

Measurement of MPE

1. Foreword

In adopt with the Human Exposure IEEE C95.1, and according to the FCC 1.1310. The *Maximum Permissible Exposure (MPE)* is obligated to measure in order to prove the safety of radiation harmfulness to the human body.

The *Gain* of the antenna used is measured in an *Anechoic chamber*. The *maximum total power to the antenna* is to be recorded. By adopting the ***Friis Transmission Formula*** and the *power gain of the antenna*, we can find the distance right away from the product, where the limit of the MPE is.

2. Description of EUT

Granted FCC ID	: NHPWLB2000
Product name	: 802.11b Wireless LAN Access Point
Model name	: as Appendix A of Test Report
Classification	: Mobile Device (i) Under normal use condition, the antenna is at least 20cm away from the user; (ii) Warning statement for keeping 20cm separation distance and the prohibition of operating next to the person has been printed in the user's manual
Frequency Range	: 2.412 GHz ~ 2.462GHz
Supported Channel	: 11 Channel
Modulation Skill	: DBPSK, DQPSK, CCK
Power Type	: Powered by the Switching Power Adaptor Manufacturer: DVE ; Model: DSA-0151A-05 A I/P: AC 100-120V, 50/60Hz, 40VA ; O/P: +5V DC, 2.4A

3. Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	100	6
3.0-30	1842/f	4.89/f	900/f ²	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	100	30
1.34-30	824/f	2.19/f	180/f ²	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

[The EUT is tested in transmit and receive modes and in the first, middle and the last channel separately. The following shows only our observation have the greatest emissions.]

According to OET BULLETIN 56 Fourth Edition/August 1999, Equation for Predicting RF Fields:

$$\text{Friis Transmission Formula: } S = \frac{PG}{4pR^2} = \frac{50.816 \times 1.514}{4p(20)^2} = 1.531 \times 10^{-2} \text{ mW/cm}^2$$

$$\text{Estimated safe separation: } R = \sqrt{\frac{PG}{4p}} = \sqrt{\frac{50.816 \times 1.514}{4p}} = 2.474 \text{ cm}$$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 2.474 cm."

Where: S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

The Numeric gain G of antenna with a gain specified in dB is determined by:

$$G = \text{Log}^{-1} (\text{dB antenna gain} / 10)$$

$$G = \text{Log}^{-1} (1.80 / 10) = 1.514$$



WHA YU INDUSTRIAL CO., LTD. (HEAD OFFICE)

TAI HWA ELECTRONIC CO., LTD.(CHINA)

SHANGHAI HUA YU ELECTRONIC CO., LTD.(CHINA)

SPECIFICATION FOR APPROVAL

CUSTOMER: 友勁科技股份有限公司

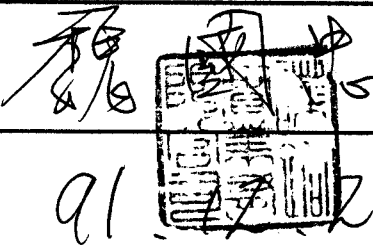
PART NAME: RF Antenna Cable Assembly

PART NO.:

REVISION:

W. Y. P/NO.: C056-510090-A

REV.: X1

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :	91.12.23	

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INDEX

<i>Item</i>	<i>Content</i>	<i>Page</i>
1.	天線規格	 1
2.	成 品 圖	 2
3.	測 試 報 告	 3~6
4.	Cable 規格	 7~10
5.	桿套材質特性	 11~17
6.	固定座材質特性	 18~20
7.	膠水粘著能力測試	 21~22
8.	天線彎曲推力測試	 23

RF Antenna Cable Assembly

Specification

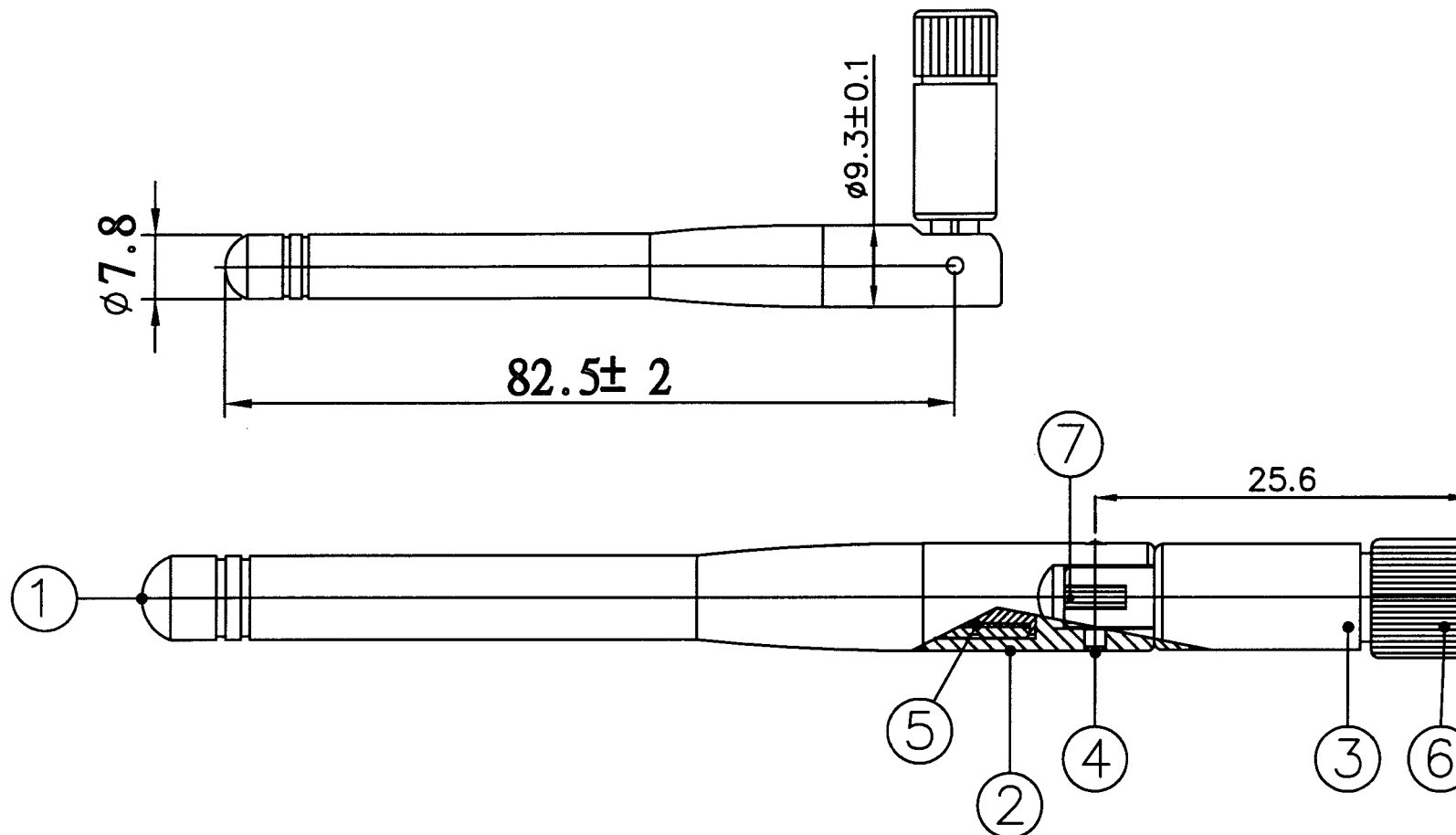
1. Electrical Properties :

- 1.1 Frequency Rang.....2.4GHz ~ 2.5GHz
- 1.2 Impedance 50 Ω Nominal
- 1.3 VSWR2.0 Max.
- 1.4 Return Loss.....-9.5 dB Maximum
- 1.5 Electrical Wave..... 1/2 λ Diople
- 1.6 Gain.....1.8 dBi
- 1.7 Admitted Power.....1W

2. Physical Properties :

- 2.1 Connector.....SMA Straight Plug/Reverse Gold Surfaced
- 2.2 Cable..... RG-178 50 Ω
- 2.3 Antenna Cover.....TPE
- 2.4 Antenna Base..... PC
- 2.5 Operating Temp.-20°C ~ +65°C
- 2.6 Storage Temp.-30°C ~ +75°C
- 2.7 ColorIvory White

REV	DATE	DESCRIPTION
X1	12/20-2002	Initial Sample Request



7	Cable	RG-178, Translucent Brown; 50 Ω	1	
6	Connector	SMA Straight Plug/Reverse Gold Plated	1	
5	Ground Tube	Brass, Ni plated	1	
4	Rivet	Brass, Silver Surfaced	2	
3	Antenna Base	PC; Color:Ivory White	1	
2	Antenna Base	PC; Color:Ivory White	1	
1	Antenna Cover	TPE; Color:Ivory White	1	
NO	DESCRIPTION		QTY	REMARK

CUSTOMER'S SIGNATURE		XX	±5	APPROVED	CUSTOMER: 友勁科技股份有限公司	
		X	±1.0	CHECKED		
		X	±0.1	CHECKED	PART NO :	
		XX	±0.01	CHECKED	PARTNAME: RF Antenna Cable Assembly	
		XXX	±0.005	DRAWING	W.Y P/NO : C056-510090-A	
				DRAWING	REV	UNIT
				X1	m/m	SHEET: 1/1


Wha Yu
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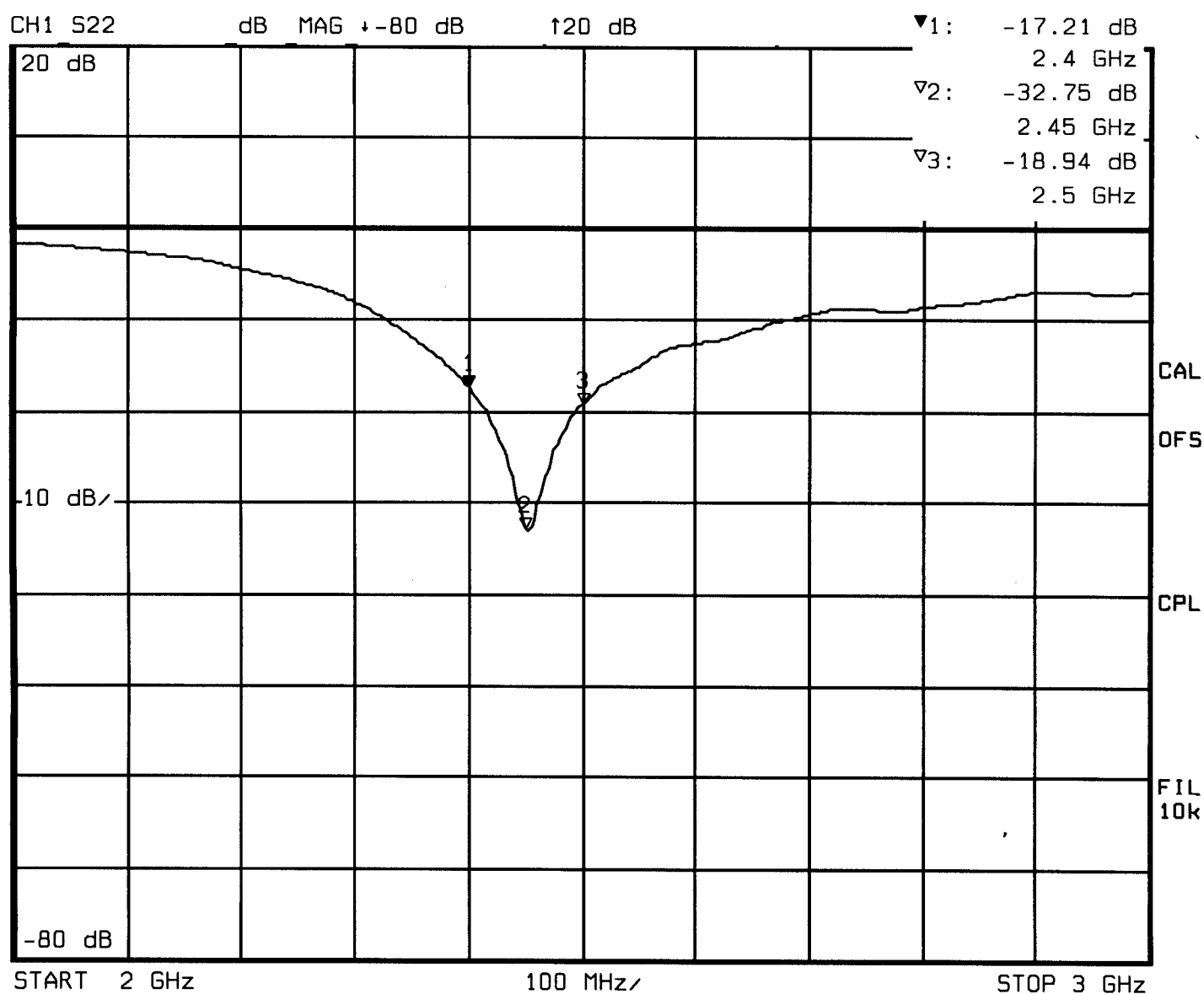


華裕實業股份有限公司

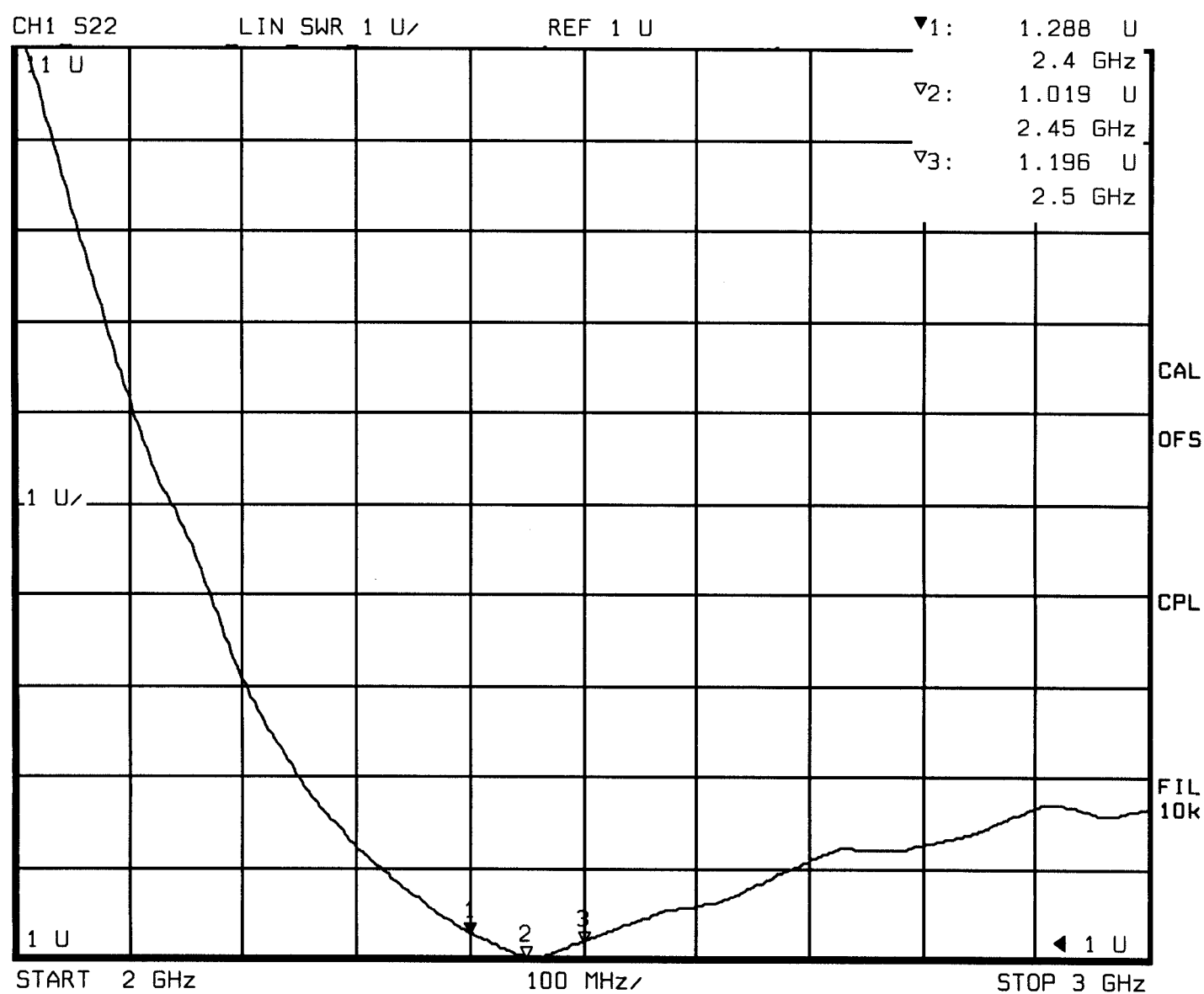
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RF Antenna Cable Assembly

Return Loss

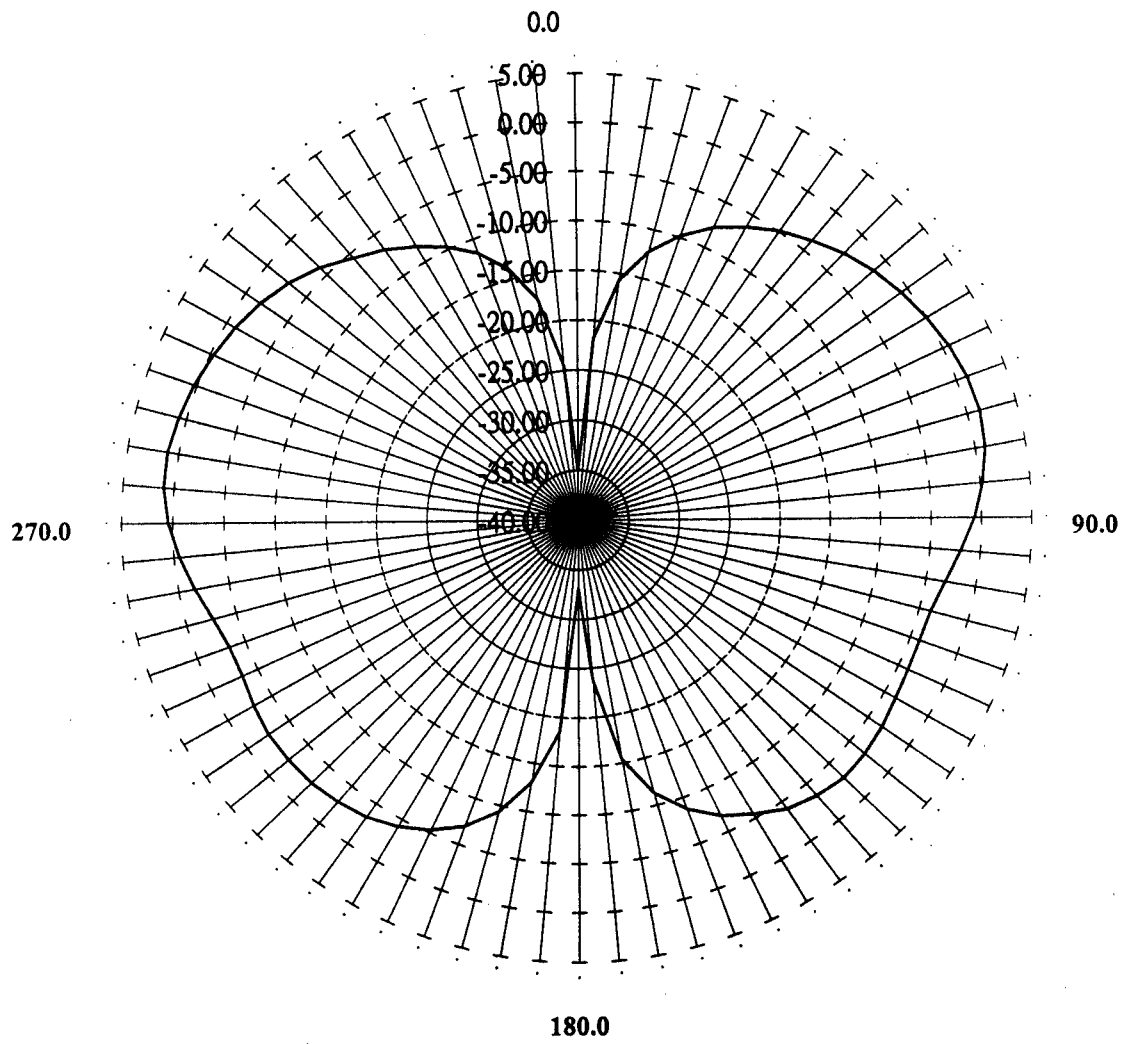


Date: 28.OCT.02 10:24:23

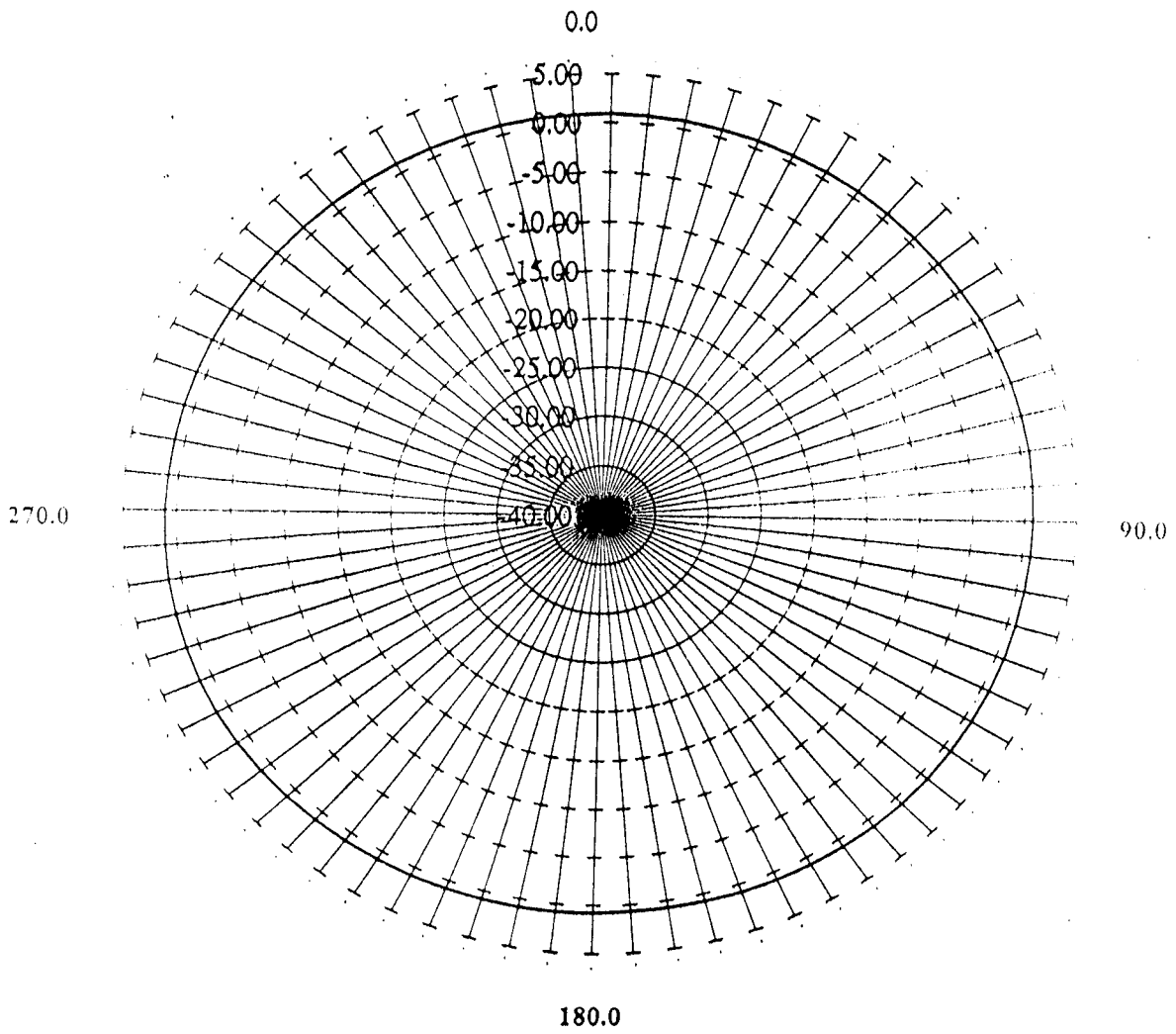
**VSWR**

Date: 28.OCT.02 10:24:51

E_PLANE



H_PLANE



Cable Specification

Cable : Mil-C-17 Coaxial Cable RG-178

1. Construction :

- 1 Conductor..... 30AWG 7/38 SCCS
- 2 Dielectric..... PTFE OD : 0.033"±0.002"
- 3 Shielded..... 38AWG SPC OD : 0.051" Nominal
- 4 Jacket..... FEP OD : 0.071"±0.004"

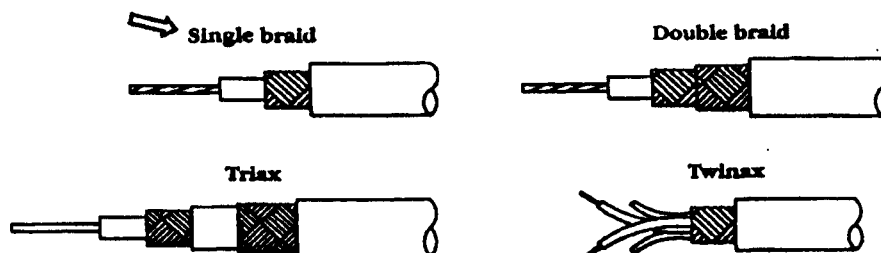
2. Physical Properties :

- 1 Weight per 1000ft..... 6.3 lbs Maximum
- 2 Bend Radius..... 0.35" Minimum
- 3 Operating Temperature Range -55°C ~ 200°C

3. Electrical Properties:

- 1 Impedance..... 50±2 ohms
- 2 Capacitance..... 32 pF/ft Maximum
- 3 Cut off Frequency..... 116 GHz
- 4 Attenuation..... 45.0 dB/100ft @ 1GHz
64.4 dB/100ft @ 2GHz
79.7 dB/100ft @ 3GHz
92.7 dB/100ft @ 4GHz
104.3 dB/100ft @ 5GHz
115.0 dB/100ft @ 6GHz

MIL-C-17 Coax Cable – QPL Approved



Harbour supplies a complete line of high temperature, high performance QPL approved MIL-C-17 coax cables for the military, commercial and industrial markets. The specific M17 constructions referenced are manufactured in accordance with the most recent revision of the MIL-C-17 specification to ensure a quality product. The MIL-C-17 specification defines complete physical and electrical characteristics for each M17 part number, including diameter parameters, dielectric materials, braid coverage, 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

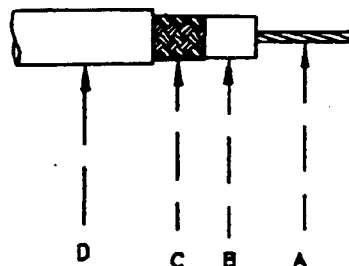
Harbour also manufactures PTFE tape wrapped cables to a previous revision of the MIL-C-17 specification. These constructions can withstand operating temperatures up to 250° C. versus 200° C. for FEP jacketed cables. Also, PTFE tape wrapped cables are generally more flexible than their FEP jacketed counterparts.

UL Approvals

All of Harbour's M17 part numbers manufactured to the MIL-C-17 specification may be ordered with UL 1971 and FT4/PT6 approvals.



Rev	Change	Date



Construction:

- A) Center Conductor:
30 7/38 SPCW
OD .012" $\pm$.001"
- B) Dielectric:
Extruded PTFE
OD .033" $\pm$.002"
- C) Shield:
38 AWG SPC
OD .051" Nom.
- D) Jacket:
FEP - Brown Tint
OD .071" $\pm$.004"
Surface Printed: "RC178HF HARBOUR INDUSTRIES 27478"

Electricals:

Impedance: 50 $\pm$ 2 Ohms
Capacitance: 32 pF/ft Max.
Velocity of Prop.: 70% Nom.
Cut off Frequency: 116 GHz

Physical Properties:

Weight per 1000 ft: 6.3 lbs Max.
Minimum Bend Radius: .35"
Operating Temperature Range: -55°C to 200°C

Attenuation:

1.0 GHz	45.0 dB/100ft.
2.0 GHz	64.4 dB/100ft.
3.0 GHz	79.7 dB/100ft.
4.0 GHz	92.7 dB/100ft.
5.0 GHz	104.3 dB/100ft.
6.0 GHz	115.0 dB/100ft.

Harbour Industries

Date: 12/17/01	Scale: None	Drawn By: MTPiner
Drawing Name: RC178HF		Approved By: MTPiner
Part Number: TBO		Rev: Sheet 1 of 1
		Drawing Number: 121701_1

MIL-C-17 Type Coaxial Cable, QPL approved

Physical Characteristics

M17 Number	Center Conductor	Dielectric	O.D.	Shield	Jacket	Overall O.D.	Operating Temp °C	Weight (lbs./MFT)	Comments
M17/60-RG142	.037 " SCCS	PTFE	.116 "	SPC(2)	FEP	.195 "	-55+200	43.0	
M17/93-RG178	.0120 " (7/.004 ") SCCS	PTFE	.033 "	SPC	FEP	.071 "	-55+200	6.3	
M17/94-RG179	.0120 " (7/.004 ") SCCS	PTFE	.063 "	SPC	FEP	.100 "	-55+200	10.8	
M17/110-RG302	.0253 " SCCS	PTFE	.146 "	SPC	FEP	.202 "	-55+200	40.0	
M17/111-RG303	.037 " SCCS	PTFE	.116 "	SPC	FEP	.170 "	-55+200	31.0	
M17/112-RG304	.059 " SCCS	PTFE	.185 "	SPC(2)	FEP	.280 "	-55+200	94.0	QPL Approval Pending
M17/113-RG316	.0201 " (7/.0067 ") SCCS	PTFE	.060 "	SPC	FEP	.098 "	-55+200	12.2	
M17/127-RG393	.094 " (7/.0312 ") SPC	PTFE	.285 "	SPC(2)	FEP	.390 "	-55+200	165.0	
M17/128-RG400	.0384 " (19/.008 ") SPC	PTFE	.116 "	SPC(2)	FEP	.195 "	-55+200	50.0	
M17/131-RG403	.0120 " (7/.004 ") SCCS	PTFE	.033 "	SPC(2)	FEP(2)	.116 "	-55+200	15.0	Triaxial M17/93-RG178
M17/152-00001	.0201 " (7/.0067 ") SCCS	PTFE	.060 "	SPC(2)	FEP	.114 "	-55+200	18.5	Double Shielded RG316

RG Type Coaxial Cable, Non-QPL

RG174 /U	.0120 " (7/.0067 ") TPC	PE	.060 "	TPC	PVC	.110 "	-40+ 85	9.0	
RG213 /U	.089 " (7/.0296 ") BC	PE	.285 "	BC	PVC	.405 "	-40+ 80	111.0	
RG214 /U	.089 " (7/.0296 ") SPC	PE	.285 "	SPC(2)	PVC	.425 "	-40+ 80	136.4	
RG223 /U	.034 " SPC	PE	.117 "	SPC(2)	PVC	.212 "	-40+ 80	36.7	
RG178 /U-SF	.0120 " (7/.004 ") TPC	PE irrad.	.033 "	TPC	PVC	.071 "	-40+105	5.8	Flexible, 105°C. rated
RG178 /U	.0120 " (7/.004 ") SPC	FEP	.033 "	SPC	FEP	.071 "	-55+200	6.3	
RG179 B/U	.0120 " (7/.004 ") SPC	FEP	.063 "	SPC	FEP	.100 "	-55+200	10.8	
RG316 /U	.0201 " (7/.0067 ") SPC	FEP	.060 "	SPC	FEP	.098 "	-55+200	12.2	
RG142 B/U	.037 " SPC	FEP	.116 "	SPC(2)	FEP	.195 "	-55+200	43.0	
RG400 /U	.0384 " (19/.008 ") SPC	FEP	.116 "	SPC(2)	FEP	.195 "	-55+200	50.0	

Other type RG cables are available upon requested.

PTFE Tape Wrap Jacketed RG Cables:

RG187 A/U	.0120 " (7/.004 ") SCCS	PTFE	.063 "	SPC	PTFE	.100 "	-55+250	9.0	Flexible, 250°C. rated
RG188 A/U	.0201 " (7/.0067 ") SCCS	PTFE	.060 "	SPC	PTFE	.100 "	-55+250	12.0	Flexible, 250°C. rated
RG196 A/U	.0120 " (7/.004 ") SCCS	PTFE	.034 "	SPC	PTFE	.080 "	-55+250	8.0	Flexible, 250°C. rated

Electrical Characteristics

Type No.	Impedance (ohms)	Capaci. (pF/ft)	Working Voltage (Volts RMS)	100Mhz	400Mhz	1 Ghz	3Ghz	5Ghz	10Ghz	Max Frequency (Ghz)
M17/60-RG142	50 +/- 2	29.4	1900	5.5	11.7	19.0	35.0	48.0	-	12.4
M17/93-RG178	50 +/- 2	29.4	1000	16.0	33.0	52.0	94.0	-	-	3.0
M17/94-RG179	75 +/- 3	19.4	1000	-	21.0	-	-	-	-	-
M17/110-RG302	75 +/- 3	19.4	2300	-	8.0	-	26.0	-	-	-
M17/111-RG303	50 +/- 2	29.4	1900	3.9	8.6	15.0	28.0	-	-	-
M17/112-RG304	50 +/- 2	29.4	3000	2.7	6.4	11.1	22.0	30.0	37.0	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	12.0
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	12.0
RG174 /U	50 +/- 2	30.8	1200	11.0	21.0	38.0	58.0	-	-	3.0
RG213 /U	50 +/- 2	30.8	2500	2.1	5.0	8.8	18.0	-	-	-
RG214 /U	50 +/- 2	30.8	2500	2.1	5.0	8.8	16.0	-	-	-
RG223 /U	50 +/- 2	30.8	1900	4.9	11.0	18.0	39.5	-	-	-
RG178 /U-SF	50 +/- 2	30.8	1000	16.0	33.0	52.0	94.0	-	-	3.0
RG178 /U	50 +/- 2	29.4	1000	16.0	33.0	52.0	94.0	-	-	3.0
RG179 B/U	75 +/- 3	19.4	1000	-	21.0	-	-	-	-	-
RG316 /U	50 +/- 2	29.4	1200	11.0	21.0	38.0	58.0	-	-	3.0
RG142 B/U	50 +/- 2	29.4	1900	5.5	11.7	19.0	35.0	-	-	-
RG400 /U	50 +/- 2	29.4	1900	4.5	10.5	17.0	38.0	-	-	-

PTFE Tape Wrap Jacketed RG Cables:

RG187 A/U	75 +/- 3	19.4	1200	-	21.0	-	-	-	-	3.0
RG188 A/U	50 +/- 2	29.4	1200	11.0	21.0	38.0	58.0	-	-	3.0
RG196 A/U	50 +/- 2	29.4	1000	-	29.0	-	-	-	-	-

All figures referenced above are nominal unless otherwise specified.

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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
$\mu\text{m/m.k}$	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	\	\	\	\	\	\
$\Omega\cdot\text{cm}$	$5*10^{14}$	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
$\times 10^{14}$	10	\	\	3.8	\	310
$\times 10^{14}$	170	350	400	350	300	350
\	800	800	600	600	600	800
\	600	600	600	800	800	600

Amitel

2.2 Product coding

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

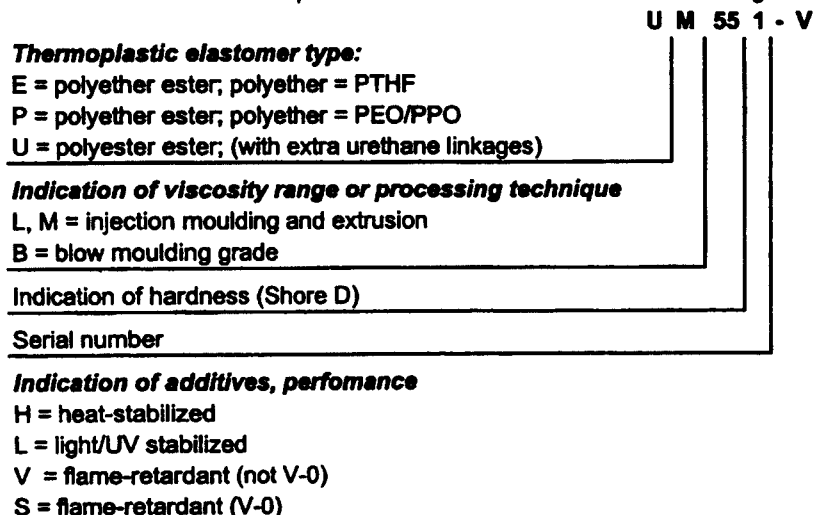


Figure 2.2: Amitel product coding

2.3 Product portfolio

The Amitel productrange is available with a hardness from 38 to 74 Shore D. The general Amitel 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 Amitel P is suggested for application areas where thermo-oxidative stability is an issue. For applications where colour and UV stability is required, the Amitel E range is advised.

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

Table 2.2: Amitel 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.

	Amitel E	Amitel P	Amitel 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.

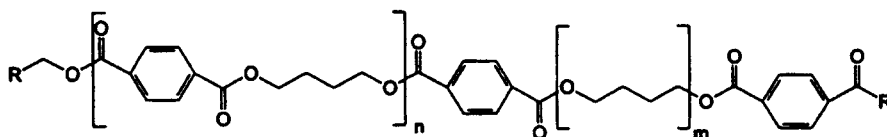


Figure 2.9: Chemical structure of Arnitel EL630/EM630.

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



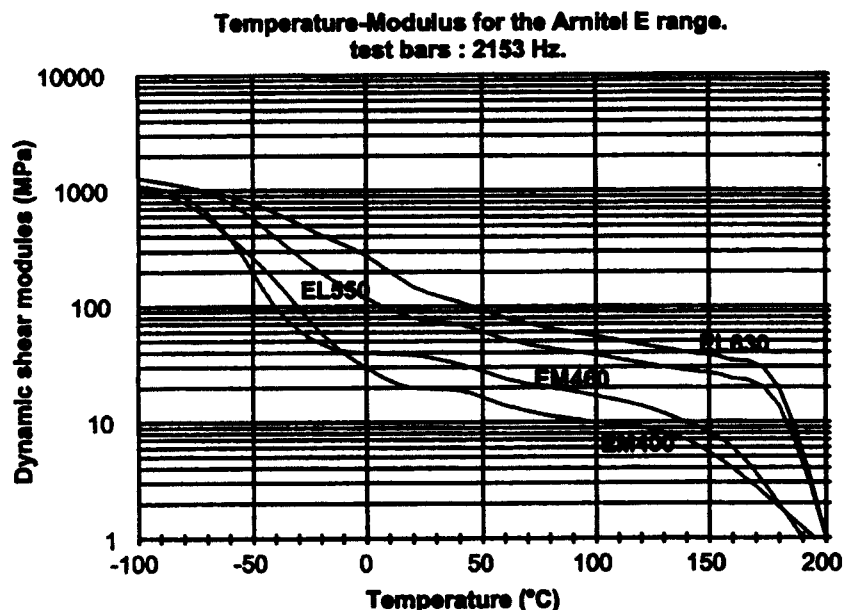
Figure 2.10: Simplified structure of Arnitel EL630/EM630.

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 306/A
Vicat B	(°C)	125	ISO 306/B
HDT-B	(°C)	115	ISO 75-1

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

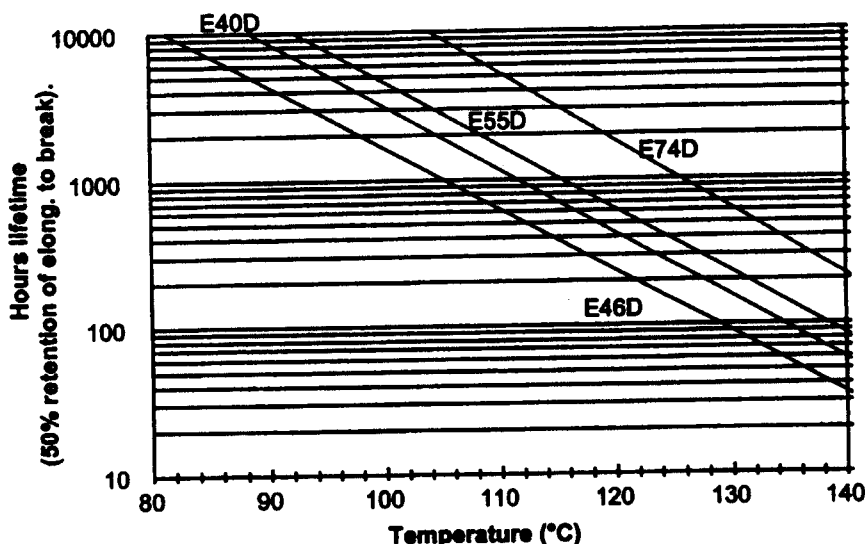
Arnitel EL630 and EM630 have a melting point of 213°C as found in the second heating curve of a DSC. The polymer will crystallize at 155°C using a 20°C/min cooling rate. The thermal expansion coefficient of Arnitel EL630/EM630 and is $140 \cdot 10^{-4} \mu\text{m/m.K}$.

• 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/cm³ according 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 120°C (or 6 hours 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.

Arnitel[®] EL630/EM630

- **Processing:**

Arnitel 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

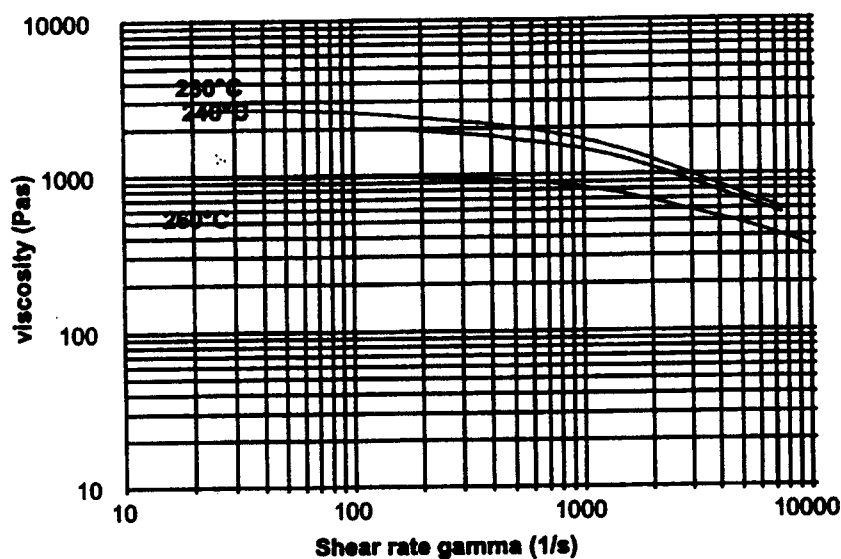
All temperatures are in °C.

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

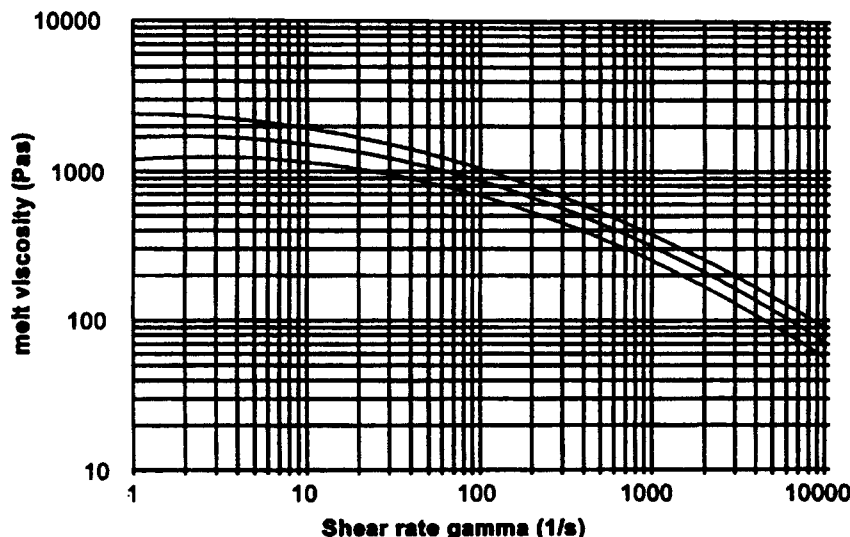
- **Rheology:**

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

Shear rate dependent of the melt viscosity of Arnitel EL630.
Effect of melt temperature.



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/m²	NB	NB	ISO 180/1A
Izod notched -30°C (-22°F)	KJ/m²	4	4	ISO 180/1A
Charpy notched 23°C (73°F)	KJ/m²	NB	NB	ISO 179/1eA
Charpy notched -30°C (-22°F)	KJ/m²	12	12	ISO 179/1eA

Data for dry natural materials.

* NB: No Break

Table 2.32: mechanical properties of Amitel® EL630.

Arnitel® EL630/EM630

- **Abrasion:**

Amitels show good abrasion resistance in both Taber and DIN 53516 abrasion tests. Data are shown in the Arnitel 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 Arnitel® 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 Arnitel EL630 and EM630 request the chemical resistance brochure.

- **Hydrolysis**

Like all polyesters Arnitel 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 Arnitel EL630 at 100°C and in steam (120°C). For improved hydrolysis stability, using a polycarbodiimide 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.



GE *Plastics*



LEXAN 123R

Product Portfolio | Product Lines | LEXAN

USA: Commercial

Nonhalogenated. 17.5 MFR, for small, intricate parts. UV stabilized. Internal mold release.

Processing

INJECTION MOULDING-USA

Melt Temperature	540-580	deg F
Nozzle Temperature	530-570	deg F
Front Temperature	540-580	deg F
Middle Temperature	520-560	deg F
Rear Temperature	500-540	deg F
Mold Temperature	160-200	deg F
 Drying Temperature	250	deg F
Drying Time (minimum)	3-4	h
Drying Time (maximum)	48	h
Back Pressure	50-100	psi
Screw Speed	40-70	rpm
Suggested shot size	40-60	%
Vent Depth	.001-.003	in

Source Eris, last updated: 1997/0

Nonhalogenated. 17.5 MFR, for small, intricate parts. UV stabilized. Internal mold release.

MECHANICAL

Property	Typical Data	Unit	Method
Tensile Strength, yield, Type I, 0.125"	9000	psi	ASTM D 638
Tensile Strength, break, Type I, 0.125"	9500	psi	ASTM D 638
Tensile Elongation, yield, Type I 0.125"	7.0	%	ASTM D 638
Tensile Elongation, break, Type I 0.125"	110.0	%	ASTM D 638
Flexural Strength, yield, 0.125"	13500	psi	ASTM D 790
Flexural Modulus, 0.125"	340000	psi	ASTM D 790
Compressive Strength	12500	psi	ASTM D 695
Compressive Modulus	345000	psi	ASTM D 695
Shear Strength	10000	psi	ASTM D 732
Shear Modulus	114000	psi	ASTM D 4065
Hardness, Rockwell M	70	-	ASTM D 785
Hardness, Rockwell R	118	-	ASTM D 785
Taber Abrasion, CS-17, 1 kg	10	mg/1000cy	ASTM D 1044
Fatigue Limit, 2.5 MM cycles	1000	psi	ASTM D 671

IMPACT

Property	Typical Data	Unit	Method
Izod Impact, unnotched, 73F	60.0	ft-lb/in	ASTM D 4812
Izod Impact, notched, 73F	13.0	ft-lb/in	ASTM D 256
Tensile Impact, Type "S"	260	ft-lb/in ²	ASTM D 1822
Falling Dart Impact (D 3029), 73F	125	ft-lbs	ASTM D 3029

THERMAL

Property	Typical Data	Unit	Method
Vicat Softening Temp, Rate B	310	deg F	ASTM D 1525
HDT, 66 psi, 0.250", unannealed	280	deg F	ASTM D 648
HDT, 264 psi, 0.250", unannealed	270	deg F	ASTM D 648
Thermal Conductivity	0.19	W/m-C	ASTM C 177
CTE, flow, -40F to 200F	3 E-5	in/in-F	ASTM E 831
Specific Heat	0.30	BTU/lb-F	ASTM C 351
Thermal Index, Elec Prop	100	deg C	UL 746B
Thermal Index, Mech Prop with impact	100	deg C	UL 746B
Thermal Index, Mech prop without impact	100	deg C	UL 746B
Brittleness Temperature	-200	deg F	ASTM D 746

PHYSICAL

Property	Typical Data	Unit	Method
Specific Gravity, solid	1.20	-	ASTM D 792
Specific Volume	23.10	in ³ /lb	ASTM D 792
Density	0.043	lb/in ³	ASTM D 792
Water Absorption, 24 hours @ 73F	0.150	%	ASTM D 570
Water Absorption, equilibrium, 73F	0.35	%	ASTM D 570
Water Absorption, equilibrium, 212F	0.58	%	ASTM D 570
Mold Shrinkage, flow, 0.125"	5-7	in/in E-3	ASTM D 955
Melt Flow Rate, nom'l, 300C/1.2 kgf (O)	17.5	g/10 min	ASTM D 1238

OPTICAL

Property	Typical Data	Unit	Method
Light Transmission, 0.100"	88.0	%	ASTM D 1003
Haze, 0.100"	1.0	%	ASTM D 1003
Refractive Index	1.586	-	ASTM D 542

ELECTRICAL

Property	Typical Data	Unit	Method
Volume Resistivity	>1E17	ohm-cm	ASTM D 257
Dielectric Strength, in air, 125 mils	380	V/mil	ASTM D 149
Dielectric Constant, 60 Hz	3.17	-	ASTM D 150
Dielectric Constant, 1 MHz	2.96	-	ASTM D 150
Dissipation Factor, 60 Hz	0.0009	-	ASTM D 150
Dissipation Factor, 1 MHz	0.0100	-	ASTM D 150

FLAME CHARACTERISTICS

Property	Typical Data	Unit	Method
UL File Number, USA	E121562	-	-
HB Rated (tested thickness)	0.058	inch	UL 94

Source Eris, last updated: 1998/1

Disclaimer

The values shown on the attached pages are typical values that have been obtained using test bars from typical lots and are not intended for specification purposes. These values are for natural colors only. Addition of pigments may alter some values. Inasmuch as the General Electric Company has no control over the use to which others may put the material, it does not guarantee that the same results as those described herein will be obtained. Each user of the material should make his own test to determine the material's suitability for his own particular use. Statements concerning possible or suggested uses of the materials described herein are not to be construed as constituting a license under any General Electric patent covering such use or as recommendations for use of such materials in the infringement of any patent.



TECHNICAL INFORMATION (TDS 47)

CA02 SUPERGLUE High Viscosity Gap Filler

DESCRIPTION

CA02 is a High viscosity ethyl based superglue for bonding where large gap fill is important, or where the materials are absorbent. CA02 is versatile and will bond most plastics, rubbers and metals. Because of its viscosity CA02 allows additional bonding time prior to cure.

APPLICATIONS

Typical applications are ferrite cores, magnets, loud speaker cones, leather trims, metal badges, electronic components, however CA02 is versatile and will also bond cork, wood, ceramic, plastics etc.

USEFUL HINTS/NOTES

Only apply adhesive to one side. Apply pressure firmly for a few seconds until the bond forms. Allow to cure before putting into use.

PROPERTIES

Steel to Steel:.....320 daN/cm(2)
Rubber to Rubber:.....70daN/cm(2)*
Plastic to Plastic:.....100daN/cm(2)*

* Substrate failure, not adhesive.

INSTRUCTIONS FOR USE

Ensure parts are clean, dry and free from oil and grease.

PROCEDURE FOR APPLICATION

Apply sparingly to one side and hold parts until handling strength is achieved.

COMPATIBLE

ACCELERATORS/PRIMERS

Primers such as A021 or Double Strength A113 as accelerators for fillet cure or for priming absorbent surfaces.

The information contained herein is produced in good faith and is believed to be reliable but is for guidance only. Holdtite and its agents cannot assume liability or responsibility for results obtained in the use of its products by persons whose methods are outside or beyond our control. It is the users responsibility to determine the suitability of any of the products and methods of use or preparation prior to use mentioned in our literature and furthermore the users responsibility to observe and adopt such precautions as may be advisable for the protection of personnel and property in the handling and use of any of our products.

TECHNICAL FEATURES

Resin.....Ethyl Cyanoacrylate
Colour.....Clear
Cure Speed With Activator.....<5 seconds
Cure Speed Without Activator.....15-20 seconds
Viscosity.....2500cps +/-500cps
Gap Fill.....0.25mm
Flash Point.....>85°C
Shelf Life.....12 months @ 20°C
Specific Gravity.....1.06
Max. Operating Temperature.....-60°C to + 90°C

CURED PERFORMANCE

Cure Time:.....<30 seconds
Tensile Strength.....320daN/cm(2)
Tensile Shear Strength:.....180daN/cm(2)

STORAGE

Store in a cool area out of direct sunlight
Refrigeration to 5C gives optimum stability.

PRESENTATION

Bottles:.....20g, 50g, 500g

HEALTH & SAFETY IN USE

DANGER -Superglue bonds skin and eyes in seconds.

If accidental skin bonding happens wash with warm soapy water and prise skin apart using a blunt instrument (such as a teaspoon handle).

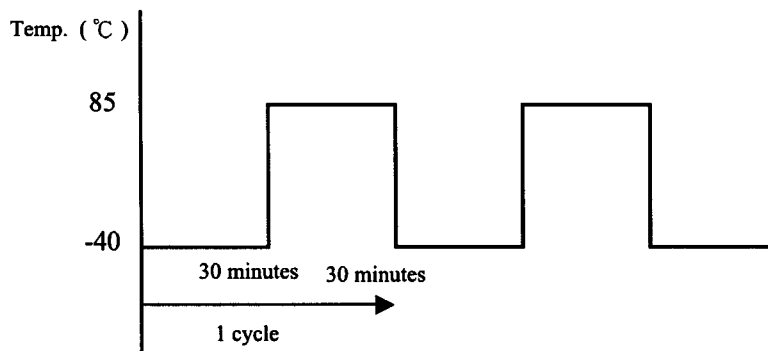
In case of eye contact, bathe immediately with water and seek immediate medical attention.

REV 21-09-99 HH

膠水粘著能力測試

RF Antenna Cable Assembly

- 1.測試設備： 冷熱衝擊試驗機,拉力測試機
- 2.測試條件： -40℃ ~ 85℃
- 3.循環次數： 20次
- 4.規 範 值： 7 Kg Minium



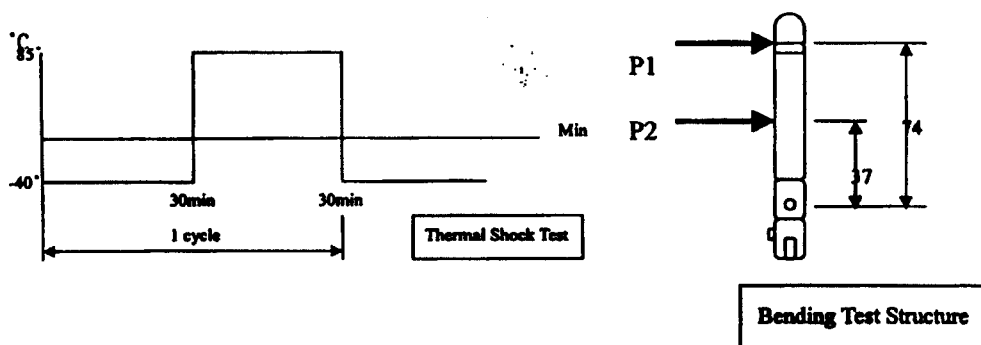
Sample	規範值	測試結果
1	7 Kg	>7Kg
2		>7Kg
3		>7Kg
4		>7Kg
5		>7Kg
6		>7Kg
7		>7Kg
8		>7Kg
9		>7Kg
10		>7Kg

Antenna Bending Force Test

Part Name : RF Antenna able Assembly

Customer P/N :

1. Test Equipment : Thermal Shock Tester + Pull tester
2. Test condition: -40°C to +85°C each 30min one cycles test 100cycles.
3. Specification : The bending force must be above 20g in 74mm distance after 1000 cycles bending test.



Test Item	Bending force				Lock pin Status
	Before 1000 cycles bending		After 1000 cycles bending		
	P1	P2	P1	P2	
Sample 1	95 g	181 g	38 g	75 g	No drop
Sample 2	100 g	187 g	43 g	88 g	No drop
Sample 3	101 g	204 g	41 g	82 g	No drop
Sample 4	94 g	188 g	40 g	84 g	No drop
Sample 5	109 g	202 g	45 g	93 g	No drop
Specification > 20g at 74mm	Pass	Pass	Pass	Pass	Pass