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: *深圳市普聯技術有限公司*

PART NAME:RF Antenna Assembly

PART NO.:31010007 ***REVISION:***

W. Y. P/NO.:C636-510005-A ***REV.:A***

SSR-00374

	MANUFACTURER SIGNATURE	**CUSTOMER SIGNATURE**
APPROVED BY :		
DATE :		

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Wujiang City,Jiangsu Province,China
Tel: + 86-512-63627980
Fax: + 86-512-63627981

INDEX

RF Antenna Cable Assembly

Specification

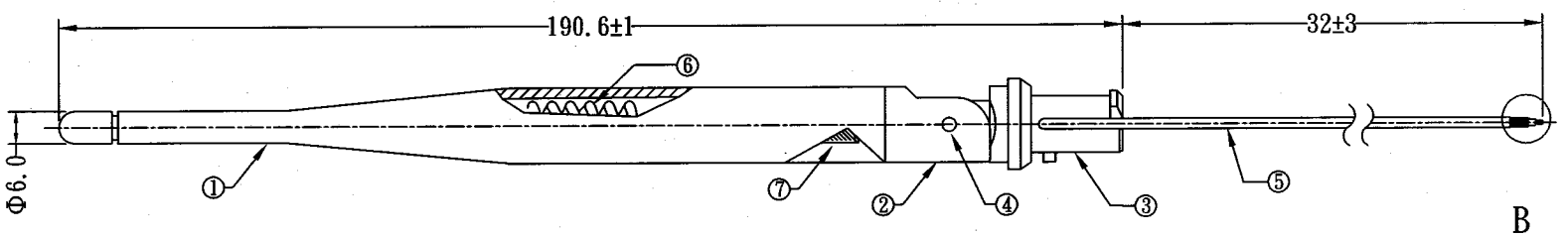
1. Electrical Properties :

1.1 **Frequency Rang…… 2.4GHz ~ 2.5GHz**
1.2 **Impedance …… 50Ω Nominal**
1.3 **VSWR …… 1.92 Max.**
1.4 **Return Loss…… -10dB Maximum**
1.5 **Electrical Wave…… 1/4 λ Helix**
1.6 **Gain…… 3.0 dBi**
1.7 **Admitted Power…… 1W**

2. Physical Properties :

2.1 Cable…… RG-178 Cable
2.2 Antenna Cover…… TPE
2.3 Antenna Base…… PC
2.4 Operating Temp. …… -20℃ ~ +65℃
2.5 Storage Temp. …… -30℃ ~ +75℃
2.6 Color …… Black

REV.	DATE	DESRIPTION



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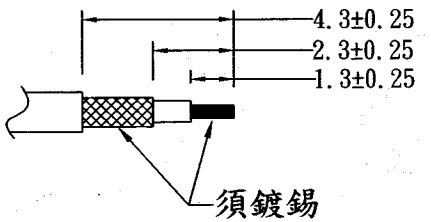
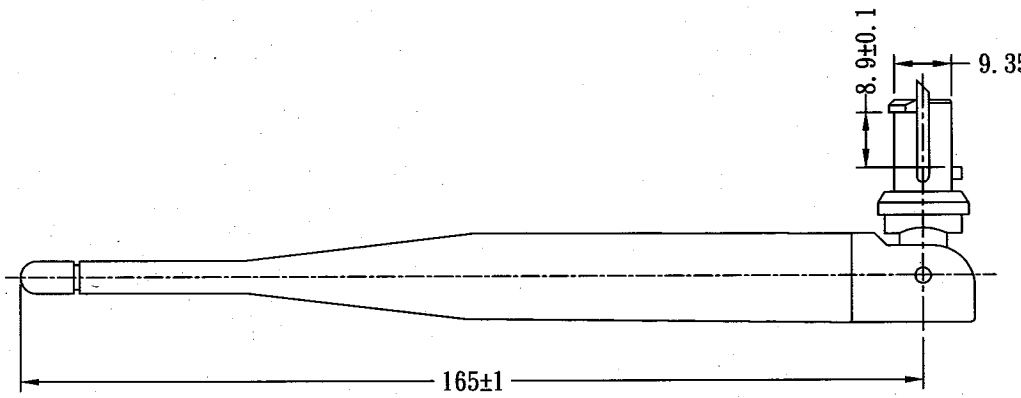




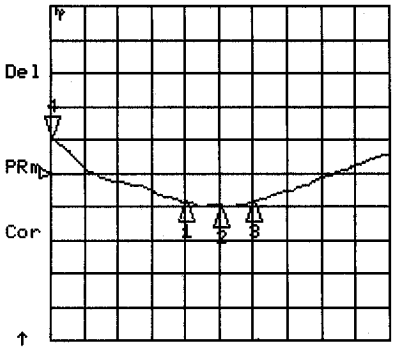
NO.	DESCRIPTION		Q'TY	EQUIVALENT
7	GROUND TUBE	BRASS, NI-PLATED	1	
6	HELIX	PHOSPHOR BRONZE	1	
5	CABLE	RG-178 CABLE, TRANSLUCENT BROWN, 50Ω	1	
4	RIVET	BRASS, Cr-PLATED, BLACK	2	
3	ANTENNA BASE	PC, COLOR:BLACK	1	
2	ANTENNA BASE	PC, COLOR:BLACK	1	
1	ANTENNA BODY	TPE, COLOR:BLACK	1	

XXX.±3.0	APPROVED	CUSTOMER:深圳市普聯技術有限公司			
XX.±2.0		W.Y. P/N:C636-510005-A			
X.±1.0	CHECKED	PART NAME:RF ANTENNA ASSEMBLY			
.X±0.5		PART NO.:31010007			
.XX±0.1	DRAWED	REV.	UNIT	PAGE	FILE:SSR-00374
		A	mm	1/2	DATE:2004.08.12

WHA YU
INDUSTRIAL CO.,LTD.
譁裕實業股份有限公司

9 Aug 2004 16:27:30

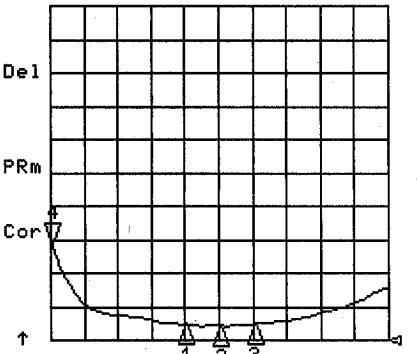
CH1 LOG 5 dB/ REF -10 dB
S11 4:-4.5914 dB 2 200.050 000 MHz



CH1 Markers
1:-14.340 dB
2.40000 GHz
2:-15.080 dB
2.45000 GHz
3:-14.374 dB
2.50000 GHz

START 2200.000 MHz STOP 2700.000 MHz

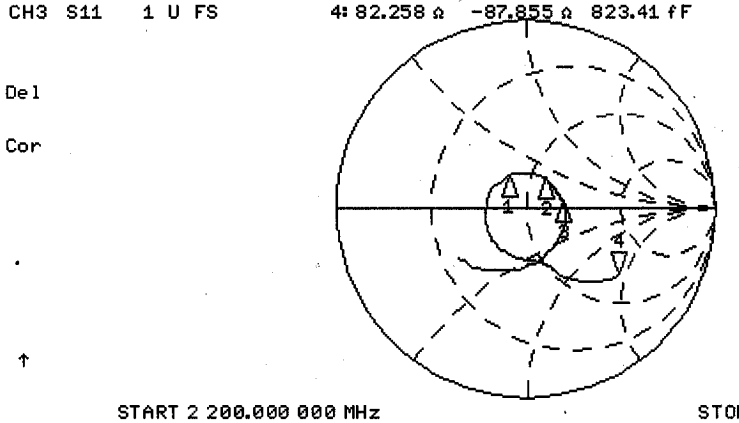
CH2 SWR 1 / REF 1
S11 4: 3.8713 2 200.050 000 MHz



CH2 Markers
1: 1.4749
2.40000 GHz
2: 1.4277
2.45000 GHz
3: 1.4725
2.50000 GHz

START 2200.000 MHz STOP 2700.000 MHz

CH3 S11 1 U FS 4: 82.258 Ω -87.855 Ω 823.41 fF 2 200.050 000 MHz



CH3 Markers
1: 38.883 Ω
13.178 Ω
2.40000 GHz
2: 57.959 Ω
17.547 Ω
2.45000 GHz
3: 73.176 Ω
4.2148 Ω
2.50000 GHz

START 2 200.000 000 MHz STOP 2 700.000 000 MHz

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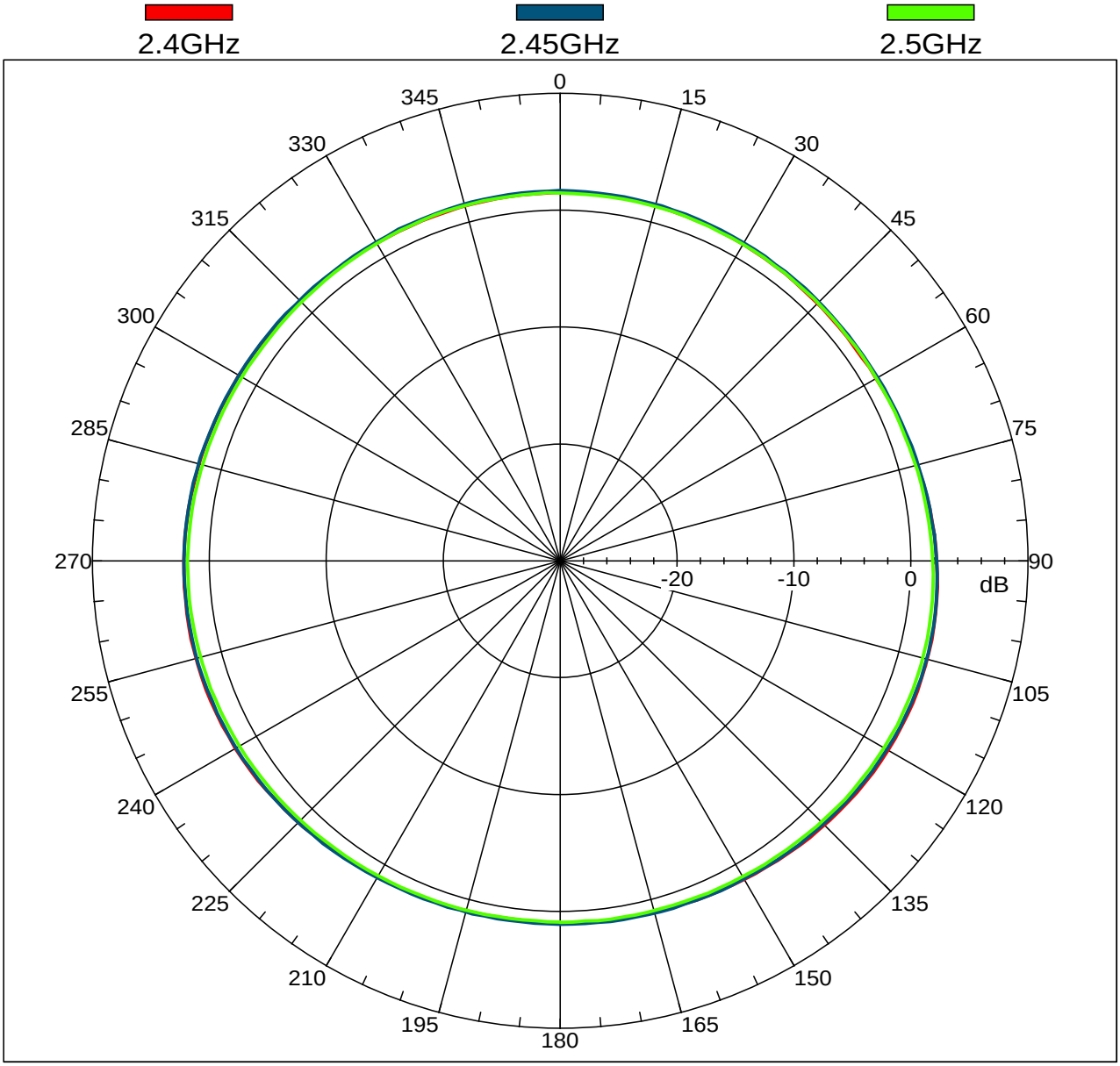
WHA YU INDUSTRIAL CO., LTD

RF Antenna Assembly

SPEC : 2.4 ~ 2.5GHz

Far-field amplitude of 2.4GHz test-V1-1.nsi



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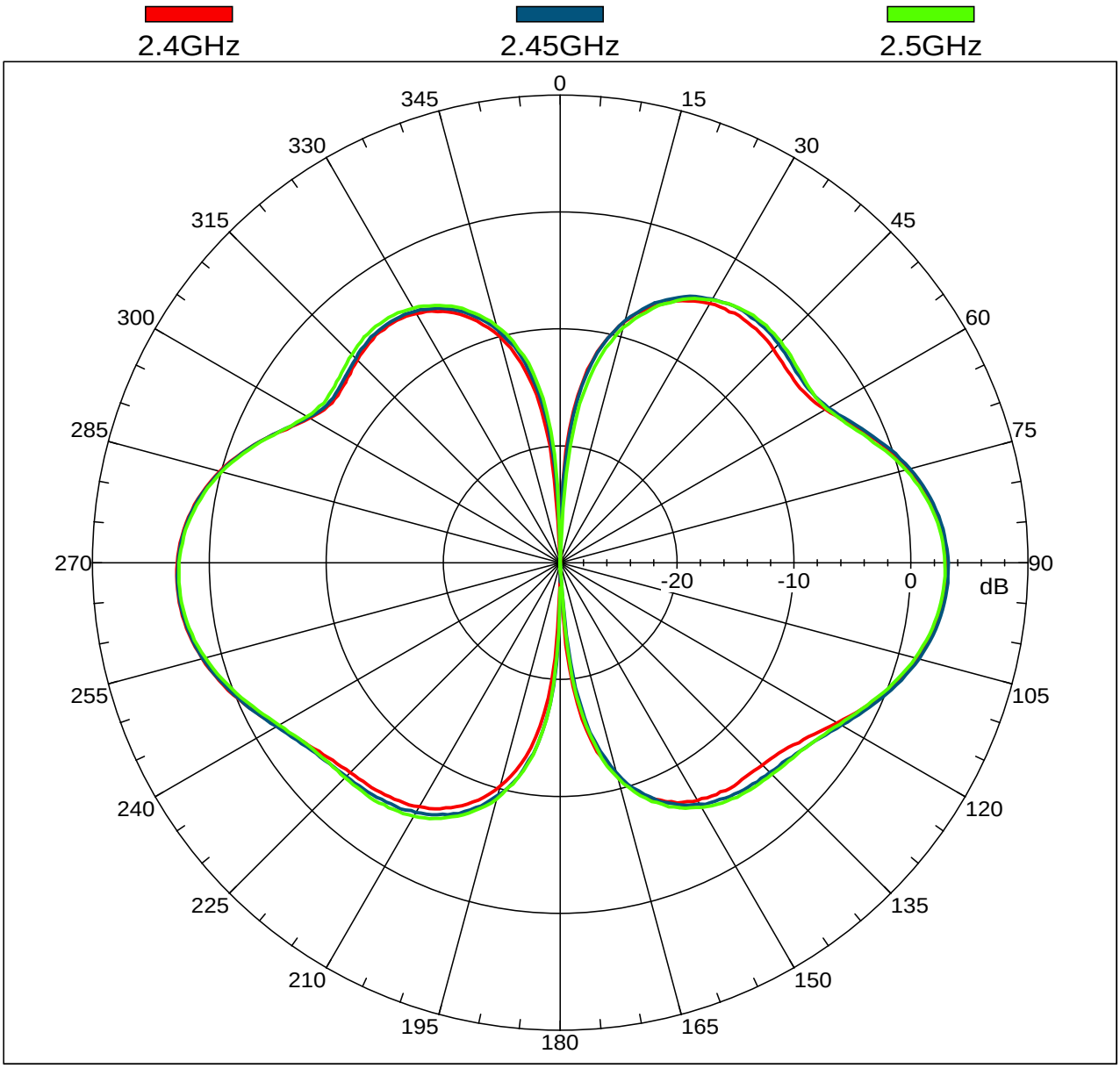
WHA YU INDUSTRIAL CO., LTD

RF Antenna Assembly

SPEC : 2.4 ~ 2.5GHz

Far-field amplitude of 2.4GHz test-H1-5.nsi



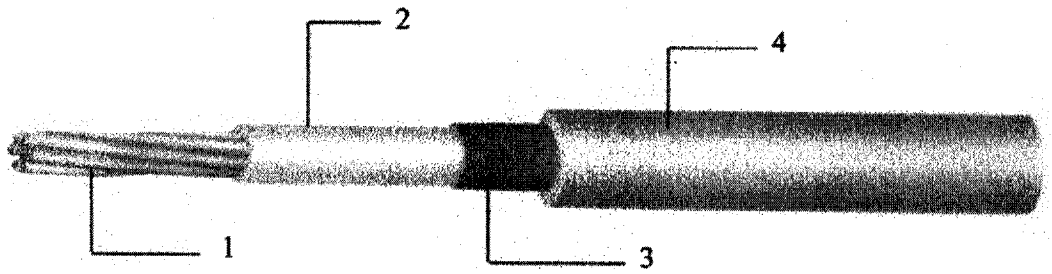
Nizing Electric Co., Ltd. 11-15 Santai Rd., Hsinchuang, Taipei Hsien, 242, Taiwan, R.O.C.
Tel: 02-29016164 Fax: 29050644 E-mail: shenbinnizing@yahoo.com.tw

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 x 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	Rocke Liu
APPROVALS	Shen Bin Chen

Nizing Electric Co., Ltd.
11-15 Santai Rd., Hsinchuang, Taipei Hsien, 242, Taiwan, R.O.C.
Tel: 02-29016164 Fax: 29050644 E-mail: shenbinnizing@yahoo.com.tw

III – Characteristics

Item	Unit	Specified Value	Note
Temperature Rating	℃	-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	Rueke Lin
APPROVALS	Shen Bin Chao

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
℃	195	185	202	212	221	197
μm/m.k	220	160	180	140	110	150
℃	\	\	110	115	120	\
℃	130	150	180	200	200	145
℃	\	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/㎡	NB	NB	NB	NB	NB	NB
kj/㎡	NB	NB	NB	NB	200	NB
kj/㎡	NB	NB	NB	NB	9	NB
kj/㎡	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

2.2 Product coding

The structure of the Arnitel productcodes is illustrated wirth 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, perfomance
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.

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

Table 2.3: *Examples of specialty grades*

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 stucture of Arnitel EL630/EM630 is shown below.

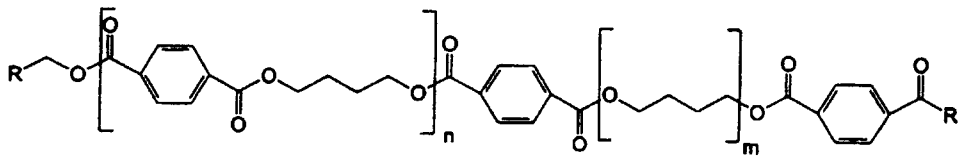


Figure 2.9: *Chemical structure of Arnitel EL630/EM630.*

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

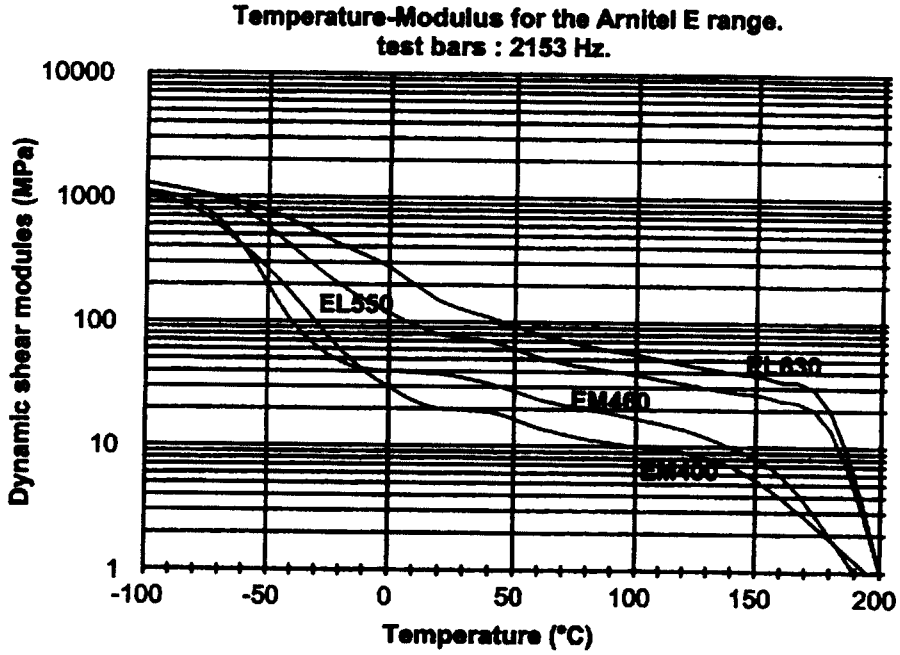
Figure 2.10: *Simplified structure of Arnitel EL630/EM630 .*

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.*

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.

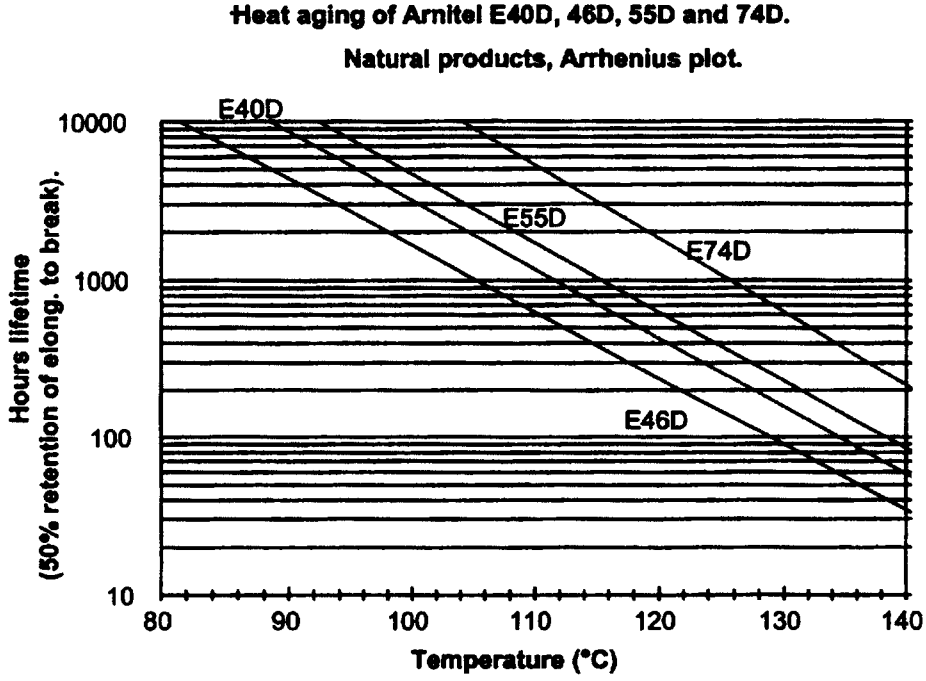
analysis	SI unit	typical data	test method
Vicat A	(°C)	200	ISO 306/A
Vicat B	(°C)	125	ISO 306/B
HDT-B	(°C)	115	ISO 75-1

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 $140*10^{-4}$ µm/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.



Graph 2.77: *Heat stability for Arnitel E-range.*

Heat ageing can be improve using a stabilisation masterbatch, however for heat stabilisation the P-range is preferred for it's 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 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 then 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.

- **Processing:**

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

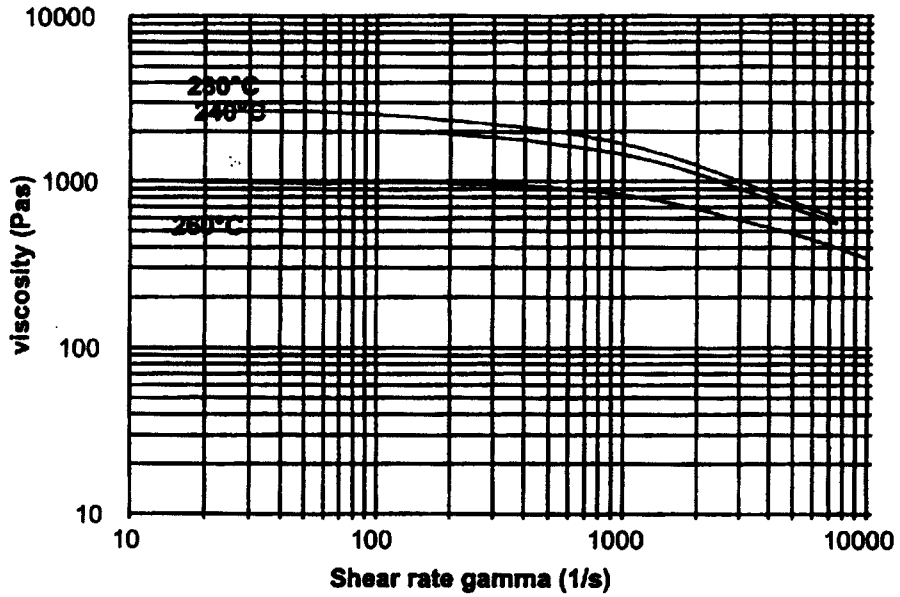
polymer	zone 1	zone 2	zone 3	additional	melt	mold
EL630	225	230	235	235	225-235	20-50
EM630	225	230	235	235	235	50

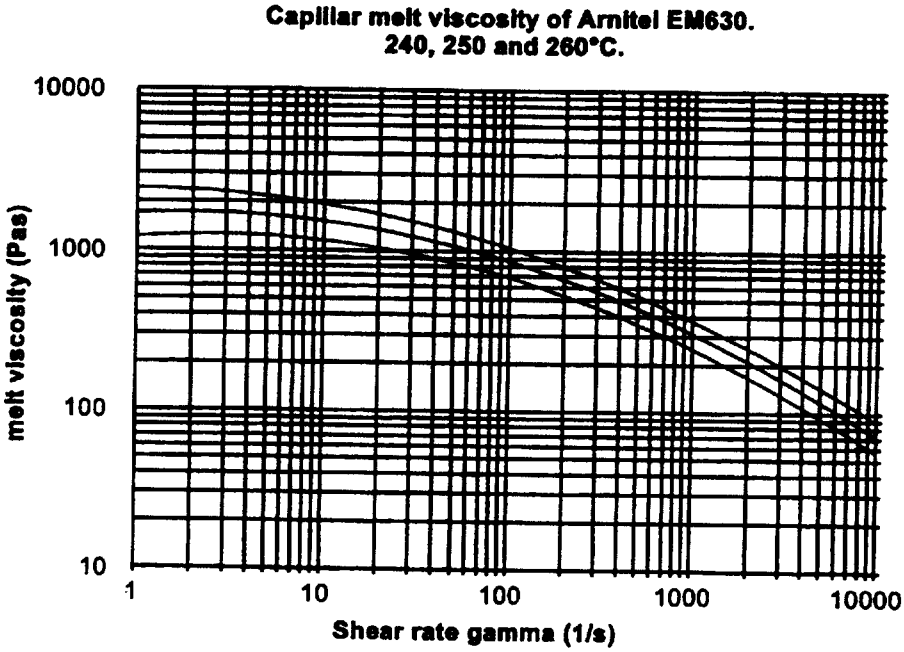
All temperatures are in °C.
Table 2.30: *Processing conditions for Arnitel EL630 and Arnitel EM630.*

- **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.





Graph 2.80 and 2.81: *Temperature dependancy of the melt viscosity for Arnitel 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 Arnitel EL630/EM630.*

- **Use of regrind:**

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

Mechanical property	SI Unit	typica 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

*1 Data for dry natural materials.
NB: No Break

Table 2.32: *mechanical properties of Arnitel® EL630.*

- **Abrasion:**

Arnitels show good abrasion resistance in both Taber and DIN 53516 abrasion tests. Data are shoen in the Arnitel general property overview (also included in the EPIC)

2.8.35 Flame retardancy:

Arnitel 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:

Arnitel EL630/EM630 can be used for cable jacketting 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	typica 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 δ) at 1kHz	-	0.019	0.019	IEC 250
Comparative tracking index	-	600	600	IEC 112
Volume resistivity	$10^{14}\Omega$.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:

Arnitel EL630 and EM630 are sensitive to strong bases and strong acids, especially at elevated temperatures. In some halogenated hydrocarbons (like tetrachloroethane), the materials (partially) dissolves. 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 Arnitels are more stable to water then 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 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.

■ WONDERLITE® PC 之代表物性：

特性 Typical Properties		試驗法 Test Method	單位 Unit	試驗條件 Condition	WONDERLITE® PC		
					光學級	射出級	
					PC-175	PC-110	PC-115
流動係數 Melt Flow Index		ASTM D1238	g/10min	300℃, 1.2 kg	75	10	15
比重 Specific Gravity		ASTM D792	-	23/23℃	1.20	1.20	1.20
吸水率 Water Absorption (immersion)		ASTM D570	%	24hr at 23℃	0.20	0.20	0.20
全光穿透率 Light Transmission		ASTM D1003	%	3 mm thick	89	89	89
濁度 Haze		ASTM D1003	%	3.2 mm thick	< 0.8	< 0.8	< 0.8
曲折率 Refractive Index		ASTM D542	-	-	1.585	1.585	1.585
引張強度, 降伏點 Tensile Strength at Yield		ASTM D638	Kg/cm^2	23℃	650	630	630
延伸率 Tensile Elongation	降伏點 Yield	ASTM D638	%	23℃	6	6	6
	破斷點 Break			23℃	50	110	110
彎曲強度 Flexural Strength		ASTM D790	Kg/cm^2	23℃	920	920	920
彎曲模數 Flexural Modulus		ASTM D790	Kg/cm^2	23℃	24000	24000	24000
Izod 缺口衝擊強度 Izod Impact Strength, Notched		ASTM D256	Kg · cm/cm	1/4"	-	14.3	14.3
				1/8"	-	87	87
洛式硬度 Rockwell Hardness		ASTM D785	M Scale	-	M-77	M-77	M-77
壓縮強度 Compressive Strength		ASTM D695	Kg/cm^2	-	-	780	780
熱變形溫度, 未退火 Heat Distortion Temperature, unannealed		ASTM D648	℃	4.6 Kg/cm^2, 120℃/hr	-	136	136
				18.6 Kg/cm^2, 120℃/hr	-	125	125
軟化點 Vicat Softening Temperature		ASTM D1525	℃	1 Kg, 50℃/hr	-	153	153
線膨脹係數 Coefficient of Linear Expansion		ASTM D696	$x10^{-5}$ cm/cm/℃	40~100℃	6~8	6~8	6~8
熱傳導率 Thermal Conductivity		ASTM C177	W/m℃	-	0.2	0.2	0.2
成型收縮率 Mold Shrinkage		ASTM D955	%	parallel	0.5-0.7	0.5-0.7	0.5-0.7
				across	0.5-0.7	0.5-0.7	0.5-0.7
燃燒率 Flammability		UL 94	1/16"	-	-	V-2	V-2
體積電阻率 Volume Resistivity		ASTM D257	$x10^{16}$ Ω • cm	-	3	3	3

介電常數 Dielectric Constant	ASTM D150	-	60 Hz	-	2.95	2.95
			10^6 Hz	-	2.9	2.9
介電損失 Dielectric Dissipation Factor (tand)	ASTM D150	-	60 Hz	-	0.0004	0.0004
			10^6 Hz	-	0.009	0.009
絕緣破壞強度 Dielectric Breakdown Strength	ASTM D149	kV/mm	1.6mm	-	30	30
耐電弧性 Arc Resistance (Tungsten electrode)	ASTM D495	sec	-	-	110	110
產品特性/ 主要應用 Characteristics/Principal Applications				光碟片 Optical Disc	中黏度 Medium Viscosity	低黏度 Low Viscosity

? ? ? : ? ? ? ? ? ? ? ? ? ?

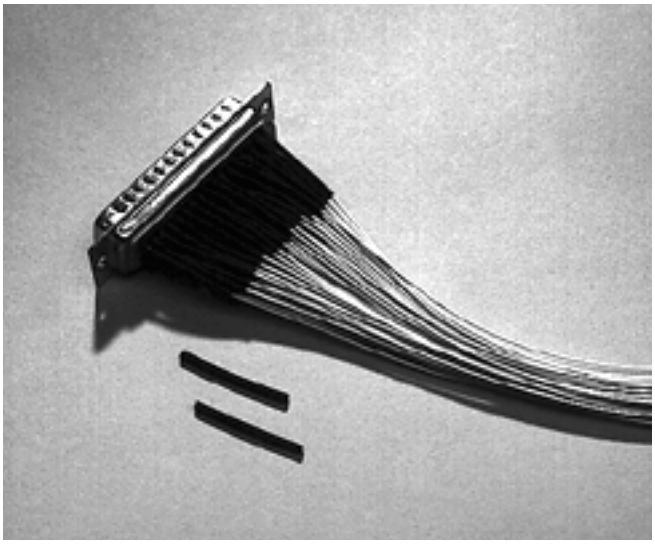
Fax-on-Demand: (800) 260-9099
(650) 361-6523

Before ordering check with factory for most current data.

FAX ID	Description
2240	Data sheet
2590	RW-3010

Versafit V4

Very-thin-wall, very flexible, highly flame-retardant polyolefin tubing



Applications

Typically used where space saving is important. Offers the ability to pack components more closely than is possible with standard tubings. Cost-effective choice for many commercial applications; electrically insulates and protects in-line components, disconnect terminals, and splices. Used for strain relief on high-density connectors.

Operating Temperature Range

–55°C to 125°C

Features/Benefits

- 2:1 shrink ratio.
- Very thin wall provides space savings and rapid shrinking.
- Low shrink temperature further reduces installation time and risk of damage to temperature-sensitive components.
- Very flexible; doesn't easily wrinkle when bent.
- Free of polybrominated biphenyls (PBBs) and polybrominated biphenyl oxides and ethers (PBBOs and PBBEs), which are classified as environmentally hazardous substances.

Installation

Minimum shrink temperature: 70°C
Minimum full recovery temperature: 90°C

Specifications/Approvals

Series	UL	CSA	Raychem
Versafit V4	E35586 VW-1 300 V, 125°C	LR31929 OFT 150 V, 125°C	RW-3010

Product Dimensions

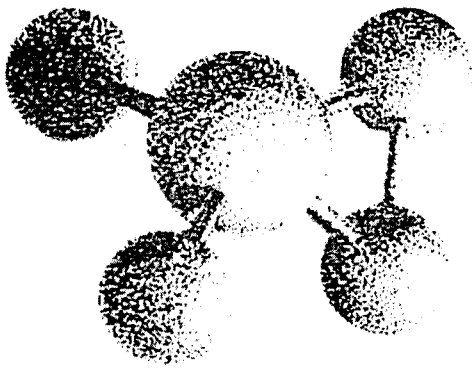
Metric sizes	As supplied: Inside Diameter	As supplied: Wall thickness (nominal)	After shrinkage: Inside diameter (max.)	After shrinkage: Wall thickness* (min.)
1.0/0.5	1.4 ±0.25	0.1	0.5	0.25
1.5/0.75	1.9 ±0.25	0.1	0.75	0.25
2.0/1.0	2.3 ±0.25	0.1	1.0	0.25
2.5/1.25	2.8 ±0.25	0.15	1.25	0.25
3.0/1.5	3.3 ±0.25	0.15	1.5	0.25
3.5/1.75	3.8 ±0.25	0.15	1.75	0.25
4.0/2.0	4.4 ±0.25	0.15	2.0	0.25
Inch sizes (mm/*in*)				
3/64	1.2 *(.046)*	0.6 *(.023)*	.30 ±.05 *(.012 ±.002)*	
1/16	1.6 *(.063)*	0.8 *(.031)*	.30 ±.05 *(.012 ±.002)*	
3/32	2.4 *(.093)*	1.2 *(.046)*	.30 ±.05 *(.012 ±.002)*	
1/8	3.2 *(.125)*	1.6 *(.062)*	.33 ±.05 *(.013 ±.002)*	
3/16	4.8 *(.187)*	2.4 *(.093)*	.33 ±.05 *(.013 ±.002)*	

Size	As supplied: Inside diameter	As supplied: Wall thickness	After shrinkage: Inside diameter (max.)	After shrinkage: Wall thickness* (min.)
5.0/2.5	5.5 ±0.25	0.15	2.5	0.25
6.0/3.0	6.5 ±0.4	0.15	3.0	0.28
7.0/3.5	7.5 ±0.4	0.15	3.5	0.28
8.0/4.0	8.5 ±0.4	0.15	4.0	0.28
9.0/4.5	9.5 ±0.4	0.15	4.5	0.28
10.0/5.0	10.5 ±0.5	0.15	5.0	0.28
1/4	6.4 *(.250)*	3.2 *(.125)*	.36 ±.05 *(.014 ±.002)*	
3/8	9.5 *(.375)*	4.8 *(.187)*	.36 ±.05 *(.014 ±.002)*	
1/2	12.7 *(.500)*	6.4 *(.250)*	.36 ±.05 *(.014 ±.002)*	
3/4	19.1 *(.750)*	9.5 *(.375)*	.46 ±.08 *(.017 ±.003)*	
1	25.4 *(1.000)*	12.7 *(.500)*	.51 ±.08 *(.020 ±.003)*	

*Wall thickness will be less if tubing recovery is restricted during shrinkage.

Ordering Information

Color	Standard	Black (-0)
	Nonstandard	Other colors available upon request.
Size selection	Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request.	
Standard packaging	On spools.	
Marking	Marked with UL/CSA/-F- legends.	
Ordering description	Specify product name, size, and color (for example, Versafit V4-1.0-0).	



施敏打硬 CEMEDINE 1500

〔一般性質〕

	主　　劑	硬　化　劑
主要成分	環氧（Epoxy）樹脂	聚醯胺（Poly-Amido）樹脂
顏色常態	的中間體淺黃色透明液體	棕色透明液體
不揮發率（%）	99.6	99.4
黏度(9/20°C)	350	600
比重(20/20°C)	1.16	0.97
溶　　劑	無	
硬化劑混合比例phr	60~110	
保持粘度時間	參照混合硬化劑後的粘度變化表	
膠化時間	3小時	
硬化所需時間	6小時10分鐘	
可保存時間(20°C)	2年	

〔特性〕

由兩種液體混合而成的環氧（Epoxy）樹脂系黏着劑，能在常溫下硬化，應用範圍至爲廣汎，可穩定黏着金屬，塑膠以及其他各種物質。而由於此黏着劑，通常以聚醯胺）Poly-Amido）樹脂爲其硬化劑，具有下列各優點：

1. 能在常溫下硬化。
2. 縱使所使用的硬化劑份量不同，也不影響其特性。
3. 由於能產生比一般黏着劑富有彎曲性的黏着層，縱使黏着不同材質的物品，也能以黏着層緩和熱膨脹的差別所引起的兩物品彎曲，對機械學的衝擊也能顯示較爲良好的性能。
4. 由於能形成透明的黏着層，可以黏着透明的物質，如玻璃等等。

〔用　途〕

由於能强力黏着各種物質，諸如金屬，熱硬化塑膠，玻璃，飛機裝配以及一般家庭器具等等，應用範圍至爲廣汎。

縱然是複聚乙烯（Polythylene），聚酯（Polyester），天然以及人造橡膠等，以一般的黏着根本無法黏着的物質，如果加以適當的表面處理，即可强力黏着。

〔實　例〕

汽車、火車、船隻、飛機……。（將金屬把手黏着於玻璃窗／可以黏着鋁製品，三聚氰胺（Melamine）裝飾板等，於內部以增加强度／不同金屬間爲免防止電傷且加黏之／當作防腐塗料亦可）。

電器製品……。（由於是一種優秀的黏着劑，使用於高級擴聲器、音響線圈的黏着／電磁器或外殼的黏着／線圈框的黏着／鐵粉芯的黏着／馬達線圈的黏着等等）。

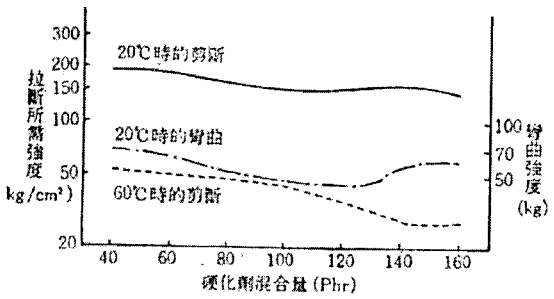
建築……（玻璃、壓克力門或將文字板黏於屋風黏住把手／照明設備以及其他塑膠裝飾品的加黏以及組立／不銹鋼製品、鋁製建材、陶器或大理石等需要强力黏劑物品的加黏。

高級裝飾品，玻璃以及塑膠製工藝品，精密機械……（照像機，調整距離儀／分光儀等等的固定）。

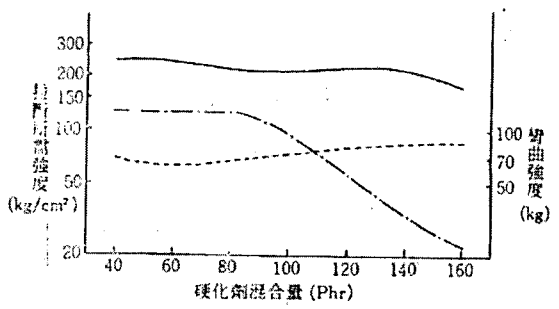
其他諸如罐頭，運動器材，公路標誌等等的加黏。

除上述各種加黏外，也可以使用作塡充劑，鑄模用，敷層用以及襯裏用。

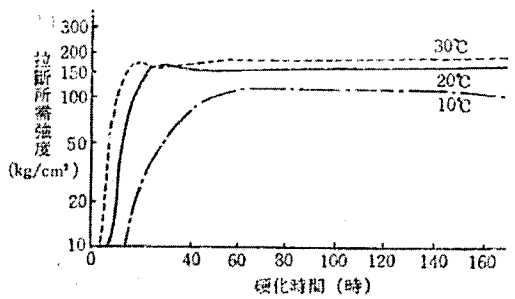
加熱溫度	加熱時間
60 °C	120分以上
80 °C	60~90分
100 °C	40~60分
120 °C	30~40分



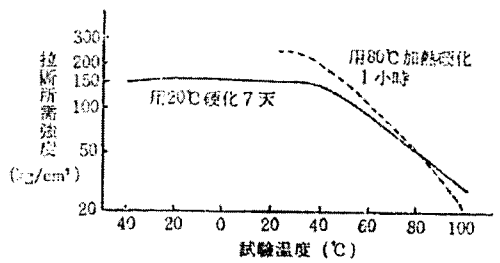
圖Ⅱ 2.1
硬化剤混合量和黏力強度
（在20°C七天的硬化）
試驗片：軟鋼板 (25×100×1.6mm)
(Over-lap)12.5mm



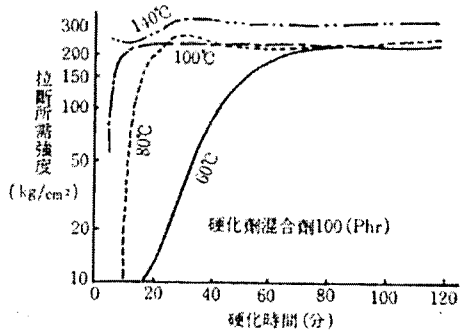
圖Ⅱ 2.2
硬化剤混合量和黏力強度
（在80°C一小時的硬化）
試驗片：以及其他同圖Ⅱ 2.1



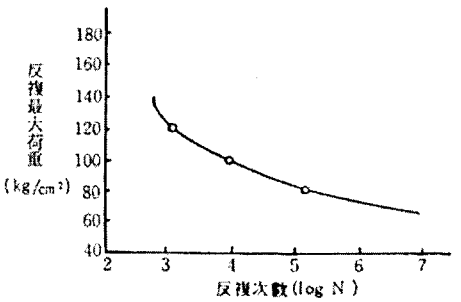
圖Ⅱ 2.3
常溫時的硬化特性 硬化剤混合率 100phr



圖Ⅱ 2.5
耐熱特性 硬化剤混合率爲 100phr



圖Ⅱ 2.4
加熱硬化特性 硬化剤混合率爲 100phr



圖Ⅱ 2.6
老化特性

表Ⅱ 2.1 物理特性

抗 張 力 (kg/mm²)	5.04	硬度 ロックウエルM	68
抗 折 力 (kg/mm²)	7.40	硬度 バーコル	67
彎曲彈性率 (kg/mm²)	214	硬度 ショアーD	82
衝撃強度 (kg/mm²)	11.6	表面固定電阻 (Ω)	5.6×10^{13}
壓縮強度 (kg/mm²)	15.10(6.41)(1)	體積固有電阻 (Ω-Cm)	10.5×10^{15}
熱變形溫度 (°C)	47	誘電率 (10^6cycle)	2.94
		電壓破壞 (kv/mm)	19

表Ⅱ 2.2 拉斷所需强度

被黏體	拉斷所需强度	被黏體	拉斷所需强度 (20°C)
樺樹材	83	多元焦炭	22
馬來西亞杉材	106 *	苯乙烯樹脂	19
針葉樹材	99< *	壓克力樹脂	30
杉材	66	硬質鹽烯樹脂	36
鐵	158	三聚氰胺裝飾板(表面)	55
鋁	61	三聚氰胺裝飾板(背面)	45
黃銅	60		
銅	80	F R P	125
鉻電鍍	71		
鋅電鍍	50		

〔註〕 1. 粘着條件： 20°C，硬化7天，硬化劑混合比 100phr(接合部over-lap)12.5mm。

2.*記號者表示材料拉斷。

表Ⅱ 2.3 促進劣化特性

試驗	未試驗前的粘力强度 (kg/cm²)	比較調整試驗片的粘力强度(1)（1個月） (kg/cm²)	經過各試驗1個月後的粘力强度 (kg/cm²)	經過各試驗 1,000 小時後的粘力强度 (kg/cm²)
利用測候儀所做的耐候試驗	143	150	—	166
利用噴射鹽水的促進試驗	143	150	100	—
利用高溫高濕的促進試驗(2)	143	150	143	—
利用反復冷却的促進試驗(3)	143	150	183	—

〔註〕 (1) 20±1°C, 65±5%RH 各保持1個月的試驗片；(2)50°C100%RH；(3)−5°C8小時～50°C16小時。

表Ⅱ 2.4 耐候性

拉斷所需强度 (kg/cm²)

暴露前的粘力强度					147
比較調整試驗片的粘力强度（6個月）	※	156	在戶外暴露6個月的粘力强度		147
〃 （1年）	※	138	〃 1年	〃	152
〃 （2年）	※	130	〃 2年	〃	138
〃 （3年）	※	123	〃 3年	〃	137
〃 (10年)	※	111	〃 10年	〃	130

〔註〕 ※20±1°C, 65±5%RH 保持各期間的試驗片。

表Ⅱ 2.5 耐水性 (20°C, 7天硬化)

拉斷所需强度 (kg/cm²)

試驗＼時間	0	3個月	6個月	1年
常態試驗	120	106	123	120
耐水試驗		109	117	109

〔註〕 硬化劑混合比爲 100phr
試驗片：不銹鋼 (100×25×1.5mm)
(接合部Over-lap)12.5mm。

表Ⅱ 2.6 耐水性 (60°C, 2小時硬化)

拉斷所需强度 (kg/cm²)

試驗＼時間	0	3個月	6個月	1年
常態試驗	157	150	169	163
耐水試驗		133	108	116

〔註〕 同表Ⅱ 2.5

表II 2.7 耐 油 性　　拉斷所需强度 (kg/cm²)

放置日數	1天	3天	5天	10天	20天	1個月
放置於20°C室溫	—	—	—	80.0	—	79.0
0°C油中	—	—	77.5	87.5	—	80.0
20°C油中	—	—	82.5	77.6	—	89.5
70°C油中	77.6	75.3	80.0	74.3	—	71.0
循環油中 cycle	—	—	79.0	78.0	89.0	76.0

放置日數	40天	2個月	3個月	6個月	1年	10年
放置於 20°C室溫	—	—	73.0	65.9	76.3	75.9
0°C油中	—	86.5	71.5	80.5	80.2	—
20°C油中	—	70.5	79.5	78.7	79.7	—
70°C油中	—	75.5	—	75.4	68.3	—
循環油中 (cycle)	71.5	—	—	—	—	—

〔註〕1．硬化劑混合比爲80phr，試驗片鐵木片 (100×25×3mm)接合部(Over-lap)12.5mm　2.油爲變壓器油。
3．試驗片全部破裂。

表II 2.8 耐溶劑、耐藥品性

種類		浸漬7天後的黏力保持率 (%)		浸漬1個月後的黏力保持率 (%)	
		以20°C硬化7天的試驗片	以80°C硬化1小時的試驗片	以20°C硬化7天的試驗片	以80°C硬化1小時的試驗片
溶劑	已烷	107.0	80.6	94.1	78.8
		85.5	63.8	51.7	66.8
		88.8	69.5	93.4	70.8
		89.5	71.3	97.4	68.7
		90.2	64.7	101.3	69.1
	三氯化烯	91.5	72.7	65.0	69.5
油	植物油	102.7	90.8	107.3	90.3
	礦物油	96.2	87.8	98.1	84.2
藥品	蒸餾水	93.4	72.3	96.3	69.3
	10% 硝酸溶液	93.4	72.8	79.8	69.8
	10% 硫酸溶液	74.7	67.8	70.8	57.2
	10% 苛性蘇打溶液	97.2	74.3	83.8	74.3
	10% 食鹽水溶液	89.6	71.8	91.0	69.8
	10% 酢酸溶液	94.2	77.8	78.4	64.2

〔註〕黏劑混合率＝1：1，試驗片：軟鋼片 (25×100×1.6mm) 但是耐藥試驗時使用了SUS-27，接合部 (Over-lap) 爲 12.5mm。

容量規格＝(主)、(硬) 110g、1kg、　　15kg (組)

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TAI HWA ELECTRONIC CO., LTD.(CHINA)
SHANGHAI HUA YU ELECTRONIC CO., LTD.(CHINA)
AEON TECH CO., LTD.(CHINA)

SPECIFICATION FOR APPROVAL

CUSTOMER:TP-LINK

PART NAME:2.4GHz(3dBi) RF Antenna Assembly

PART NO.:31010008 ***REVISION:***

W. Y. P/NO.:C636-510009-A ***REV.:A***

SSR-00470

	MANUFACTURER SIGNATURE	**CUSTOMER SIGNATURE**
APPROVED BY :		
DATE :		

WHA YU GROUP

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INDEX

RF Antenna Cable Assembly

Specification

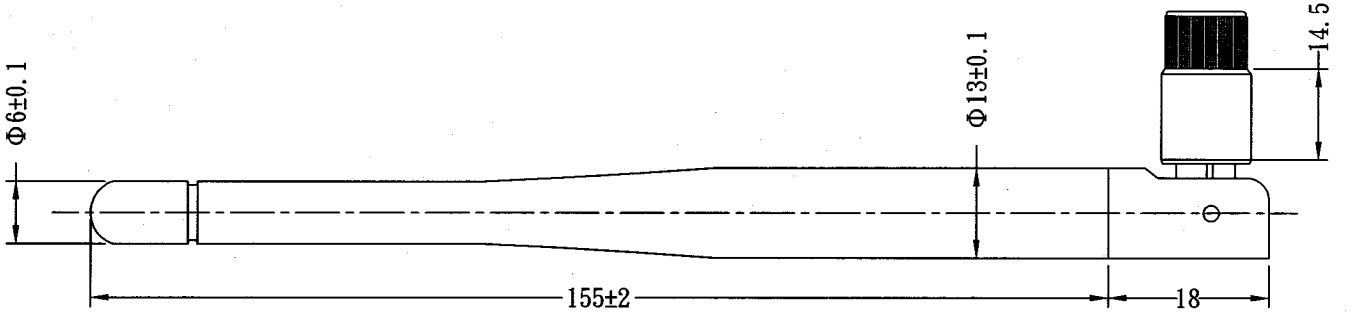
1. Electrical Properties :

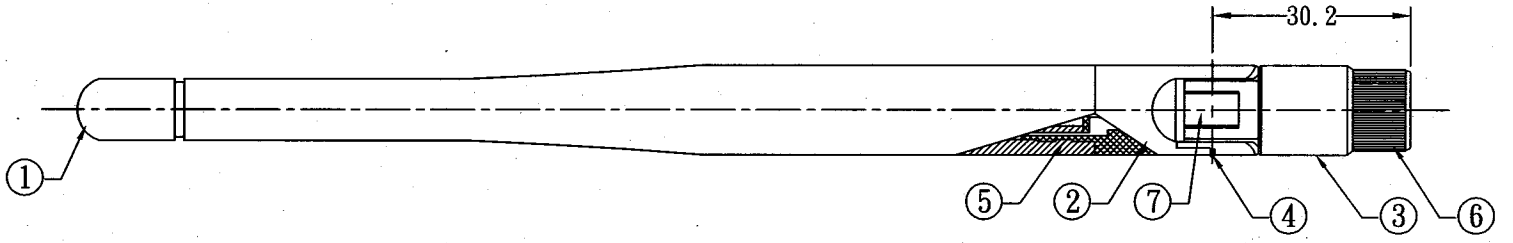
1.1 **Frequency Rang……2.4GHz ~ 2.5GHz**
1.2 **Impedance …… 50Ω Nominal**
1.3 **VSWR …… 1.92 Max.**
1.4 **Return Loss…… -10dB Maximum**
1.5 **Electrical Wave……1/4 λ Helix**
1.6 **Gain…….……3.0 dBi**
1.7 **Admitted Power……1W**
1.8 **Polarization…… Linear Vertical**

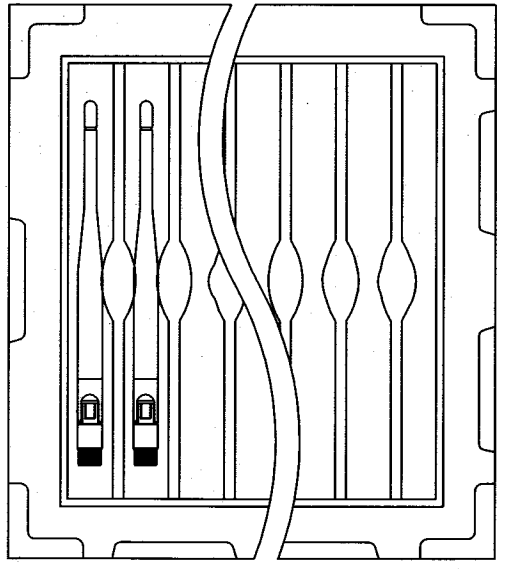
2. Physical Properties :

2.1 Cable……RG-178 Cable
2.2 Antenna Cover……TPE
2.3 Antenna Base1……PC
Antenna Base2……PBT
2.4 Operating Temp. …… -20℃ ~ +65℃
2.5 Storage Temp. …… -30℃ ~ +75℃
2.6 Color …… Black
2.7 Connector …… SMA Plug

REV.	DATE	DESCRIPTION







PACKING:20PCS/TRAY

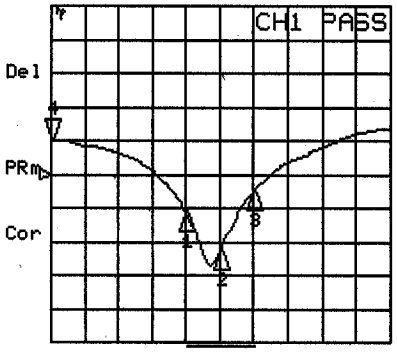
NO.	DESCRIPTION	Q'TY	EQUIVALENT
7	CABLE; RG-178CABLE; TRANSLUCENT BROWN, 50Ω	1	EQUIVALENT
6	CONNECTOR; BIG SMA STRAIGHT PLUG/REVERSE; BLACK	1	EQUIVALENT
5	GROUND TUBE; BRASS; Ni-PLATED	1	EQUIVALENT
4	RIVET; BRASS; Cr-PLATED; COLOR: BLACK	2	EQUIVALENT
3	ANTENNA BASE; PBT; COLOR: BLACK	1	EQUIVALENT
2	ANTENNA BASE; PC; COLOR: BLACK	1	EQUIVALENT
1	ANTENNA BODY; TPE; COLOR: BLACK	1	EQUIVALENT

XX.±3.0 X.±2.0 .X±1.0 .XX±0.5 .XXX±0.1	APPROVED	CUSTOMER: TP-LINK			
	CHECKED	W.Y. P/N: C636-510009-A			
		PART NAME: RF CABLE ASSEMBLY			
		PART NO.: 31010008			
	DRAWED	REV.	UNIT	PAGE	FILE: SSR-00470
		A	mm	1/2	DATE: 2004.10.29

WHA YU
INDUSTRIAL CO., LTD.
譁裕實業股份有限公司

25 Sep 2004 09:20:17

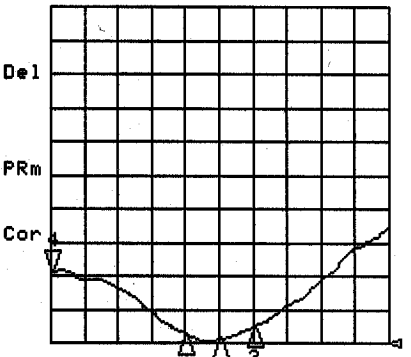
CH1 LOG 5 dB/ REF -10 dB
S11 4:-4.9512 dB 2 200.150 000 MHz



CH1 Markers
1:-15.598 dB
2.40000 GHz
2:-21.169 dB
2.45000 GHz
3:-12.319 dB
2.50000 GHz

START 2200.000 MHz STOP 2700.000 MHz

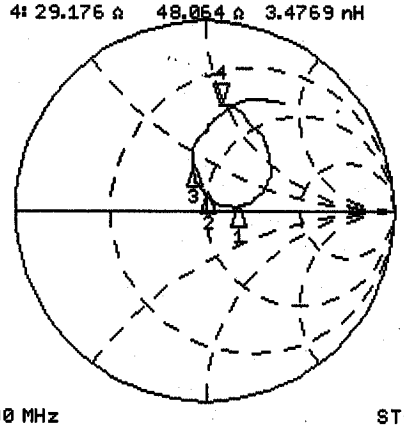
CH2 SWR 1 / REF 1
S11 4: 3.1597 2 200.000 000 MHz



CH2 Markers
1: 1.2695
2.40000 GHz
2: 1.1221
2.45000 GHz
3: 1.4895
2.50000 GHz

START 2200.000 MHz STOP 2700.000 MHz

CH3 S11 1 U FS 4: 29.176 Ω 48.064 Ω 3.4769 nH 2 200.150 000 MHz



CH3 Markers
1: 69.621 Ω
3.0781 Ω
2.40000 GHz
2: 49.508 Ω
8.7168 Ω
2.45000 GHz
3: 39.311 Ω
19.379 Ω
2.50000 GHz

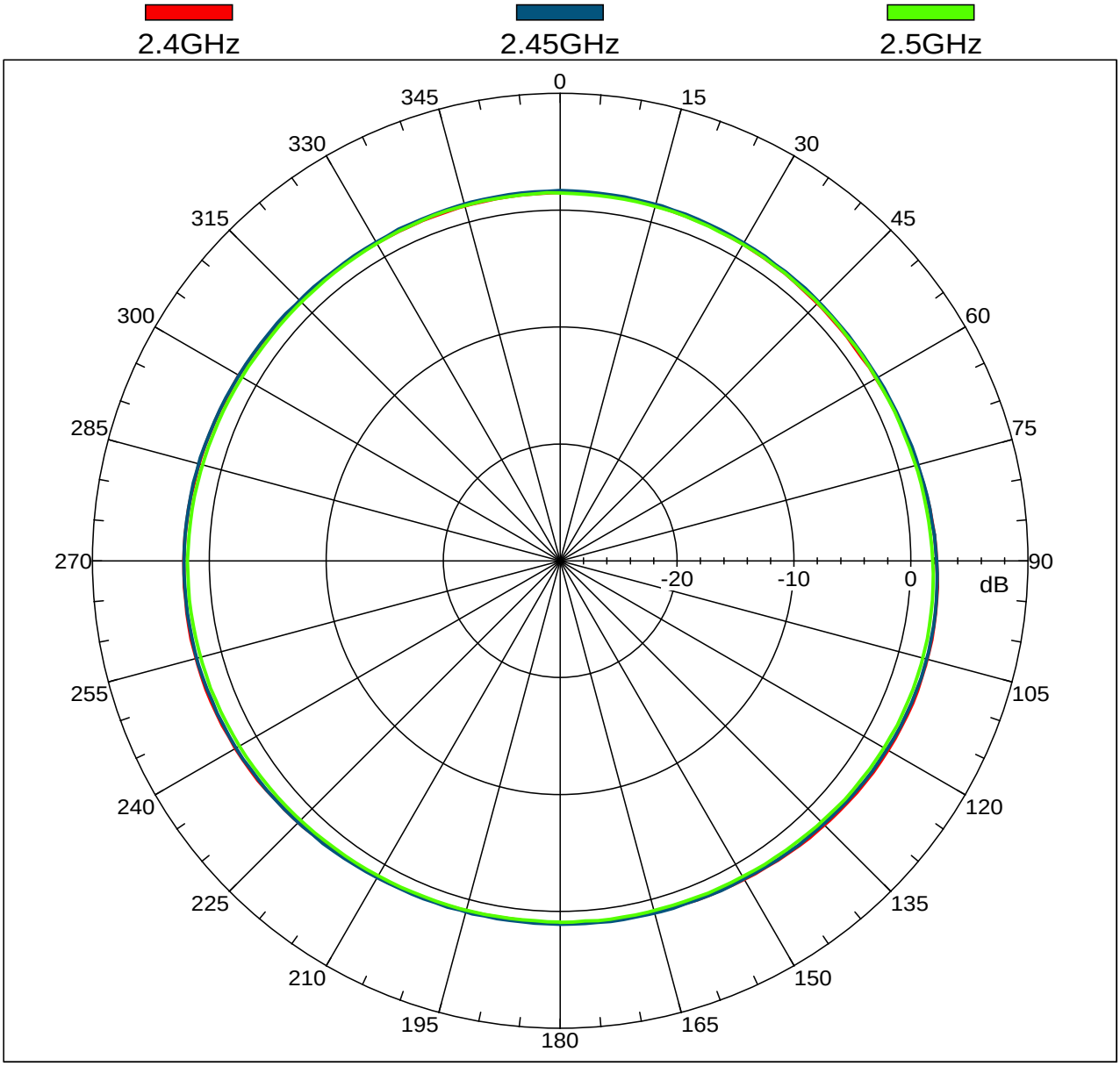
START 2 200.000 000 MHz STOP 2 700.000 000 MHz

謙裕實業股份有限公司
WHA YU INDUSTRIAL CO., LTD

RF Antenna Assembly

SPEC : 2.4 ~ 2.5GHz

Far-field amplitude of 2.4GHz test-V1-1.nsi

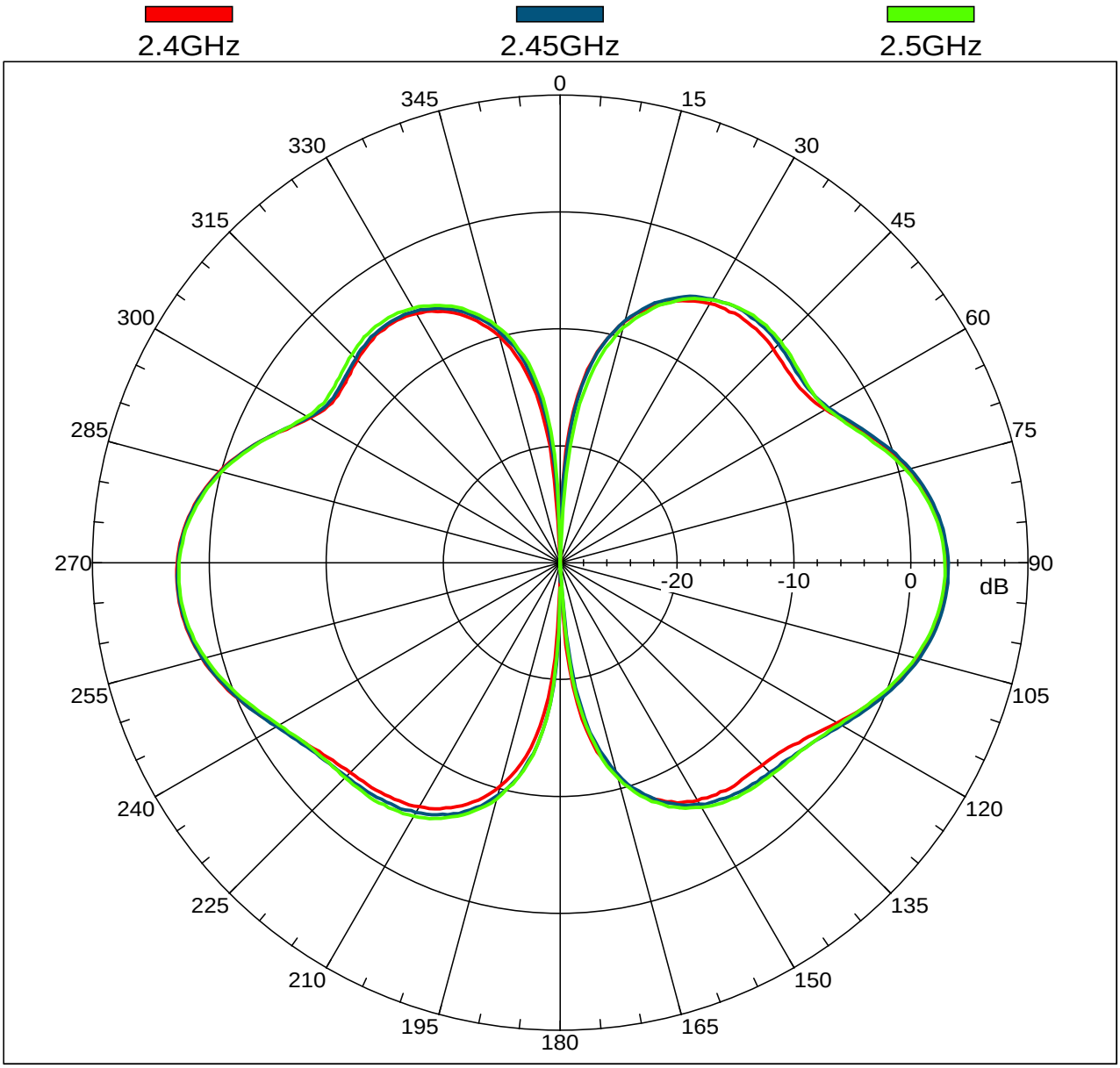


謙裕實業股份有限公司
WHA YU INDUSTRIAL CO., LTD

RF Antenna Assembly

SPEC : 2.4 ~ 2.5GHz

Far-field amplitude of 2.4GHz test-H1-5.nsi



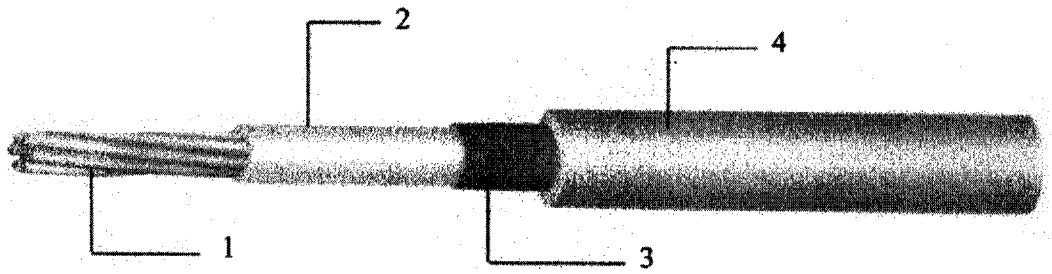
Nizing Electric Co., Ltd. 11-15 Santai Rd., Hsinchuang, Taipei Hsien, 242, Taiwan, R.O.C.
Tel: 02-29016164 Fax: 29050644 E-mail: shenbinnizing@yahoo.com.tw

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 x 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	Rocke Liu
APPROVALS	Shen Bin Chen

Nizing Electric Co., Ltd.
11-15 Santai Rd., Hsinchuang, Taipei Hsien, 242, Taiwan, R.O.C.
Tel: 02-29016164 Fax: 29050644 E-mail: shenbinnizing@yahoo.com.tw

III – Characteristics

Item	Unit	Specified Value	Note
Temperature Rating	℃	-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	Rueke Lin
APPROVALS	Shen Bin Chao

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
℃	195	185	202	212	221	197
μm/m.k	220	160	180	140	110	150
℃	\	\	110	115	120	\
℃	130	150	180	200	200	145
℃	\	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/㎡	NB	NB	NB	NB	NB	NB
kj/㎡	NB	NB	NB	NB	200	NB
kj/㎡	NB	NB	NB	NB	9	NB
kj/㎡	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

2.2 Product coding

The structure of the Arnitel productcodes is illustrated wirth 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, perfomance
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.

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

Table 2.3: *Examples of specialty grades*

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 stucture of Arnitel EL630/EM630 is shown below.

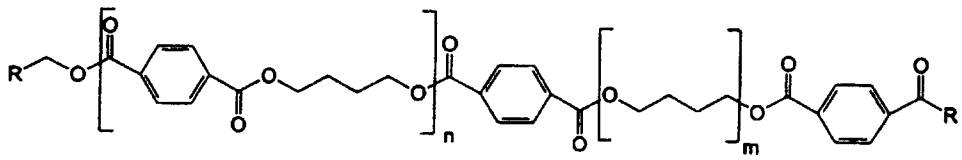


Figure 2.9: *Chemical structure of Arnitel EL630/EM630.*

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

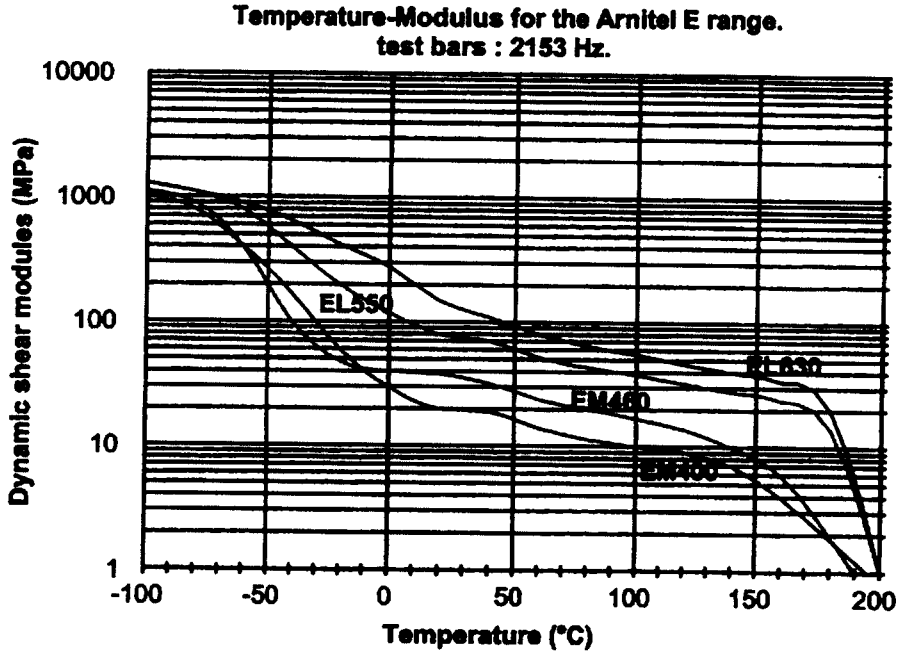
Figure 2.10: *Simplified structure of Arnitel EL630/EM630 .*

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.*

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.

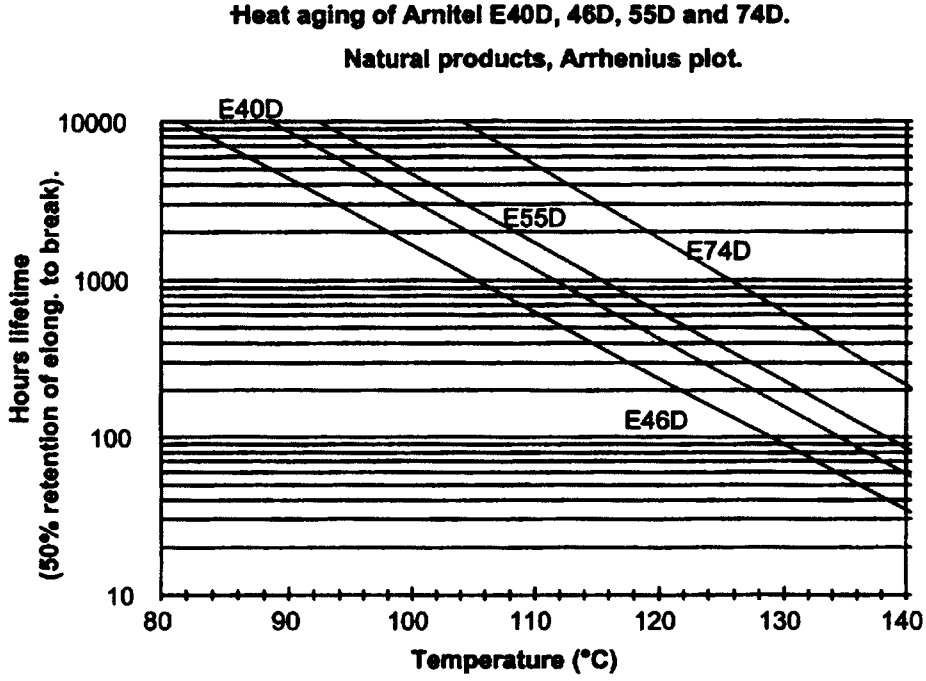
analysis	SI unit	typical data	test method
Vicat A	(°C)	200	ISO 306/A
Vicat B	(°C)	125	ISO 306/B
HDT-B	(°C)	115	ISO 75-1

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 $140*10^{-4}$ µm/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.



Graph 2.77: *Heat stability for Arnitel E-range.*

Heat ageing can be improve using a stabilisation masterbatch, however for heat stabilisation the P-range is preferred for it's 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 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 then 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.

- **Processing:**

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

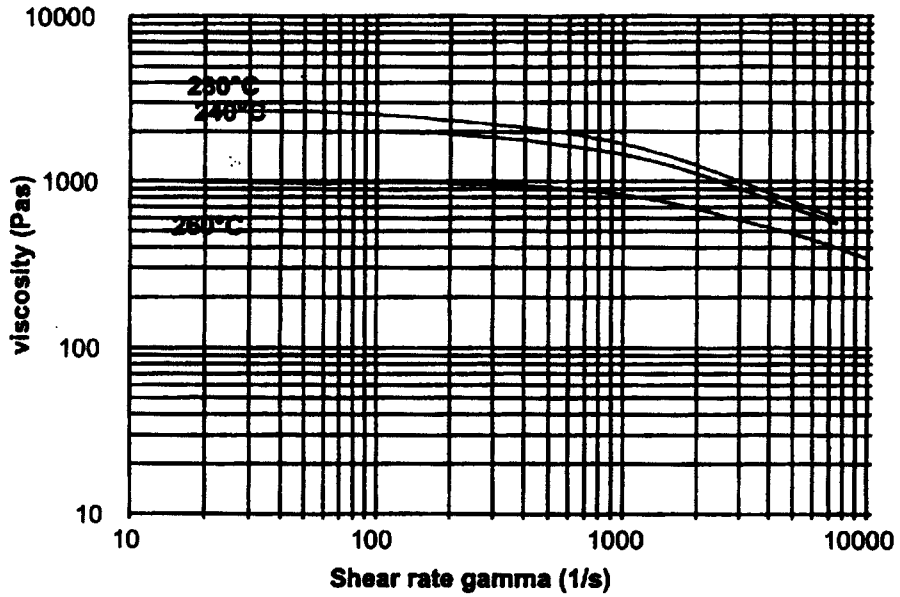
polymer	zone 1	zone 2	zone 3	additional	melt	mold
EL630	225	230	235	235	225-235	20-50
EM630	225	230	235	235	235	50

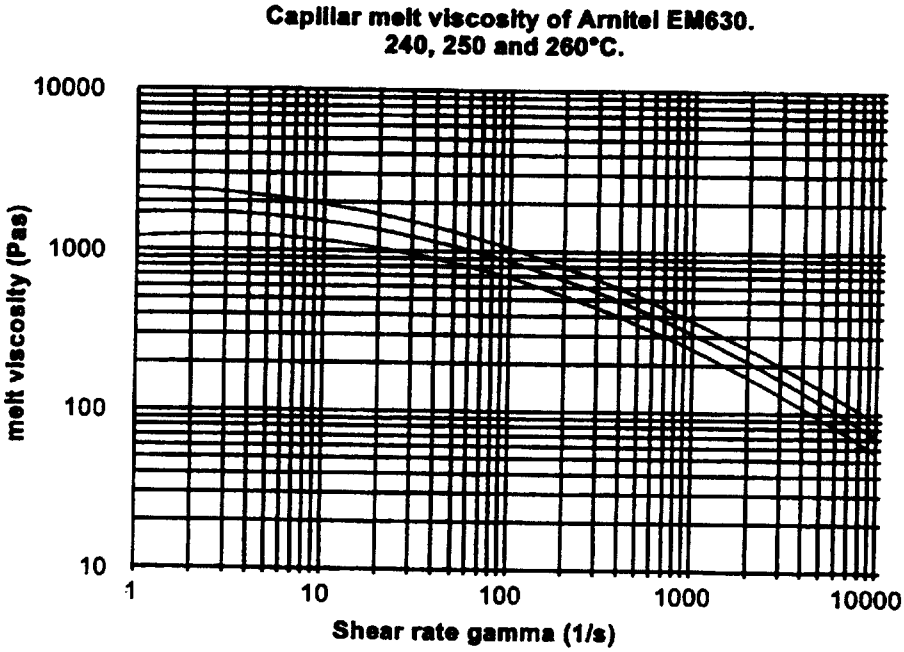
All temperatures are in °C.
Table 2.30: *Processing conditions for Arnitel EL630 and Arnitel EM630.*

- **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.





Graph 2.80 and 2.81: *Temperature dependancy of the melt viscosity for Arnitel 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 Arnitel EL630/EM630.*

- **Use of regrind:**

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

Mechanical property	SI Unit	typica 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

*1 Data for dry natural materials.
NB: No Break

Table 2.32: *mechanical properties of Arnitel® EL630.*

- **Abrasion:**

Arnitels show good abrasion resistance in both Taber and DIN 53516 abrasion tests. Data are shoen in the Arnitel general property overview (also included in the EPIC)

2.8.35 Flame retardancy:

Arnitel 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:

Arnitel EL630/EM630 can be used for cable jacketting 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	typica 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 δ) at 1kHz	-	0.019	0.019	IEC 250
Comparative tracking index	-	600	600	IEC 112
Volume resistivity	$10^{14}\Omega$.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:

Arnitel EL630 and EM630 are sensitive to strong bases and strong acids, especially at elevated temperatures. In some halogenated hydrocarbons (like tetrachloroethane), the materials (partially) dissolves. 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 Arnitels are more stable to water then 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 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.

■ WONDERLITE® PC 之代表物性：

特性 Typical Properties		試驗法 Test Method	單位 Unit	試驗條件 Condition	WONDERLITE® PC		
					光學級	射出級	
					PC-175	PC-110	PC-115
流動係數 Melt Flow Index		ASTM D1238	g/10min	300℃, 1.2 kg	75	10	15
比重 Specific Gravity		ASTM D792	-	23/23℃	1.20	1.20	1.20
吸水率 Water Absorption (immersion)		ASTM D570	%	24hr at 23℃	0.20	0.20	0.20
全光穿透率 Light Transmission		ASTM D1003	%	3 mm thick	89	89	89
濁度 Haze		ASTM D1003	%	3.2 mm thick	< 0.8	< 0.8	< 0.8
曲折率 Refractive Index		ASTM D542	-	-	1.585	1.585	1.585
引張強度, 降伏點 Tensile Strength at Yield		ASTM D638	Kg/cm^2	23℃	650	630	630
延伸率 Tensile Elongation	降伏點 Yield	ASTM D638	%	23℃	6	6	6
	破斷點 Break			23℃	50	110	110
彎曲強度 Flexural Strength		ASTM D790	Kg/cm^2	23℃	920	920	920
彎曲模數 Flexural Modulus		ASTM D790	Kg/cm^2	23℃	24000	24000	24000
Izod 缺口衝擊強度 Izod Impact Strength, Notched		ASTM D256	Kg · cm/cm	1/4"	-	14.3	14.3
				1/8"	-	87	87
洛式硬度 Rockwell Hardness		ASTM D785	M Scale	-	M-77	M-77	M-77
壓縮強度 Compressive Strength		ASTM D695	Kg/cm^2	-	-	780	780
熱變形溫度, 未退火 Heat Distortion Temperature, unannealed		ASTM D648	℃	4.6 Kg/cm^2, 120℃/hr	-	136	136
				18.6 Kg/cm^2, 120℃/hr	-	125	125
軟化點 Vicat Softening Temperature		ASTM D1525	℃	1 Kg, 50℃/hr	-	153	153
線膨脹係數 Coefficient of Linear Expansion		ASTM D696	$x10^{-5}$ cm/cm/℃	40~100℃	6~8	6~8	6~8
熱傳導率 Thermal Conductivity		ASTM C177	W/m℃	-	0.2	0.2	0.2
成型收縮率 Mold Shrinkage		ASTM D955	%	parallel	0.5-0.7	0.5-0.7	0.5-0.7
				across	0.5-0.7	0.5-0.7	0.5-0.7
燃燒率 Flammability		UL 94	1/16"	-	-	V-2	V-2
體積電阻率 Volume Resistivity		ASTM D257	$x10^{16}$ Ω • cm	-	3	3	3

介電常數 Dielectric Constant	ASTM D150	-	60 Hz	-	2.95	2.95
			10^6 Hz	-	2.9	2.9
介電損失 Dielectric Dissipation Factor (tand)	ASTM D150	-	60 Hz	-	0.0004	0.0004
			10^6 Hz	-	0.009	0.009
絕緣破壞強度 Dielectric Breakdown Strength	ASTM D149	kV/mm	1.6mm	-	30	30
耐電弧性 Arc Resistance (Tungsten electrode)	ASTM D495	sec	-	-	110	110
產品特性/ 主要應用 Characteristics/Principal Applications				光碟片 Optical Disc	中黏度 Medium Viscosity	低黏度 Low Viscosity

? ? ? : ? ? ? ? ? ? ? ? ? ?

Valox 物性　Typical Properties of Valox

PBT

Valox®

項目 Property	試驗法 ASTM Test Method	單位 Units	300			400						500			700			
			310	310SEO	325	DR51	420	414	457	DR48	420SEO	507	508	553	735	745	750	780
物理的性質 比重 Specific Gravity	D792 23 ℃		1.31	1.41	1.31	1.40	1.53	1.60	1.45	1.50	1.62	1.51	1.49	1.60	1.62	1.46	1.75	1.77
吸水率 Water Absorption	D570 23 ℃ 24HRS	%	0.08	0.08	0.08	0.07	0.06	0.06	0.07	0.07	0.07	0.06	0.07	0.06	0.08	0.09	0.07	0.02
成形收縮率 Mold Shrinkage	D955	%	1.7~2.3	1.0~1.7	1.7~2.3	0.3~0.5 0.8~1.0	0.1~0.3 0.7~0.9	0.1~0.2 0.6~0.8	0.5~0.7 0.8~1.2	0.3~0.5 0.8~1.0	0.1~0.3 0.7~0.9	0.1~0.2 0.3~0.6	0.1~0.2 0.3~0.6	0.1~0.2 0.3~0.6	0.2~0.5 0.4~0.9	1.0~1.4 1.0~1.4	0.3~0.5 0.5~0.7	0.3~0.4 0.4~0.6
機械的性質 伸張強度（降伏點） Tensile Strength	D638 23 ℃	kg/cm²	530	600	530	910	1,200	1,300	790	910	1,200	1,200	1,200	1,200	900	500	900	980
		MPa	52.0	58.8	52.0	89.2	117.7	127.5	77.5	89.2	117.7	117.7	117.7	117.7	88.3	49.0	88.3	96.1
伸延斷裂（破斷點） Tensile Elongation	D638 23 ℃	%	300	80	300	5	3	3	5	5	3	5	5	5	3	30	3	
彎曲強度 Flexural Strength	D790 23 ℃	kg/cm²	840	1,000	840	1,400	1,930	2,100	1,260	1,400	1,900	1,900	1,800	1,800	1,500	910	1,400	1,680
		MPa	82.4	98.1	82.4	137.3	189.3	205.9	123.6	137.3	186.3	186.3	176.5	176.5	147.1	89.2	137.3	164.8
彎曲模數 Flexural Modulus	D790 23 ℃	× 10³kg/cm²	24	26	24	45.8	77	90	35	50	80	75	75	75	90	35	84	105
		MPa	2,350	2,550	2,350	4,490	7,550	8,830	3,430	4,900	7,850	7,350	7,350	7,350	8,830	3,430	8,240	10,300
IZOD 衝擊強度 Izod Impact Strength	D256 23 ℃	kg cm/cm	6	5	6	7	10	12	6	5.5	10	10	14	8	8	10	6	6
		J/m	59	49	59	69	98	118	59	54	98	98	137	78	78	98	59	59
洛氏硬度 Rockwell Hardness	D785		R117	R120	R117	R118	R118	R117	R118	R118	R119	R119		R118	R110	R112	R114	R116
磨耗 Taber Abrasion Resistance	D1044	mg																
熱的性質 熱變形溫度 Deflection Temperature Under Load	D648 (0.455MPa)	℃	154	163	154	210	215	216	214	210	215	216		210	220	165	204	210
	D648 (1.820MPa)	℃	55	71	55	190	208	207	160	182	205	200	190	171	200	88	194	193
線膨脹係數 Coefficient of linear therm	TMA 法 -30 ℃~30 ℃	×10⁻⁵mm/mm/℃ [× 10⁻⁵K]	13	9	13	5	3	3	9	4	3	3		3	4	8	3	2.5
防火性 Flammability	UL94		HB(1.47)	V-0(0.71)	HB(1.47)	HB(1.47)	HB(0.71)	HB 相當	V-0(0.71)	V-0(0.71)	V-0(0.71)	HB(0.83)	HB(1.47)	V-0(0.86)	HB(0.81)	HB(1.57)	V-0(0.71)	V-0(0.81)
含氧指數 Oxygen Index	D2863	%	20	29	20	20	20		30	30	32			32			34	
VICAT 軟化點（0.1mm 針） Vicat Softening Temperature	D1525	℃	165	165	155	210	215		205	210	215			210			210	
UL 長期使用溫度 UL Recognition Temperature Index		℃	[illegible]	120	120	120	140		120	120	130	125	125	125	140	105	130	130
電氣的性質 介電強度 Dielectric Breakdown Strength	D149(1/8")	KV/mm	[illegible]	[illegible]	[illegible]	28	26	29	29	29	30	30		26	43	25	27	26
體積固有電阻 Volume Resistivity	D256	Ω · cm	[illegible]	10^{15}	[illegible]	10^{14}	10^{16}	10^{16}	10^{16}	10^{15}	10^{15}	10^{16}		10^{15}	10^{16}	10^{16}	10^{16}	10^{15}
介電常數 Dielectric Constant	D150 23 ℃ 60Hz		3.[illegible]	[illegible]	[illegible]	3.6	3.8	3.6	3.3	3.6	3.8	3.7		3.6	4.0	3.3	3.7	3.9
介電損失 Dielectric Dissipation Factor	D150 23 ℃ 60Hz		0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002		0.002	0.006	0.002	0.006	0.007
耐電弧性 Arc Resistance	D495	sec	[illegible]	[illegible]	184	129	146	85	28	35	80	75		94	100	127	125	126

Note　Figures in [ ] of the Table of characteristics are of SI units and those of ( ) are wall thickness.
[illegible]

RF SMA Connector

Specification

1. Electrical Properties :

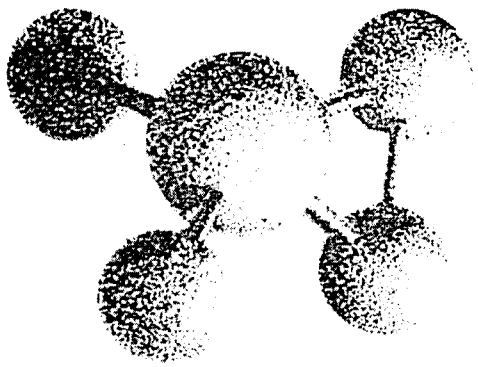
1.1 Frequency Rang……1~3GHz
1.2 Impedance …… 70Ω Nominal
1.3 VSWR ……1.3 Max.
1.4 Voltage rating …… AC 500V
1.5 Withstanding Voltage …..AC 1000V one minute
1.6 Insulation Resistance ……5000MΩ

2. Mechanical Properties :

2.1 Mating / unmating force .. 2 inch-lb
2.2 Mating Torque …… 7~10 inch-lb
2.3 Contact Retention …….4 lbs min. axial force
2.4 Cable Retention ……15lb for RG316 ; 9lb for RG178
2.5 Durability ……500 cycles Minimum

3. Environment Properties :

3.1 Temperature Range…… -40℃ ~ +85℃
3.2 Thermal Shock……MIL-STD-202, Method 107, Condition B
3.3 Shock……MIL-STD-202, Method 213, Condition I
3.2 Vibration ……MIL-std-202 Method 204, Test Condition D



施敏打硬 CEMEDINE 1500

〔一般性質〕

	主　　劑	硬　化　劑
主要成分	環氧（Epoxy）樹脂的中間體淺黃色透明液體	聚醯胺（Poly-Amido）樹脂棕色透明液體
顏色常態		
不揮發率（%）	99.6	99.4
黏度(9/20°C)	350	600
比重(20/20°C)	1.16	0.97
溶　　劑	無	
硬化劑混合比例phr	60～110	
保持粘度時間	參照混合硬化劑後的粘度變化表	
膠化時間	3小時	
硬化所需時間	6小時10分鐘	
可保存時間(20°C)	2年	

〔特性〕

由兩種液體混合而成的環氧（Epoxy）樹脂系黏着劑，能在常溫下硬化，應用範圍至爲廣汎，可穩定黏着金屬，塑膠以及其他各種物質，而由於此黏着劑，通常以聚醯胺）Poly-Amido）樹脂爲其硬化劑，具有下列各優點：

1. 能在常溫下硬化。
2. 縱使所使用的硬化劑份量不同，也不影響其特性。
3. 由於能產生比一般黏着劑富有彎曲性的黏着層，縱使黏着不同材質的物品，也能以黏着層緩和熱膨脹的差別所引起的兩物品彎曲，對機械學的衝擊也能顯示較爲良好的性能。
4. 由於能形成透明的黏着層，可以黏着透明的物質，如玻璃等等。

〔用　途〕

由於能强力黏着各種物質，諸如金屬，熱硬化塑膠，玻璃，飛機裝配以及一般家庭器具等等，應用範圍至爲廣汎。

縱然是複聚乙烯（Polythylene），聚酯（Polyester），天然以及人造橡膠等，以一般的黏着根本無法黏着的物質，如果加以適當的表面處理，卽可强力黏着。

〔實　例〕

汽車、火車、船隻、飛機……。（將金屬把手黏着於玻璃窗／可以黏着鋁製品，三聚氰胺（Melamine）裝飾板等，於內部以增加强度／不同金屬間爲彙防止電傷且加黏之／當作防腐塗料亦可）。

電器製品……。（由於是一種優秀的黏着劑，使用於高級擴聲器、音響線圈的黏着／電磁器或外殼的黏着／線圈框的黏着／鐵粉蕊的黏着／馬達線圈的黏着等等）。

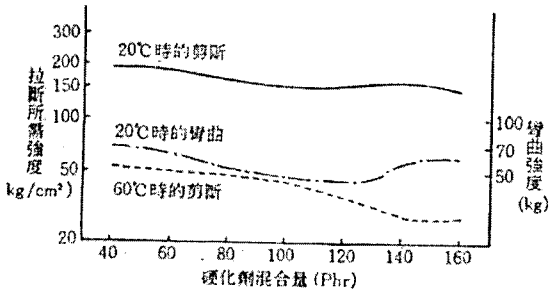
建築……（玻璃、壓克力門或將文字板黏於屏風黏住把手／照明設備以及其他塑膠裝飾品的加黏以及組立／不銹鋼製品、鋁製建材、陶器或大理石等需要强力黏劑物品的加黏。

高級裝飾品，玻璃以及塑膠製工藝品，精密機械……（照像機，調整距離儀／分光儀等等的固定）。

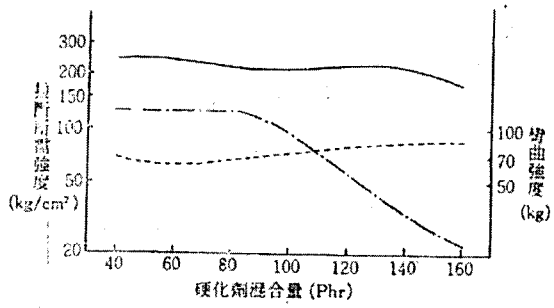
其他諸如罐頭，運動器材，公路標誌等等的加黏。

除上述各種加黏外，也可以使用作填充劑，鑄模用，敷層用以及襯裏用。

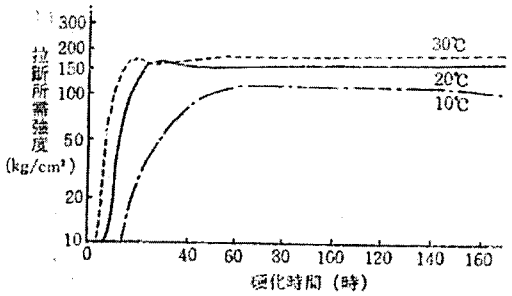
加熱溫度	加熱時間
60 ℃	120分以上
80 ℃	60～90分
100 ℃	40～60分
120 ℃	30～40分



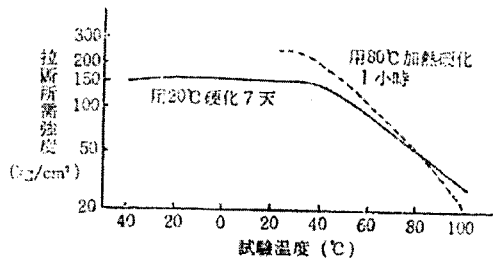
圖Ⅱ 2.1
硬化剤混合量和黏力強度
（在20°C七天的硬化）
試驗片：軟鋼板 (25×100×1.6mm)
(Over-lap)12.5mm



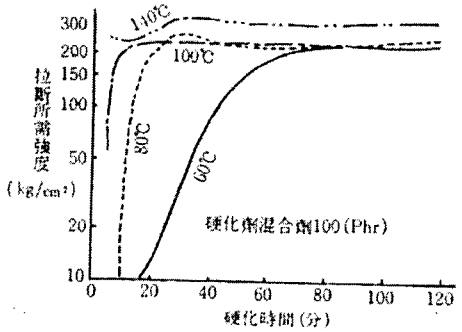
圖Ⅱ 2.2
硬化剤混合量和黏力強度
（在80°C一小時的硬化）
試驗片：以及其他同圖Ⅱ 2.1



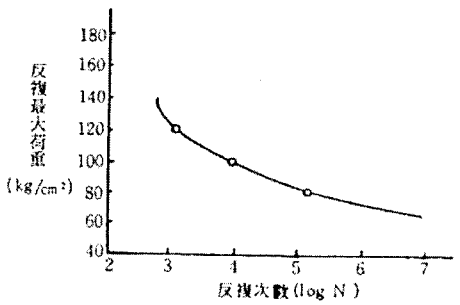
圖Ⅱ 2.3
常溫時的硬化特性 硬化剤混合率 100phr



圖Ⅱ 2.5
耐熱特性 硬化剤混合率爲 100phr



圖Ⅱ 2.4
加熱硬化特性 硬化剤混合率爲 100phr



圖Ⅱ 2.6
老化特性

表Ⅱ 2.1 物理特性

抗 張 力 (kg/mm²)	5.04	硬度 ロックウエルM	68
抗 折 力 (kg/mm²)	7.40	硬度 バーコル	67
彎曲彈性率 (kg/mm²)	214	硬度 ショアーD	82
衝撃強度 (kg/mm²)	11.6	表面固定電阻 (Ω)	5.6×10^{13}
壓縮強度 (kg/mm²)	15.10(6.41)(1)	體積固有電阻 (Ω-Cm)	10.5×10^{13}
熱變形溫度 (°C)	47	誘電率 (10^6cycle)	2.94
		電壓破壞 (kv/mm)	19

表Ⅱ 2.2 拉斷所需强度

被黏體	拉斷所需强度	被黏體	拉斷所需强度 (20°C)
柞樹材	83	多元焦炭	22
馬來西亞杉材	106 *	苯乙烯樹脂	19
針葉樹材	99< *	壓克力樹脂	30
杉材	66	硬質鹽烯樹脂	36
鐵	158	三聚氰胺裝飾板 (表面)	55
鋁	61	三聚氰胺裝飾板 (背面)	45
黃銅	60		
銅	80	F R P	125
鉻電鍍	71		
鋅電鍍	50		

〔註〕 1. 粘着條件： 20°C，硬化7天，硬化劑混合比 100phr(接合部over-lap)12.5mm。

2.*記號者表示材料拉斷。

表Ⅱ 2.3 促進劣化特性

試驗	未試驗前的粘力强度 (kg/cm²)	比較調整試驗片的粘力强度(1) (1個月) (kg/cm²)	經過各試驗1個月後的粘力强度 (kg/cm²)	經過各試驗 1,000 小時後的粘力强度 (kg/cm²)
利用測候儀所做的耐候試驗	143	150	—	166
利用噴射鹽水的促進試驗	143	150	100	—
利用高溫高濕的促進試驗(2)	143	150	143	—
利用反復冷却的促進試驗(3)	143	150	183	—

〔註〕 (1) 20±1°C, 65±5%RH 各保持1個月的試驗片；(2)50°C100%RH；(3)−5°C8小時～50°C16小時。

表Ⅱ 2.4 耐候性

拉斷所需强度 (kg/cm²)

暴露前的粘力强度					147
比較調整試驗片的粘力强度 (6個月)	※	156	在戶外暴露6個月的粘力强度		147
〃 (1年)	※	138	〃 1年	〃	152
〃 (2年)	※	130	〃 2年	〃	138
〃 (3年)	※	123	〃 3年	〃	137
〃 (10年)	※	111	〃 10年	〃	130

〔註〕 ※20±1°C, 65±5%RH 保持各期間的試驗片。

表Ⅱ 2.5 耐水性 (20°C, 7天硬化)

拉斷所需强度 (kg/cm²)

試驗＼時間	0	3個月	6個月	1年
常態試驗	120	106	123	120
耐水試驗		109	117	109

〔註〕 硬化劑混合比爲 100phr
試驗片：不銹鋼 (100×25×1.5mm)
(接合部Over-lap)12.5mm。

表Ⅱ 2.6 耐水性 (60°C, 2小時硬化)

拉斷所需强度 (kg/cm²)

試驗＼時間	0	3個月	6個月	1年
常態試驗	157	150	169	163
耐水試驗		133	108	116

〔註〕 同表Ⅱ 2.5

表II 2.7 耐 油 性

拉斷所需強度 (kg/cm²)

放置日數	1天	3天	5天	10天	20天	1個月
放置於20°C室溫	—	—	—	80.0	—	79.0
0°C油中	—	—	77.5	87.5	—	80.0
20°C油中	—	—	82.5	77.6	—	89.5
70°C油中	77.6	75.3	80.0	74.3	—	71.0
循環油中 cycle	—	—	79.0	78.0	89.0	76.0

放置日數	40天	2個月	3個月	6個月	1年	10年
放置於 20°C室溫	—	—	73.0	65.9	76.3	75.9
0°C油中	—	86.5	71.5	80.5	80.2	—
20°C油中	—	70.5	79.5	78.7	79.7	—
70°C油中	—	75.5	—	75.4	68.3	—
循環油中 (cycle)	71.5	—	—	—	—	—

〔註〕 1. 硬化劑混合比爲80phr，試驗片電木片 (100×25×3mm)接合部(Over-lap)12.5mm 2. 油爲變壓器油。
3. 試驗片全部破裂。

表II 2.8 耐溶劑、耐藥品性

種類		浸漬7天後的黏力保持率 (%)		浸漬1個月後的黏力保持率 (%)	
		以20°C硬化7天的試驗片	以80°C硬化1小時的試驗片	以20°C硬化7天的試驗片	以80°C硬化1小時的試驗片
溶劑	已烷	107.0	80.6	94.1	78.8
		85.5	63.8	51.7	66.8
		88.8	69.5	93.4	70.8
		89.5	71.3	97.4	68.7
		90.2	64.7	101.3	69.1
	三氯化烯	91.5	72.7	65.0	69.5
油	植物油	102.7	90.8	107.3	90.3
	礦物油	96.2	87.8	98.1	84.2
藥品	蒸餾水	93.4	72.3	96.3	69.3
	10% 硝酸溶液	93.4	72.8	79.8	69.8
	10% 硫酸溶液	74.7	67.8	70.8	57.2
	10% 苛性蘇打溶液	97.2	74.3	83.8	74.3
	10% 食鹽水溶液	89.6	71.8	91.0	69.8
	10% 酢酸溶液	94.2	77.8	78.4	64.2

〔註〕 黏劑混合率＝1：1，試驗片：軟鋼片 (25×100×1.6mm) 但是耐藥試驗時使用了SUS-27，接合部 (Over-lap) 爲 12.5mm。

容量規格—(主)、(硬) 110g、1kg、 15kg (組)

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