WHA YU INDUSTRIAL CO., LTD. (HEAD OFFICE)
SUPERGRADE INTERNATIONAL ENTERPRISE LTD. (SHANGHAI)

SPECIFICATION FOR APPROVAL

CUSTOMER ：達創科技股份有限公司

PART NAME : outdoor 2dBi ANTENNA

PART NO ： ***REVISION：***

W. Y. P/NO ： C529-540207-A ***REV ：***

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY ：		
DATE ：		

WHA YU GROUP
WHA YU INDUSTRIAL CO., LTD.(HEAD OFFICE)
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天線規格表

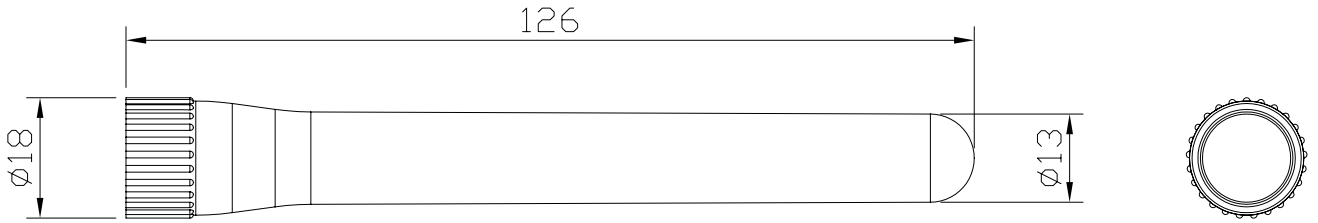
Electrical Specification

Frequency Range:	2.4GHz~2.5GHz
Peak Gain:	2 dBi
VSWR:	1.92:1 max.
HPBW /H:	360°
HPBW /V:	70°
Impedance:	50Ω
Polarization:	Linear; Vertical
Power Handling:	10W
Connector:	RP TNC Plug

Mechanical Specification

Operating Temperature:	-40°C~85°C
Storage Temperature:	-40°C~70°C
Humidity:	95% RH
Radome Material:	TPE
Color:	Black
Dimensions:	ø18 x 126L
Weight:	30 gfw

REV	DATE	DESCRIPTION



Item	Description	Q'ty	P/N	Remark

XXX.	±5
XX.	±1.0
X.	±0.50
.X	±0.20
.XX	±0.10

APPROVED

CHECKED

DRAWING

2003.06.23

VENDER :

PART NO :

PARTNAME:

REV	UNIT	FILE :
B	m/m	SHEET : 1/1

Wha Yu
INDUSTRIAL CO.,LTD.
華裕實業股份有限公司

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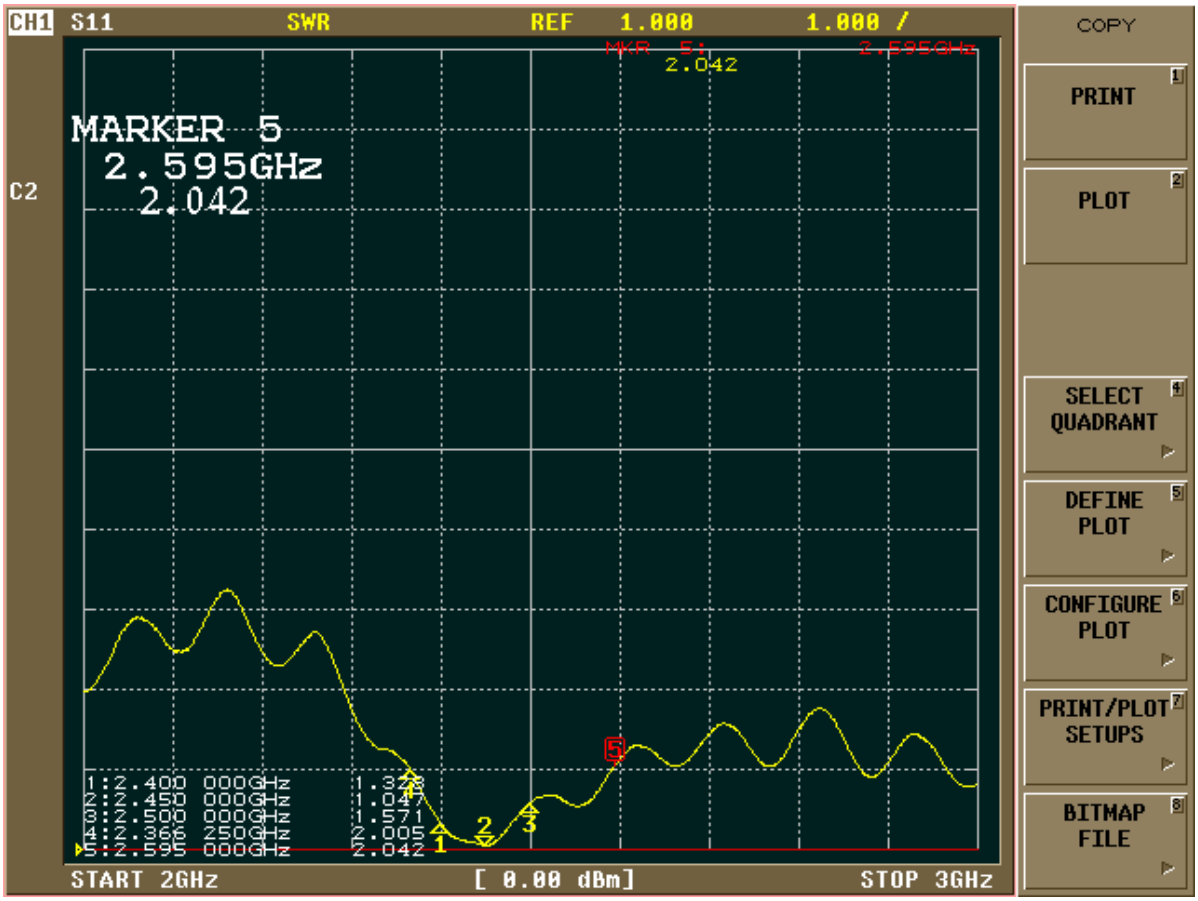
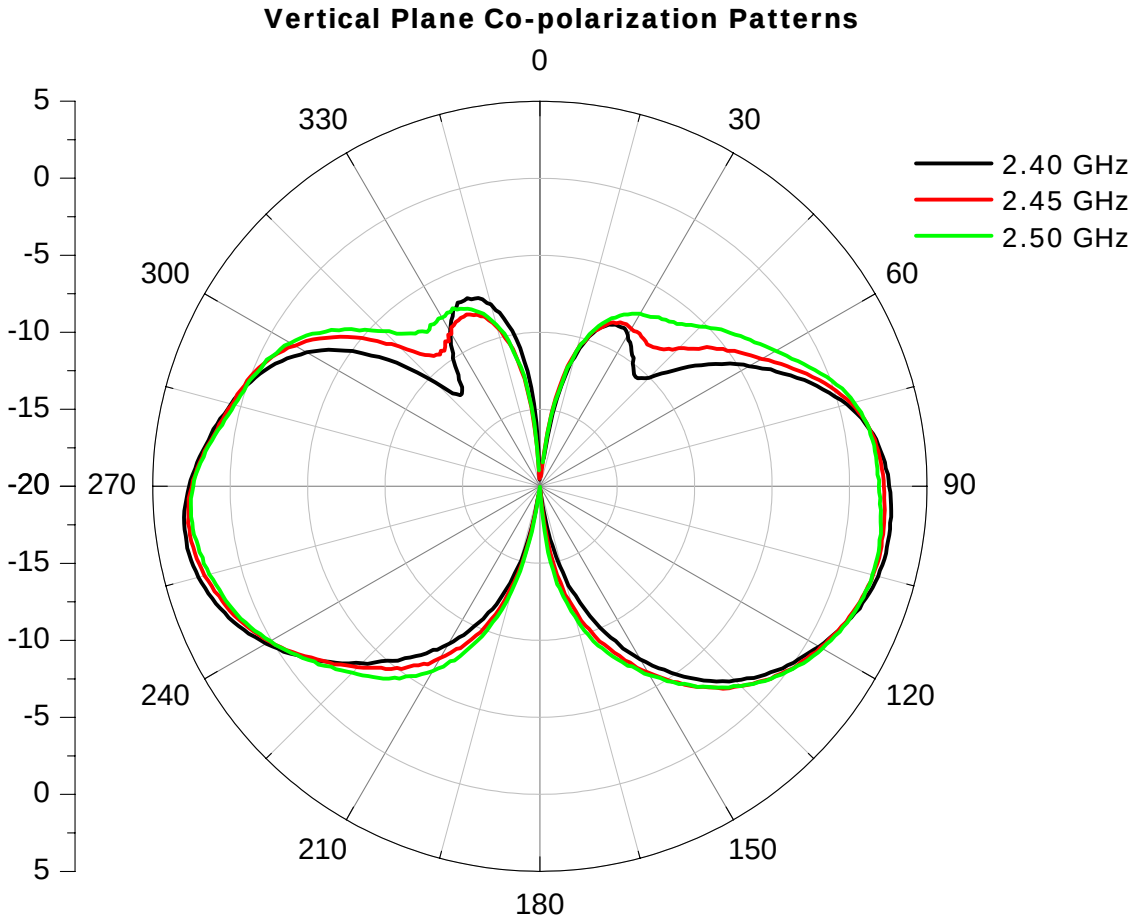
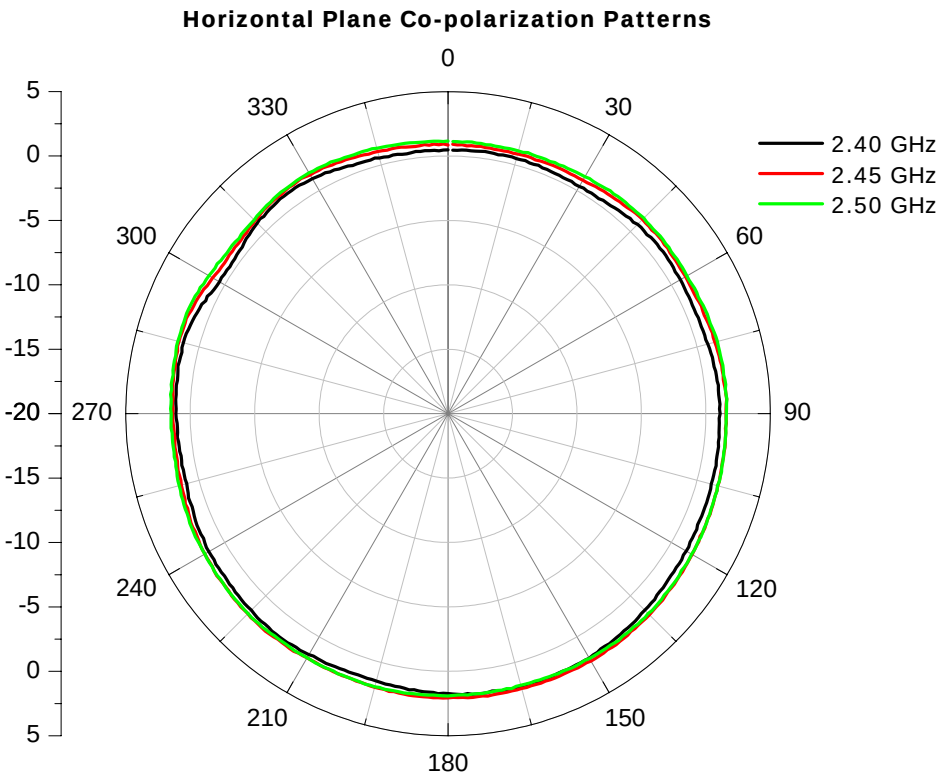
測試報告

VSWR


CH1 S11 SWR REF 1.000 1.000 /
MKR 5: 2.595GHz
2.042
MARKER 5
2.595GHz
2.042
C2
1:2.400 000GHz 1.323
2:2.450 000GHz 1.047
3:2.500 000GHz 1.571
4:2.366 250GHz 2.005
5:2.595 000GHz 2.042
START 2GHz
[0.00 dBm]
STOP 3GHz
COPY
PRINT
PLOT
SELECT QUADRANT
DEFINE PLOT
CONFIGURE PLOT
PRINT/PLOT SETUPS
BITMAP FILE


Vertical Plane Co-polarization Patterns
0
30
60
90
120
150
180
210
240
270
300
330
5
0
-5
-10
-15
-20
-15
-10
-5
0
5
2.40 GHz
2.45 GHz
2.50 GHz


Horizontal Plane Co-polarization Patterns
0
30
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210
240
270
300
330
5
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-5
-10
-15
-20
-15
-10
-5
0
5
2.40 GHz
2.45 GHz
2.50 GHz

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 Properities :
   - 1 Weight per 1000ft..... 6.3 lbs Maximum
   - 2 Bend Radius.....0.35" Mininum
   - 3 Operating Temperature Range -55℃~ 200℃

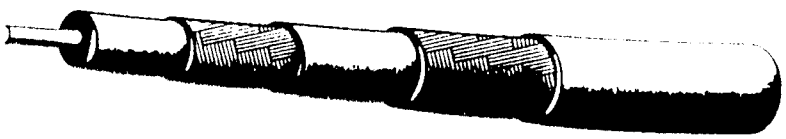
3. Electrical Properities:
   - 1 Impedance..... 50±2 ohms
   - 2 Capacitance..... 32 pF/ft Maximum
   - 3 Cut off Frequency..... 116 GHz
   - 4 Attenuation.....45.0 dB/100ft @ 1GHz
     64.4 dB/100ft @ 2GHz
     79.7 dB/100ft @ 3GHz
     92.7 dB/100ft @ 4GHz
     104.3 dB/100ft @ 5GHz
     115.0 dB/100ft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

Mil-C-17 Coaxial Cable QPL Approved

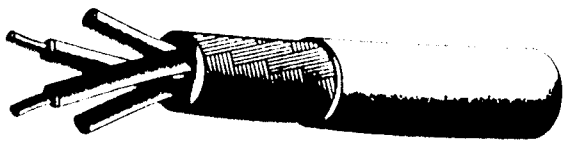
Single braid

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

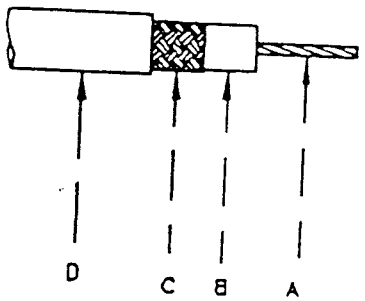
Harbour also manufactures PTFE tape wrapped cables to a previous revision of the MIL-C-17 specification. These constructions can withstand operating temperatures up to 250° C. versus 200° C. for FEP jacketed cables. Also, PTFE tape wrapped cables are generally more flexible than their FEP jacketed counterparts.

UL Approvals

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

alldata\drawings\black

Rev	Change	Date



Construction:

A) Center Conductor:
30 7/38 SPCW
OD .012" ± .001"

B) Dielectric:
Extruded PTFE
OD .033" ± .002"

C) Shield:
38 AWG SPC
OD .051" Nom.

D) Jacket:
FEP – Brown Tint
OD .071" ± .004"
Surface Printed: "RG178HF HARBOUR INDUSTRIES 27478"

Electricals:

Impedance:	50 ± 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	
		Approved By: TTLJ Pinner	
Drawing Name: RG178HF		Rev:	Sheet 1 of 1
Part Number: TBD		Drawing Number: 121701_1	

MIL-C-17 Type Coaxial Cable, QPL approved

Physical Characteristics

M17 Number	Center Conductor	Dielectric	Dielectric O.D.	Shield	Jacket	Overall O.D.	Operating Temp℃	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℃ 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℃ rated
RG188 A/U	.0201 " (7/.0067 ")SCCS	PTFE	.060 "	SPC	PTFE	.100 "	-55+250	12.0	Flexible, 250℃ rated
RG196 A/U	.0120 " (7/.004 ") SCCS	PTFE	.034 "	SPC	PTFE	.080 "	-55+250	8.0	Flexible, 250℃ rated

Electrical Characteristics

Type No.	Impedance (ohms)	Capaci. (pf/ft)	Working Voltage (Volts RMS)	Maximum Attenuation (db/100ft) @ 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.

INTERNET - http://www.commate.com.tw

E-MAIL: raison@commate.com.tw

Commate International, Canada - 49 Thatcher's Millway, Markham, Ontario L3P 3T2/FAX:+1(905)472-2487

Commate International, Taiwan - 2-2 Alley 3, Lane 387 Nei-Hu Road Sec. 1, Taipei / TEL: +886(2) 2659-0060 / FAX: +886(2) 2797-3715

KEYFLEX BT-1055D

Ester type TPE

Item	Test method	Test Condition	Unit	Value
PHYSICAL				
Specific Gravity	ASTM D297	23°C		1.19
Melt Index	ASTM D1238	200°C/2.16kg	g/10min	28
Density	ASTM D1505	Density Gradient Tube	g/10min	
Water Absorbance	ASTM D570	23°C	%	0.5
Mold Shrinkage	ASTM D955		%	1.2
MECHANICAL				
Tensile Strain at Break	ASTM D412	500mm/min	kg/cm²	340
			MPa	33.3
Tensile Elongation	ASTM D412	500mm/min	%	650
Tensile Strength	ASTM D638	500mm/min	kg/cm²	140
			MPa	13.7
5% Tensile Stress	ASTM D638	500mm/min	kg/cm²	65
			MPa	6.4
Flexural Modulus(Initial)	ASTM D790	15mm/min	kg/cm²	2,100
			MPa	206
Tear Strength	ASTM D624	JIS B type	kg/cm	150
Izod Impact Strength (Notched)	ASTM D256	23°C	kg·cm/cm	NB
			J/m	NB
		-40 °C	kg·cm/cm	20
			J/m	NB
Elongation	ASTM D395		%	
Compression Set	ASTM D395	25°C x 22hr	%	
		70°C x 22hr	%	54
Hardeness	ASTM D2240	shore A		
		shore D		55

*Note : 1)The values of properties in the above table have been obtained by the test pieces(natural color) manufactured under certain of injection.

2)The listed values should be used for referential purposed only.

LG Chemical Limited LG Twin Tower/ East Wing, 20, Yoido-dong, Youngdungpo-gu Seoul, 150- 721 Korea Tel : 822-3773-7743 Fax : 822-3773-7660	**MSDS** **(Material Safety Data Sheet)**	File No.	
		Issue Data	
		Revised Data	
	KEYFLEX BT-1055D	Revised Item	
		Page	1/ 2

SECTION 1. IDENTIFICATION

1) Product name : KEYFLEX BT-1055D
2) Chemical family : Polyester Elastomer
3) MSDS number
4) Chemical abstract registry No. : 155123- 66-3
5) Shipping name : Plastic material
6) Chemical name : 1, 4Butanediol Hydro-W-Hydroxy Poly(Oxy 1,4Butanediol)

SECTION 2. PHYSICAL DATA

1) Melting point : 200°C
2) Specific gravity : 1.19 (H_2O=1)
3) Percent Volatile : <0.5%
4) State and appearance : Solid and pellet
5) Solubility in water % by WT : <0.001
6) Odor : Odorless

SECTION 3. HEALTH HAZARD DATA

1) Acute effects of exposure
   1. Ingestion : No toxic symptoms reported, however, low toxicity by this route is expected based on biological activity of high molecular weight polyester polymers.
   2. Inhalation : No toxic symptoms reported. Pellets are not considered an inhalation hazard.
   3. Skin(contact) : No toxic symptoms reported. Molten material has the potential to cause thermal burns.
   4. Eye(contact) : No toxic symptoms reported. Polymer particle may act as foreign body.
2) Emergency and first aid procedures
   1. Ingestion : If significant quantity has been swallowed, give glass of water and induce vomiting. Seek medical attention.
   2. Inhalation : Remove to fresh air. Seek medical attention if symptoms persist.
   3. Skin(contact) : If molten polymer contacts skin. Cool rapidly with cold water. Seek medical attention.
   4. Eye(contact) : Flush with plenty of water. Seek medical attention if symptoms persist.

SECTION 4. FIRE AND EXPLOSION HAZARD DATA

1) Flash point (method used) : 330~390°C
2) Flammable limits in air % by volume
3) Extinguishing media : Dry chemical, CO_2, foam or water spray
4) Special fire-fighting procedures
   Water and/ or dry chemical should not be used on machinery. Self-contained breathing apparatus and personal protective equipment may be needed for large fires.
5) Unusual fire and explosion hazards
   None known to LG Chem.

SECTION 5. REACTIVITY DATA

1) Stability : stable

2) Incompatibility(material to avoid) : Oxidizing materials can cause a reaction

3) Hazardous polymerization : Will not occur

4) Conditions to avoid : Do not heat above 260°C
Avoid prolonged exposure to temperatures above 250°C

5) Hazard decomposition product
Major : Carbon dioxide, Probably carbon monoxide / Minor : Hydrogen Bromide, THF

SECTION 6. SPILL OR LEAK PROCEDURES

1) Steps to be taken if material is released or spilled
: Pellets are slippery. Sweep up and place in disposal container.

2) Waste disposal method
: Transfer to an approved disposal area in accordance with regulations on industrial wasted disposal.

SECTION 7. SPECIAL PROTECTION INFORMATION

1) Ventilation
Local exhaust mechanical : Recommended when appropriate to control employee exposure may not be adequate as the sole means to control employee exposure.

2) Respiratory protection : Approved respirators recommended when handling hot material.

3) Protective gloves : Recommend during ment processing

4) Eye protection : Safety glasses recommended.

SECTION 8. SPECIAL PRECAUTIONS

Precautions to be taken in handling and storing storage in a cool dry place toxic substances controls act (TSCA) all the components of this product are listed on the TSCA inventory.

* The information submitted in this MSDS is based on our current knowledge and experience.
All materials may present unknown health hazards and should be used with caution.
Final responsibility lies in user's determination. Although the MSDS is described herein.
We cannot guarantee that these are the only hazards which exist.

Product Information

Dow Plastics

CALIBRE 700 series

Ignition Resistant Resins

These CALIBRE* resins are formulated and produced to supply both clarity and enhanced ignition resistance. They do so while maintaining excellent physical properties and processability. Grades are available with additives for improved mould release and/or UV stablisation.

CALIBRE 700: No mould release, no UV stabilisation. CALIBRE 701: Only mould release. CALIBRE 702: Only UV stabilisation. CALIBRE 703: Mould release and UV stabilisation.

Applications

- Industrial switches
- Circuit breakers
- Plugs, sockets and switches
- Street lights
- Safety lights
- Reflectors

Properties	Test method	Value	Value
Products, Units		**700-10**	**700-15**
Physical			
Melt Flow Rate (300°C, 1.2kg), g/10 min.	ISO 1133	10	15
Density, kg/m³	ISO 1183	1200	1200
Mould Shrinkage, %	ASTM D-955	0.5–0.7	0.5-0.7
Optical			
Light Transmittance, %	ASTM D1003	84-88	84-88
Thermal			
HDT 0.45 MPa, annealed, °C	ISO 75	144	142
HDT 1.82 MPa, annealed, °C	ISO 75	140	139
HDT 1.82 MPa, unannealed, °C	ISO 75	123	122
Vicat Softening Point (B/50), °C	ISO 306B	149	147
Mechanical			
Tensile Strength at Yield, MPa	ISO 527	60	60
Tensile Strength at Rupture, MPa	ISO 527	66	66
Elongation at Yield, %	ISO 527	6	6
Elongation at Rupture, %	ISO 527	120	120
Tensile Modulus, MPa	ISO 178	2300	2300
Flexural Strength, MPa	ISO 178	100	100
Flexural Modulus, MPa	ISO 180	2400	2400
Izod Notched (23°C), J/m	ISO 180	900	850
Izod Unnotched (23°C), J/m	ISO 179	no break	no break
Charpy Notched (23°C), kJ/m²		30	20
Flammability Rating (1)			
1.6 mm	UL-94	V2	V2
3.2 mm	UL-94	V0	V0
Electrical			
GWT 2.0 mm, 5 sec., °C	IEC 695-2-1	960	960
Ball Indentation Temperature, °C	IEC 598-1 (2)	> 125	> 125
Comp. Tracking Index (2.0 mm), V	IEC 112	250	250

(1) These numerical flame spread ratings are small scale test values and are not intended to reflect hazards presented by these or any other materials under actual fire conditions.

(2) Ball Indentation Temperature is described in IEC 598-1.

*Trademark of The Dow Chemical Company

See "Safety and Handling Considerations" and "Medical Application Policy"

Dow Plastics is a business group of The Dow Chemical Company and its subsidiaries.

CH 262-038-E-900

譁裕實業股份有限公司
WHA YU INDUSTRIAL CO., LTD

Part Name : 2.4GHz Antenna Cable Assembly

WHA YU P/N : C120-510026-A (Torque Range：200~500 gf.cm)

TNC PLUG CONNECTOR 扭力值測試

NO	1	2	3	4	5	6	7	8	9	10
扭力值	400	420	420	380	400	420	400	400	410	430
NO	11	12	13	14	15	16	17	18	19	20
扭力值	410	420	400	400	390	420	400	400	410	380
NO	21	22	23	24	25	26	27	28	29	30
扭力值	400	390	420	390	420	400	400	400	400	400
NO	31	32	33	34	35	36	37	38	39	40
扭力值	420	380	400	420	420	400	420	440	410	400
NO	41	42	43	44	45	46	47	48	49	50
扭力值	400	400	400	440	410	400	400	380	400	400

扭力值單位:gf.cm