. In order to enhance the flexibility of the portfolio a set of masterbatches (a.o. for heat, UV, etc) are on offer (refer to § 2.4).

Because of the development of these masterbatches heat stabilised Arnitel P is suggested for application areas where thermo-oxidative stability is an issue. For applications where colour and UV stability is required, the Arnitel E range is advised.

	Shore D					
	38	40	46	55	63	74
Arnitel E		EM400	EM460	EL550 EM550	EL630 EM630	EL740 EM740
Arnitel P	PL380		PL460	PL580 PM581		
Arnitel U				UM551 UM551-V UM552 UM552-V	UM622	

Table 2.2: Arnitel productrange for general purpose

Besides these multi-purpose grades, specialty grades can be offered for specific purposes and/or application areas. These grades are not intended for regular sales and are therefore restricted. Permission from marketing is needed before sampling is initiated.

	Arnitel E	Arnitel P	Arnitel U
Automotive			
• CVJ boots	EB460 EB463 EB464		
• Boyplugs		PL380-M0	
Extrusion			
• Roofing foil	EM402-L		

Table 2.3: Examples of specialty grades

Arnitel® EL630/EM630

2.8.31 General:

Arnitel is the brand name of a series polyester based thermoplastic elastomers. These polymers combine excellent processability with good elastomeric properties between -40 and 200°C. Arnitel EL630 and EM630 are excellent materials for injection moulding and extrusion applications respectively. The chemical structure of Arnitel EL630/EM630 is shown below.

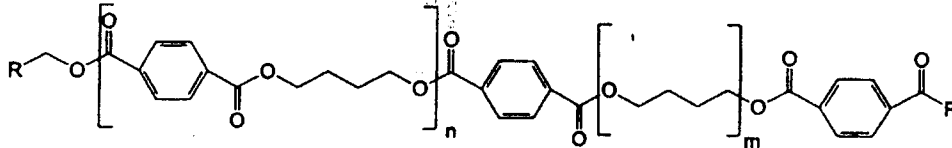


Figure 2.9: Chemical structure of Arnitel EL630/EM630.

Another way of writing the structure of Arnitels is shown below in Figure 2.



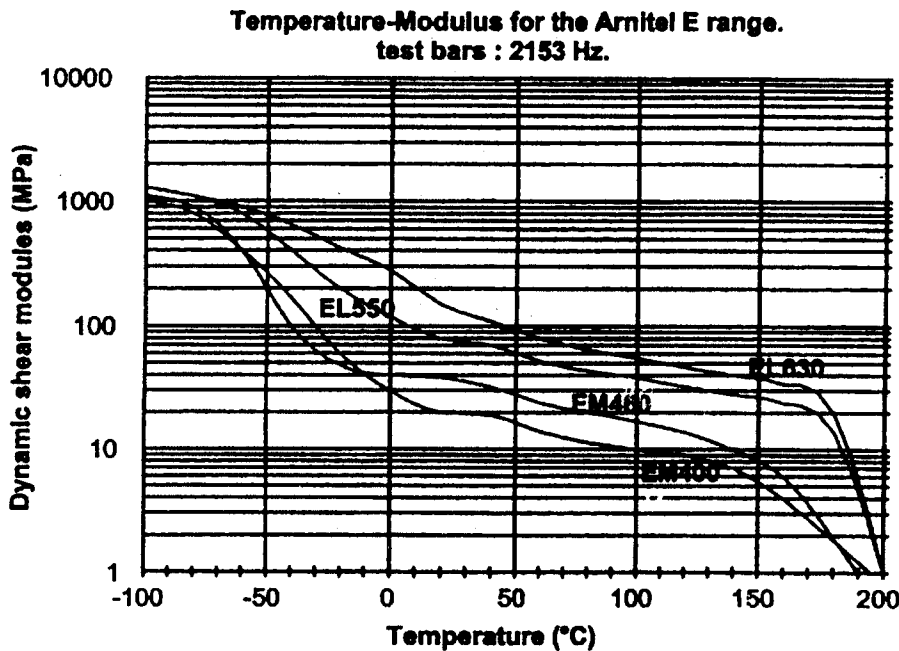
Figure 2.10: Simplified structure of Arnitel EL630/EM630.

Arnitel EL630/EM630 is TOSCA registered (including DSL-Canada) under CAS 37282-12-5

2.8.32 Thermal properties:

• **Modulus-temperature behaviour:**

The materials have a glass transition at circa -40°C and a typical melting point at 213°C. The modulus-temperature behaviour is shown in graph 2.76, for comparison, accompanied by other Arnitel E types.



Graph 2.76: Modulus-temperature behaviour of Arnitel EL630/EM630.

Arnitel® EL630/EM630

Although information on performance at higher temperatures may be extracted from the above shown graph, a Vicat or HDT are shown in table 2.29.

analysis	SI unit	typical data	test method
Vicat A	(°C)	200	ISO 308/A
Vicat B	(°C)	125	ISO 308/B
HDT-B	(°C)	115	ISO 75-1

Table 2.29: Vicat and HDT data on Arnitel® EL630 and EM630

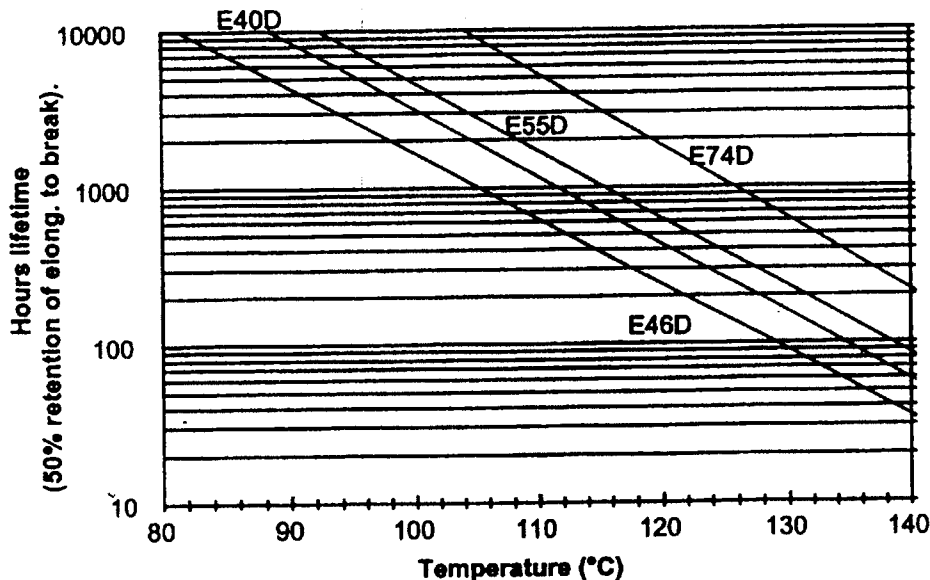
Arnitel EL630 and EM630 have a melting point of 213°C as found in the second heating curve of a DSC. The polymer will crystallize at 155°C using a 20°C/min cooling rate. The thermal expansion coefficient of Arnitel EL630/EM630 and is $140 \cdot 10^{-4} \mu\text{m/m.K}$.

• **Heat aging:**

Arnitel EL630/EM630 shows an optimum between heat resistance and colour stability. Heat aging for EL630/EM630 is under test at this moment, however the data will be between EL550 and EL740. Arrhenius curves of thermo-oxidative heat aging are shown in graph 2.77. Criterium chosen is retention of 50% original elongation at break.

Heat aging of Arnitel E40D, 46D, 55D and 74D.

Natural products, Arrhenius plot.



Graph 2.77: Heat stability for Arnitel E-range.

Heat ageing can be improved using a stabilisation masterbatch, however for heat stabilisation the P-range is preferred for its excellence in performance. These data can be found in the Arnitel properties summary or an Arnitel P datasheet.

2.8.33 Processing and Handling:

Arnitel EL630/EM630 is a polyester with a density of 1.12 g/cm^3 according to ISO 1183. Due to the polyester nature of these materials it is of major importance to store the material dry prior to processing. Materials packaged in sealed packaging should have a moisture content lower than 500 ppm. The polymer will contain 0.12% moisture in 50% RH and 0.58% water after saturation in water. Both numbers are in equilibrium.

If samples have become wet during storage a drying step of 24 hours at 120°C (or 6 hours at 140°C) prior to use will prevent degradation of the material during processing combined with an eventual loss of properties. The air or nitrogen will have to have a dew point of at least -30°C.

Amitel® EL630/EM630

• **Processing:**

Amitel EL630/EM630 shows a single melting point at 195°C in DSC. Processing conditions are shown in the table below.

polymer	zone 1	zone 2	zone 3	additional	melt	mold
EL630	225	230	235	235	225-235	20-50
EM630	225	230	235	235	235	50

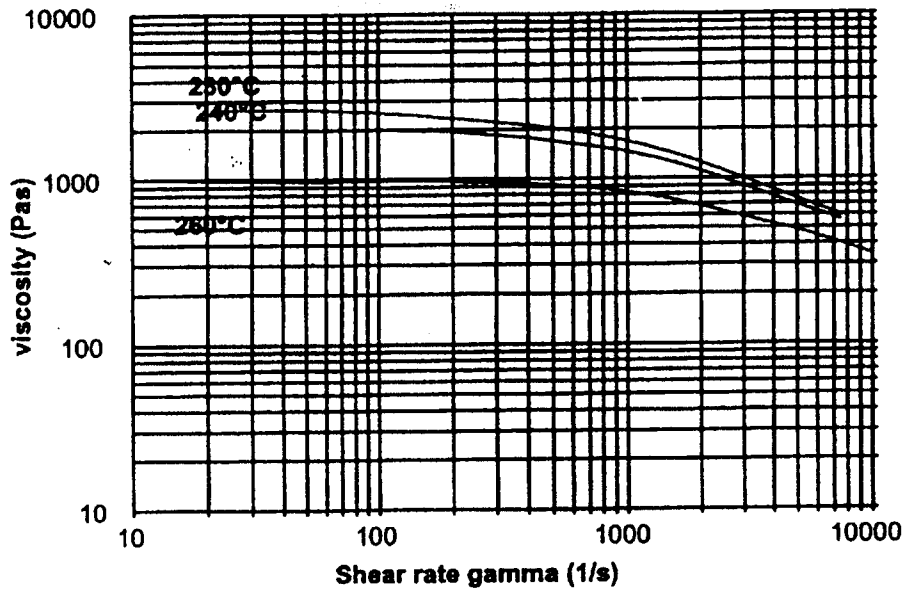
All temperatures are in °C.

Table 2.30: Processing conditions for Amitel EL630 and Amitel EM630.

• **Rheology:**

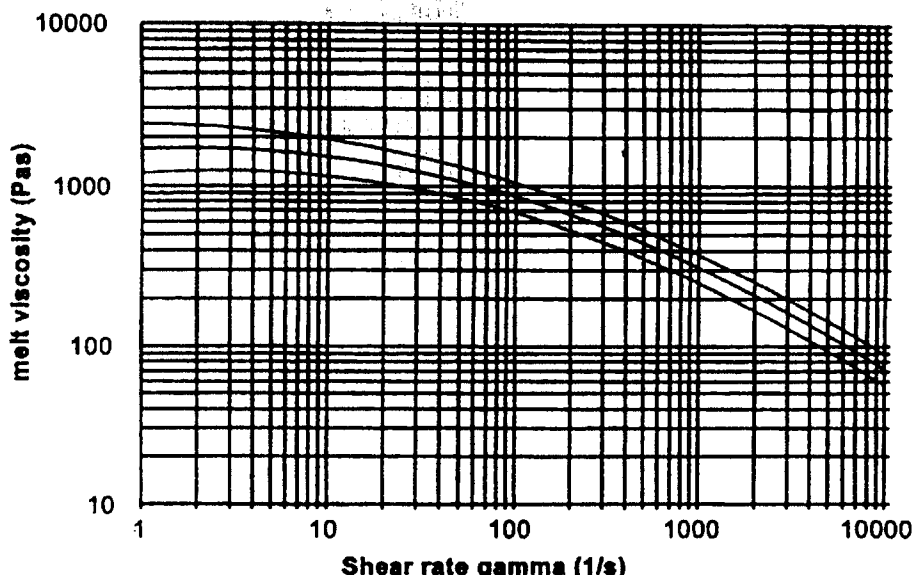
The temperature depending melt viscosity of Amitel EL630/EM630 and are shown below in graph 2.80 and 2.81 respectively.

**Shear rate dependent of the melt viscosity of Amitel EL630.
Effect of melt temperature.**



Amitel® EL630/EM630

Capillar melt viscosity of Amitel EM630.
240, 250 and 260°C.



Graph 2.80 and 2.81: Temperature dependency of the melt viscosity for Amitel EL630 and EM630 .

The MFI values are shown in table 2.31.

		EL630	EM630	
MFI 230°C	g/10 min		7	ISO 1133
MFI 240°C	g/10 min	30		ISO 1133

Table 2.31: MFI for Amitel EL630/EM630.

• Use of regrind:

Amitel can readily be recycled. If the MFI of the regrind is up or down to four points higher, 20% can be recycled. A difference of 2 MFI points allows up to 50% of regrind. Obviously the regrind should be dried properly before use.

2.8.34 Mechanical properties:

If Amitel EL630 or Amitel EM630 are processed properly the materials will have mechanical properties as shown in table 2.32.

Mechanical property	SI Unit	typical data*		test method
		EL630	EM630	
Hardness	Shore D	63	63	ISO 868
Tensile modulus (1 mm/min)	MPa	330	330	ISO 527
Tensile strength (50 mm/min)	MPa	30	30	ISO 527
Strain at break	%	350	350	ISO 527
Tensile stress at 5% strain	Mpa	11.5	11.5	
Tensile stress at 10% strain	Mpa	15.9	15.9	
Tensile stress at 50% strain	Mpa	17.3	17.3	
Tear strength Graves	KN/m	145	145	DIN53515
Izod notched 23°C (73°F)	KJ/m ²	NB	NB	ISO 180/1A
Izod notched -30°C (-22°F)	KJ/m ²	4	4	ISO 180/1A
Charpy notched 23°C (73°F)	KJ/m ²	NB	NB	ISO 179/1eA
Charpy notched -30°C (-22°F)	KJ/m ²	12	12	ISO 179/1eA

Data for dry natural materials.

NB: No Break

Table 2.32: mechanical properties of Amitel® EL630.

Amitel® EL630/EM630

• **Abrasion:**

Amitels show good abrasion resistance in both Taber and DIN 53516 abrasion tests. Data are shown in the Amitel general property overview (also included in the EPIC)

2.8.35 Flame retardancy:

Amitel EL630 and EM630 show in an ISO1210/A flammability test a burning rate leading to a classification FH-1. Flame retardancy can be improved using a halogenated or halogen free FR masterbatch.

2.8.36 Electrical properties:

Amitel EL630/EM630 can be used for cable jacketing applications. If the material is in permanent contact with copper a copper stabilisation package should be added. If the copper wires are coated with a tin layer, no stabilisation is necessary. The electrical properties are shown in table 33.

Electrical property	SI Unit	typical data*		test method
		EL630	EM630	
Dielectric strength	KV/mm	22	22	IEC 243-1
Relative permittivity (ϵ_r) at 1 kHz	-	4.4	4.4	IEC 250
Dissipation factor ($\tan \delta$) at 1kHz	-	0.019	0.019	IEC 250
Comparative tracking index	-	600	600	IEC 112
Volume resistivity	$10^{14} \Omega \cdot \text{cm}$	1	1	IEC 93
Surface resistivity	$10^{14} \Omega$	1	1	IEC 93

Table 2.33: Typical electrical properties of Amitel® EL630 and EM630.

2.8.37 Chemical resistance:

Amitel EL630 and EM630 are sensitive to strong bases and strong acids, especially at elevated temperatures. In some halogenated hydrocarbons (like tetrachloroethane), the materials (partially) dissolve. For a full review on chemical resistance of Amitel EL630 and EM630 request the chemical resistance brochure.

• **Hydrolysis**

Like all polyesters Amitel are sensitive to moisture, however Amitels are more stable to water than e.g. PET and PBT. graph 2.84 shows the hydrolytic stability of Amitel EL630 at 100°C and in steam (120°C). For improved hydrolysis stability, using a polycarbodiimid containing masterbatch like Stabaxol® in an option. To maintain all other properties use a masterbatch based on polyester. Data on the Stabaxol stabilised grade are shown in graph 2.85.

■ Panlite L-1250Z

Category	Unit	Test Method	Condition	L-1250Z 100
Melt volume flow rate	cm ³ /10min	ISO 1133	300°C load 1.2kg	8
Density	kg/m ³	ISO 1183	—	1200
Water absorption rate	%	ISO 62	in water 23°C24h	0.2
Light transmission	%	ASTM D 1003	thickness 3mm	88
Refractive index	—	ASTM D 542	—	1.585
Tensile modulus	MPa	ISO 527-1 and ISO 527-2	1mm/min	2400
Tensile stress at yield	MPa		50mm/min	61
Tensile strain at yield	%		50mm/min	6
Nominal tensile strain at break	%		50mm/min	>50
Flexural modulus	MPa	ISO 178	2mm/min	2350
Flexural strength	MPa		2mm/min	93
Charpy impact strength	KJ/m ²	ISO 179	unnotched	NB
			notched	76
Heat deflection temperature	°C	ISO 75-1 and ISO 75-2	1.80MPa	129
			0.45MPa	142
Vicat softening temperature	°C	ISO 306	50°C/h 50N	149
Mold shrinkage	%	In-house method	parallel	0.5~0.7
			vertical	0.5~0.7
Coefficient of linear expansion	× 10 ⁻⁴ /°C	ISO 11359-2	parallel	0.7
			vertical	0.7
Specific inductive capacity	—	IEC 60250	100Hz	3.1
	—		1MHz	3
Dielectric loss tangent	× 10 ⁻⁴	IEC 60250	100Hz	10
	× 10 ⁻⁴		1MHz	90
Volume resistivity	Ω·m	IEC 60093	—	>1 × 10 ¹³
Surface resistivity	Ω	IEC 60093	—	>1 × 10 ¹⁵
Withstand voltage	MV/m	IEC 60243-1	short time test	30
Tracking resistance	—	IEC 60112	—	250
Flammability	—	UL 94	—	V-2(0.40mm) HB(1.5mm)
Temperature index	°C	UL 746B	electric 1.47mmt	125
			impact 1.47mmt	115
			non-impact 1.47mmt	125

※The values listed are specification values, not certified values.

VALOX® 310SE0

Americas: COMMERCIAL

Unreinforced. UL94V-0/5VA rated. For electrical industry; bobbins, keyboard switches and switch components, and appliance housings.

Property

TYPICAL PROPERTIES ⁽¹⁾			
MECHANICAL	Value	Unit	Method
Tensile Stress, yld, Type I, 50 mm/min	59	MPa	ASTM D 638
Tensile Stress, brk, Type I, 50 mm/min	59	MPa	ASTM D 638
Tensile Strain, brk, Type I, 50 mm/min	80	%	ASTM D 638
Flexural Stress, yld, 1.3 mm/min, 50 mm span	101	MPa	ASTM D 790
Flexural Stress, brk, 1.3 mm/min, 50 mm span	101	MPa	ASTM D 790
Flexural Modulus, 1.3 mm/min, 50 mm span	2620	MPa	ASTM D 790
Hardness, Rockwell R	120	-	ASTM D 785
IMPACT	Value	Unit	Method
Izod Impact, unnotched, 23 °C	1602	J/m	ASTM D 4812
Izod Impact, notched, 23 °C	37	J/m	ASTM D 256
Gardner, 23 °C	34	J	ASTM D 3029
Modified Gardner, 23 °C	34	J	ASTM D 3029
THERMAL	Value	Unit	Method
HDT, 0.45 MPa, 6.4 mm, unannealed	163	°C	ASTM D 648
HDT, 1.82 MPa, 6.4 mm, unannealed	71	°C	ASTM D 648
CTE, -40 °C to 40 °C, flow	7.92E-05	1/°C	ASTM E 831
CTE, 60 °C to 138 °C, flow	1.31E-04	1/°C	ASTM E 831
Relative Temp Index, Elec	120	°C	UL 746B
Relative Temp Index, Mech w/impact	120	°C	UL 746B
Relative Temp Index, Mech w/o impact	140	°C	UL 746B
PHYSICAL	Value	Unit	Method
Specific Gravity	1.39	-	ASTM D 792
Specific Volume	0.72	cm ³ /g	ASTM D 792
Water Absorption, 24 hours	0.08	%	ASTM D 570
Mold Shrinkage, flow, 0.75-2.3 mm	0.9 - 1.6	%	GE Method
Mold Shrinkage, flow, 2.3-4.6 mm	1.5 - 2.3	%	GE Method
Mold Shrinkage, xflow, 0.75-2.3 mm	1 - 1.7	%	GE Method
Mold Shrinkage, xflow, 2.3-4.6 mm	1.6 - 2.4	%	GE Method
ELECTRICAL	Value	Unit	Method
Volume Resistivity	>1.6E+16	Ohm-cm	ASTM D 257
Dielectric Strength, in air, 3.2 mm	18.4	kV/mm	ASTM D 149

Dielectric Strength, in oil, 1.6 mm	22	kV/mm	ASTM D 149
Relative Permittivity, 100 Hz	3.1	-	ASTM D 150
Relative Permittivity, 1 MHz	3.1	-	ASTM D 150
Dissipation Factor, 100 Hz	0.002	-	ASTM D 150
Dissipation Factor, 1 MHz	0.02	-	ASTM D 150
Arc Resistance, Tungsten {PLC}	6	PLC Code	ASTM D 495
Hot Wire Ignition {PLC}	2	PLC Code	UL 746A
High Voltage Arc Track Rate {PLC}	4	PLC Code	UL 746A
High Ampere Arc Ign, surface {PLC}	0	PLC Code	UL 746A
Comparative Tracking Index (UL) {PLC}	3	PLC Code	UL 746A
FLAME CHARACTERISTICS	Value	Unit	Method
UL Recognized, 94V-0 Flame Class Rating (3)	0.7	mm	UL 94
UL Recognized, 94-5VA Rating (3)	3	mm	UL 94
CSA (See File for complete listing)	LS88480	File No.	CSA LISTED

Source GMD, last updated:04/14/2003

Processing

Parameter		
	Value	Unit
Injection Molding		
Drying Temperature	120	°C
Drying Time	3 - 4	hrs
Drying Time (Cumulative)	12	hrs
Maximum Moisture Content	0.02	%
Melt Temperature	245 - 260	°C
Nozzle Temperature	240 - 255	°C
Front - Zone 3 Temperature	245 - 260	°C
Middle - Zone 2 Temperature	240 - 255	°C
Rear - Zone 1 Temperature	230 - 250	°C
Mold Temperature	50 - 75	°C
Back Pressure	0.3 - 0.7	MPa
Screw Speed	50 - 100	rpm
Shot to Cylinder Size	40 - 80	%
Vent Depth	0.013 - 0.025	mm

Source GMD, last updated:04/14/2003

THESE PROPERTY VALUES ARE NOT INTENDED FOR SPECIFICATION PURPOSES.

PLEASE CHECK WITH YOUR [\(LOCAL SALES OFFICE\)](#) FOR AVAILABILITY IN YOUR REGION

(1) Typical values only. Variations within normal tolerances are possible for various colors. All values are measured after at least 48 hours storage at 23 °C/50% relative humidity. All properties, except the melt volume and melt flow rates, are measured on injection molded samples. All samples tested under ISO test standards are prepared according to ISO 294.

(2) Only typical data for selection purposes. Not to be used for part or tool design.

(3) This rating is not intended to reflect hazards presented by this or any other material under actual fire conditions.

(4) Internal measurements according to UL standards.

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Style Page 1354

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E76475

1365 BLVD INDUSTRIEL

FARNHAM

QC J2N 2X3, CANADA

Table of Recognized Styles

Single-conductor, thermoplastic insulation.

1164	1419	1655	1738	1900	10058	10126	10366
1180	1512	1656	1739	1901	10064	10129	10367
1198	1517	1657	1745	1911	10068	10143	10371
1199	1530	1658	1766	1929	10072	10144	10410
1212	1538	1659	1815	1930	10073	10156	10412
1213	1570	1668	1824	1971	10077	10185	10475
1226	1584	1669	1835	1979	10086	10202	10486
1227	1586	1671	1848	10007	10088	10293	10487
1330	1609	1698	1849	10009	10102	10297	10488
1331	1610	1709	1857	10011	10109	10300	10595
1332	1636	1710	1858	10020	10110	10323	10596
1333	1643	1716	1859	10030	10111	10362	10605
1354	1644	1723	1885	10032	10114	10363	10606
1371	1653	1726	1886	10048	10115	10364	
1394	1654	1727	1887	10050	10125	10365	

Multiple-conductor, thermoplastic insulation.							
2095	2383	2493	2610	2785	2919	2983	20370
2096	2384	2501	2614	2786	2920	2990	20371
2097	2385	2502	2653	2803	2921	2991	20604
2098	2386	2516	2654	2833	2930	2992	20710
2099	2387	2517	2655	2835	2931	2993	20711
2100	2388	2532	2656	2876	2933	2994	20712
2101	2448	2535	2660	2885	2934	20229	20713
2102	2461	2551	2661	2894	2935	20230	20887
2103	2462	2570	2662	2895	2936	20231	20920
2343	2463	2571	2747	2897	2937	20232	21081
2344	2464	2574	2748	2905	2938	20308	21091
2345	2477	2576	2749	2906	2961	20368	21092
2346	2490	2589	2750	2912	2969	20369	
Single-conductor, thermoset insulation.							
3066	3098	3134	3177	3230	3268	3333	3513
3067	3099	3135	3178	3231	3270	3350	3514
3068	3100	3136	3179	3232	3274	3353	3529
3069	3101	3137	3207	3239	3278	3354	3530
3070	3113	3138	3208	3240	3301	3355	3540
3071	3114	3139	3209	3241	3303	3361	3541
3074	3115	3140	3210	3243	3304	3367	3546
3075	3122	3141	3211	3251	3305	3407	3548
3076	3123	3142	3212	3252	3306	3408	3561
3077	3125	3143	3213	3253	3307	3410	3576
3078	3126	3144	3214	3254	3316	3420	3577
3079	3127	3145	3215	3256	3318	3434	3579
3080	3128	3146	3216	3257	3322	3479	3580
3081	3129	3147	3217	3260	3323	3487	3590
3082	3130	3171	3218	3261	3324	3507	3603
3083	3132	3172	3219	3262	3326	3508	3645
3084	3133	3176	3220	3267	3332	3512	

Multiple-conductor, thermoset insulation.							
4255	4367	4389	4403	4421	4452		
Single and multiple-conductor specialty items.							
5033	5105	5144	5192	5229	5256	5318	5350
5035	5107	5158	5196	5230	5257	5324	5359
5045	5108	5167	5214	5231	5259	5328	5360
5046	5121	5168	5215	5233	5281	5329	
5047	5125	5175	5222	5247	5283	5331	
5083	5127	5180	5224	5251	5288	5334	
5093	5128	5181	5225	5253	5315	5335	
5096	5134	5191	5226	5254	5316	5344	

Marking: Company name, voltage rating, temperature rating, conductor size, conductor material if other than copper, and use.

LOOK FOR THE RECOGNITION MARK See General Information Preceding These Recognitions

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Style 1354 Coaxial Cable.

Rating 60°C or 80°C, 30 V.

Conductors No. 44 AWG min, material not specified.

Insulation 2 mils minimum at any point, 125 mils maximum. The insulation may be:

Extruded solid or cellular PE, FRPE, Polypropylene, PFA, FEP, ECTFE, PTFE, ETFE, or combination thereof with or without irradiation; or tape wrapped solid or cellular PTFE, PFA, or FEP. Applied as a spiral wrapped thread (5 mils minimum, 40 mils maximum) and enclosed in a tube of insulation.

Covering Optional. Extruded PVC, PFA, Polyamide, Polyester, PVDF, FEP, PTFE, ECTFE, ETFE, PE, XLPE, XLFRPE or FRPE; lacquered braids; heat sealed PTFE, PFA or FEP tape; Polyester or Polyester-Polyethylene film. Thicknesses not specified.

Shield Optional. (Required if outer shield not provided.)

Covering Optional. Extruded PVC, PFA, PP, Polyamide, Polyester, PVDF, FEP, PTFE, ECTFE, ETFE, PE, XLPE, XLFRPE or FRPE; lacquered braids; heat sealed PTFE, PFA or FEP tape; Polyester or Polyester-Polyethylene film. Thicknesses not specified.

Outer Shield Optional. (Required if inner shield not provided.)

Outer Covering Optional. (Required if outer shield is provided.) Extruded Irradiated PE Irradiated PVC Polyurethane PVC, PFA, PP, Polyamide, Polyester, PVDF, FEP, PTFE, ECTFE, ETFE, PE, XLPE, XLFRPE or FRPE; lacquered braids; heat sealed PTFE, PVC, PFA or FEP tape; Polyester or Polyester-Polyethylene film. Thicknesses not specified.

(Continued on Page 1354A)

UNDERWRITERS LABORATORIES INC.
Subj. 758

Section 1

*Page 1354A

APPLIANCE WIRIING MATERIAL
Issued: 1964-02-19
Revised: 2003-03-31

Standard Appliance Wiring Material UL 758.

Instructions Detailed Examination.
to UL
Representative

UL (4) Detailed Examination.
Counter-Check (12) Horizontal Flame Test.
Program

Marking General.

Use Internal wiring of Class 2 circuits of electronic equipment
or as insulated single in jacketed multiconductor cables.



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TEIJIN CHEMICALS LTD
 HIBIYA DAIBIRU BLDG
 2-2 UCHISAIWAI-CHO 1-CHOME
 CHIYODA-KU
 TOKYO 100-0011, JAPAN

E50075

				H	D						
		Min.			H	H	R T I		V	4	C
Material Dsg	Color	Thk	Flame	W	A	Elec	Mech		T	9	T
		mm	Class	I	I		Imp	Str	R	5	I
Acrylic/Polycarbonate (A/PC), "Metamarble", furnished as pellets.											
PW-1000N	ALL	1.5	V-1	2	0	50	50	50	4	7	0
		3.0	V-0	2	0	50	50	50			
		6.0	V-0	1	1	50	50	50			
Acrylonitrile Butadiene Styrene/Polycarbonate (ABS/PC), carbon fiber and glass reinforced, "Panlite", furnished as pellets.											
BN-32(cc)N#	BK	0.75	V-0	-	-	60	60	60			
BN-35(cc)N#	BK	0.75	V-0	-	-	60	60	60			
Acrylonitrile Butadiene Styrene/Polycarbonate (ABS/PC), carbon fiber reinforced, "Panlite", furnished as pellets.											
BN-31(k)N#	ALL	0.75	V-0	-	-	60	60	60			
Polybutylene Napthalate (PBN), furnished as pellets.											
C10(zz)(++)	ALL	0.75	HB	4	3	50	50	50	2	5	3
		1.5	HB	3	3	50	50	50			
		3.0	HB	3	3	50	50	50			

		3.0	HB	2	1	125	115	125			
		6.0	HB	1	1	125	115	125			
L-1225LL	ALL	0.40	V-2	4	3	80	80	80	2	5	2
		0.75	V-2	3	1	80	80	80			
		1.5	V-2	3	1	125	115	125			
		3.0	V-2	2	1	125	115	125			
		3.3	HB	2	1	125	115	125			
		6.0	HB	1	1	125	115	125			
L-1225LM, L-1225ZL											
	ALL	0.40	V-2	4	3	80	80	80	2	5	2
		0.75	V-2	3	1	80	80	80			
		1.5	V-2	3	1	125	115	125			
		2.1	HB	3	1	125	115	125			
		3.0	HB	2	1	125	115	125			
		6.0	HB	1	1	125	115	125			
L-1250#(f2), L-1250U#, L-1250V#, L-1250Z#(f1)											
	ALL	0.40	V-2	4	3	80	80	80	4	5	2
		0.84	V-2	4	3	80	80	80			
		1.5	HB	4	0	125	115	125			
		3.0	HB	1	0	125	115	125			
		6.0	HB	1	0	125	115	125			
LD-1000#	WT	0.44	V-2	4	0	80	80	80	2	6	2
		0.75	V-2	4	0	80	80	80			
		1.4	V-2	3	1	125	115	125			
		3.0	V-2	2	1	125	115	125			
		6.0	V-2	1	1	125	115	125			
LD-1000R#	WT	0.44	V-2	4	0	80	80	80	2	6	0
		0.75	V-2	4	0	80	80	80			
		1.4	V-2	3	1	125	115	125			
		3.0	V-2	2	1	125	115	125			
		6.0	V-2	1	1	125	115	125			
LE-1250#, LE-1250M#											

ML-1100#	NC	0.38	V-2	-	-	80	80	80
Polycarbonate (PC), furnished as pellets.								
LN-2525#	ALL	1.0	V-0	-	-	80	80	80
		2.0	V-0, 5VB	-	-	80	80	80
		3.0	V-0, 5VA	-	-	80	80	80
Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS), "Panlite", furnished as pellets.								
B-31(ww)R(#)								
	BK	0.75	HB	-	-	60	60	60
Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS), "PANLITE", furnished as pellets.								
BN-38(cc)N#	BK	0.75	V-0	-	-	60	60	60
Polyethylene (PE), furnished as pellets.								
B40(ee)(++)	ALL	1.5	HB	-	-	50	50	50
B4010(++)	ALL	1.5	HB	-	-	50	50	50
B4040(++)	ALL	1.5	HB	-	-	50	50	50
Q41(ff)(++)	ALL	1.5	HB	-	-	50	50	50
Q4110(++)	ALL	1.5	HB	-	-	50	50	50
Q4190(++)	ALL	1.5	HB	-	-	50	50	50
QN41(ff)(++)								
	ALL	1.5	V-0	-	-	50	50	50
QN4110(++)	ALL	1.5	V-0	-	-	50	50	50
QN4190(++)	ALL	1.5	V-0	-	-	50	50	50

- Material designation may be suffixed with any one or two letters.

% - 01 through 09 incl.

& - 01 through 30 ic., denotes degree of glass fill.

(++) - May be suffixed with one, two, three, or four letters, in case of 46 Nylon, with the exception of S.

(a) - 1 through 6 incl.

(aa) - 11-49, denotes degree of glass fill.

(b) - 0 through 9 except 8

(c) - 0 through 9 except 8

(cc) - 10 through 30 incl.

(d) - 1 through 9 inclusive.

(dd) - A two digit number 15 through 20 incl., denoting content of carbon.

(ee) - Two digits 11 thro 39 incl.

(f1) - Suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and Immersion in accordance with UL 746C.

(f2) - Subjected to one or more of the following tests: Ultraviolet Light, Water Exposure or Immersion in accordance with UL 746C, where the acceptability for outdoor use is to be determined by UL Inc.

(ff) - Two digits 11-89

(g) - Suitable for electroplating.

(i) - A two digit number (10-15) denoting the content of carbon fiber that may be suffixed to the grade.

(j) - A two digit number (10-40) denoting the total content of carbon fiber and glass fiber.

(jj) - 15 through 25 inclusive

(k) - 05 through 30 incl.

(kk) - 10 through 14 incl.

(mm) - 15 through 30 incl.

(nn) - 31 through 49 incl.

(pp) - 11 through 30 incl.

(qq) - 31 through 50 incl.

(uu) - 01 through 20 incl.

(ww) - A two digit number 10 through 20 denoting content of carbon filler.

(zz) - Two digits 01-29

* - All colors except clear.

+ - 11 through 29 incl.

gg - Material designation may be suffixed with any one or two letters except N.

Marking: Company name or tradename "METAMARBLE" , "MULTILON" , "PANLITE" and material designation on container, wrapper or finished part.

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DSM ENGINEERING PLASTICS B V

E47960

POSTBUS 43

6130 AA SITTARD, THE NETHERLANDS

									H	D	
			Min.	H	H	R T I			V	4	C
Material Dsg	Color	Thk	Flame	W	A	Elec	Mech	T	9	T	
		mm	Class	I	I		Imp	Str	R	5	I
Acrylonitrile Butadiene Styrene/Polycarbonate (ABS/PC), "Stapron C", furnished as pellets.											
CF 102	ALL	1.5	V-0	2	0	60	60	60	4	7	1
		2.1	V-0, 5VB	2	0	60	60	60			
		3.0	V-0	1	0	60	60	60			
CF 202	ALL	011.5	V-0	3	0	60	60	60	0	7	0
		2.1	V-0, 5VB	3	0	60	60	60			
		3.0	V-0	2	0	60	60	60			
CF 203	ALL	1.5	V-0	-	-	60	60	60			
		3.0	V-0	-	-	60	60	60			
CM 204	ALL	1.5	HB	4	0	60	60	60	2	6	1
		3.0	HB	3	0	60	60	60			
CM 205	ALL	1.5	HB	4	0	60	60	60	2	6	1
		3.0	HB	3	0	60	60	60			
CM 205 U	ALL	1.5	HB	4	0	60	60	60	2	6	1

		3.0	HB	3	0	75	75	75	
Thermoplastic Elastomer (TPE), polyester, "Arnitel", furnished as pellets.									
EL550, EM550									
	NC, BK	1.5	HB	-	-	50	50	50	
Thermoplastic Elastomer (TPE), Polyester, "Arnitel", furnished as pellets.									
EL630, EM630									
	NC, BK	1.5	HB	-	-	-	-	-	
Thermoplastic Elastomer (TPE), polyester -ester, flame retarded, "Arnitel", furnished as pellets.									
UM551-V	NC	1.5	V-2	-	-	50	50	50	
Thermoplastic Elastomer (TPE), polyether-ester elastomer, "Arnitel", furnished as pellets.									
EL740, EM740									
	NC, BK	1.5	HB	-	-	50	50	50	
EM460	NC, BK	1.5	HB	-	-	50	50	50	
PL650	NC, BK	1.5	HB	-	-	50	50	50	

(a) - Represents 16-29% range.

(a1) - Density range 0.92 - 1.27g/cc.

(b) - Represents 31-49% range.

(b1) - Density range 1.0 - 1.35g/cc.

(d1) - Density range 1.07 - 1.27g/cc.

(f1) - Suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and Immersion in accordance with UL 746C.

(g) - Denotes a single digit 4-8 incl.

(g1) - Represents a number 2-10 inclusive, denoting glass content range 10 - 50%.

(h) - Virgin and regrind up to 50% by weight inclusive, have the same basic material characteristics.

(h1) - Virgin and regrind, up to 50% by weight inclusive, in thicknesses of 0.75mm and greater, have the same basic material characteristics, except for CTI.

(h2) - Virgin and regrind up to 50% by weight inclusive, have the same basic material characteristics, except for HWI

(h3) - Virgin and regrind up to 50% by weight inclusive, have the same basic material characteristics in the 0.75 mm thickness and greater, and with respect to Flammability in the 0.4 mm thickness and greater.

(h4) - Virgin and regrind, from 0 to 50% by weight inclusive, have the same basic material characteristics, except for RTI

(h5) - Virgin and regrind, from 0 to 100% by weight inclusive, have the same basic material characteristics, with respect to Flammability.

(h6) - Virgin and regrind up to 50% by weight have the same flammability characteristics (>0.4 mm only) and the same basic material characteristics (>0.75 mm only) except with respect to 5VA/5VB.

(i) - Virgin and regrind up to 50% by weight inclusive, have the same basic material characteristics with respect to flammability (GY, 0.75-3.0 mm only)

(j) - Virgin and regrind, up to 100% by weight inclusive, have the same basic material characteristics with respect to Flammability in hte 0.75mm thickness and greater.

(j1) - Virgin and regrind, up to 100% by weight inclusive, have the same basic material characteristics with respect to flammability.

(r1) - Virgin and regrind, up to 50% by weight, have the same basic material characteristics in unpigmented (NC) and black (BK) only.

(x) - Represents one or two letters to specify the additive package, xx can be B, R, U, UR, SR, FD

(y) - One or two letters B, R, U, UR specifying additive package.

Marking: Company name or tradename "APSCOM" , "Akulon" , "Akulon Ultraflow" , "Arnite" , "Arnitel" and material designation on container, wrapper or finished part.

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