

TO: 拍檔科技股份有限公司

SPECIFICATION FOR APPROVAL

DESCRIPTION : PCB 2.4GHz ANTENNA



PART NO : _____

慶陞 PART NO : 6672113032-110

DATE : 2009/04/08

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APPROVED SIGNATURES

			
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慶陞工業股份有限公司
KINSUN INDUSTRIES INC.

桃園縣中壢市普忠路 211 巷 20 號

TEL : 886-3-4353551

[Http://www.kinsun.com](http://www.kinsun.com)

FAX : 886-3-4353951

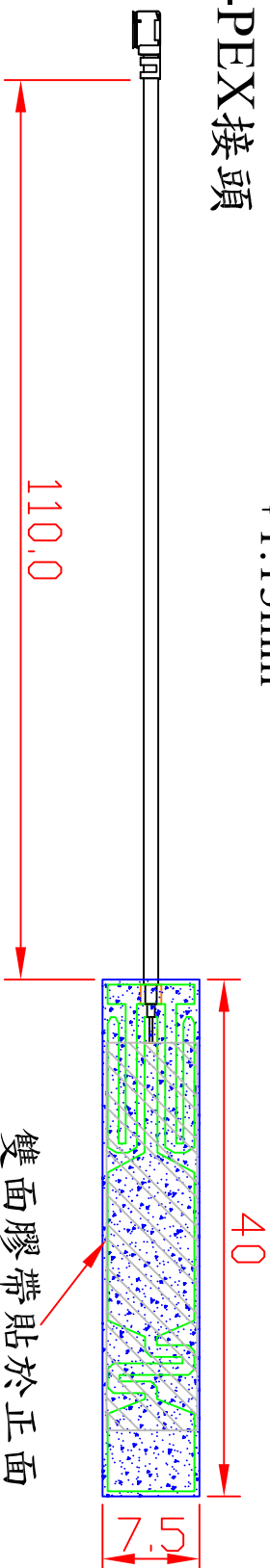
e-mail: kevin@kinsun.com

FR-4單面板-0.6mm



I-PEX接頭

Standard Coaxial Cable
 $\phi 1.13\text{mm}$



Frequency Rang : 2.4~2.5GHz
 Impedance : $50\ \Omega$
 V.S.W.R : ≤ 1.8

Radiation : Directional

Gain : 1.0dBi

Polarization : Vertical

設計 DR.	Wind-Kuo	核准 APP.	Jerry	容許公差	TOLERANCE	品名	2.4GHz-PCB-天線
版本說明	2007/09/14	REVISION NOTE	2007/09/14	XXX	± 0.10	ARTICLE	
				XX	± 0.25	圖號	6672113032-110
				X	± 0.38	單位 UNIT	mm
				ANG	± 0.50	比例 SCALE	1/1
					$\pm 3^\circ$	張數 SHEET	1/1
						版本 REV.	A



慶陞工業股份有限公司

測試報告書

測試品名：6672113032-110 (with 拍檔科技點餐機)

測試項目：S11 與天線場型

測試設備：STARLAB-3D-Chamber (Satimo 公司)

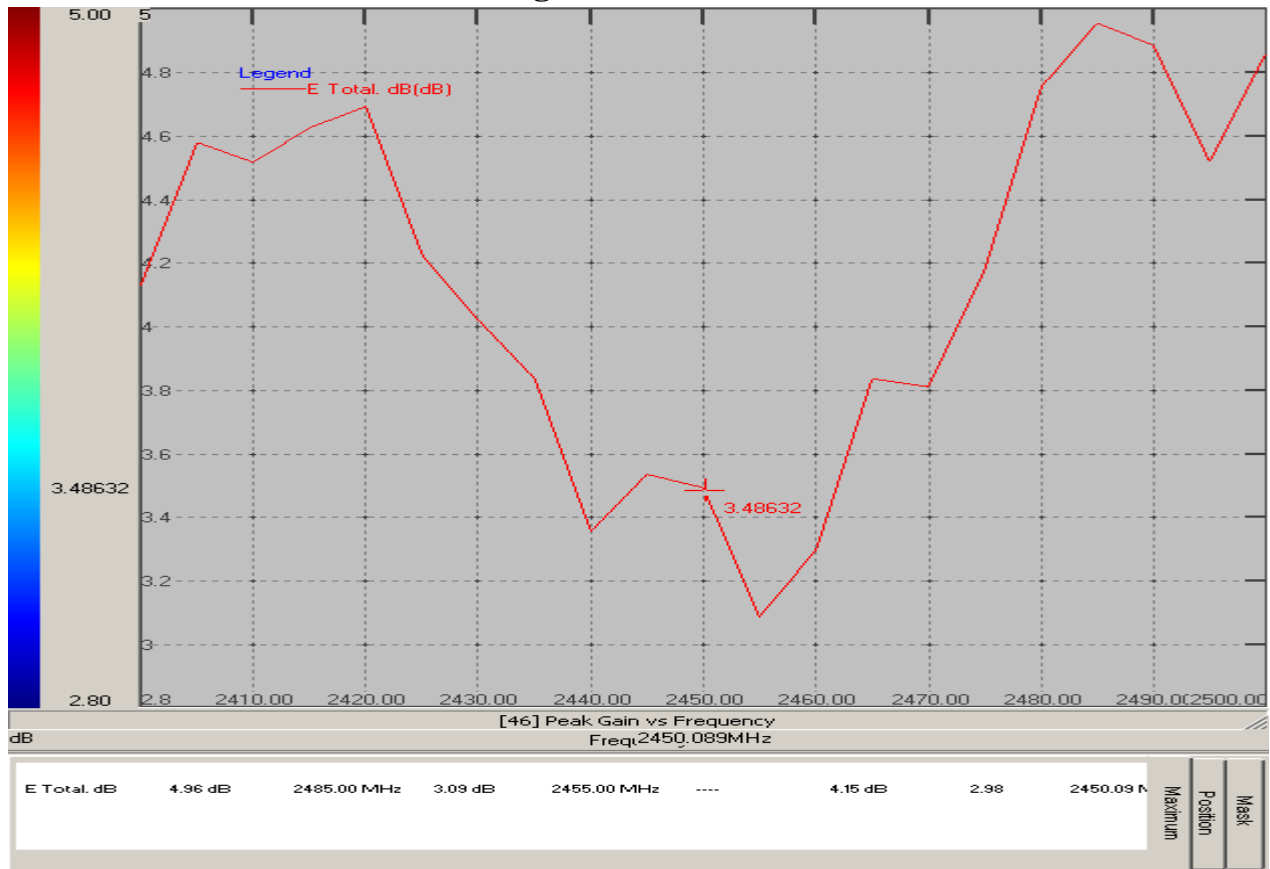
測試人員 (單位) : 郭玄一

分析報告人員：郭玄一

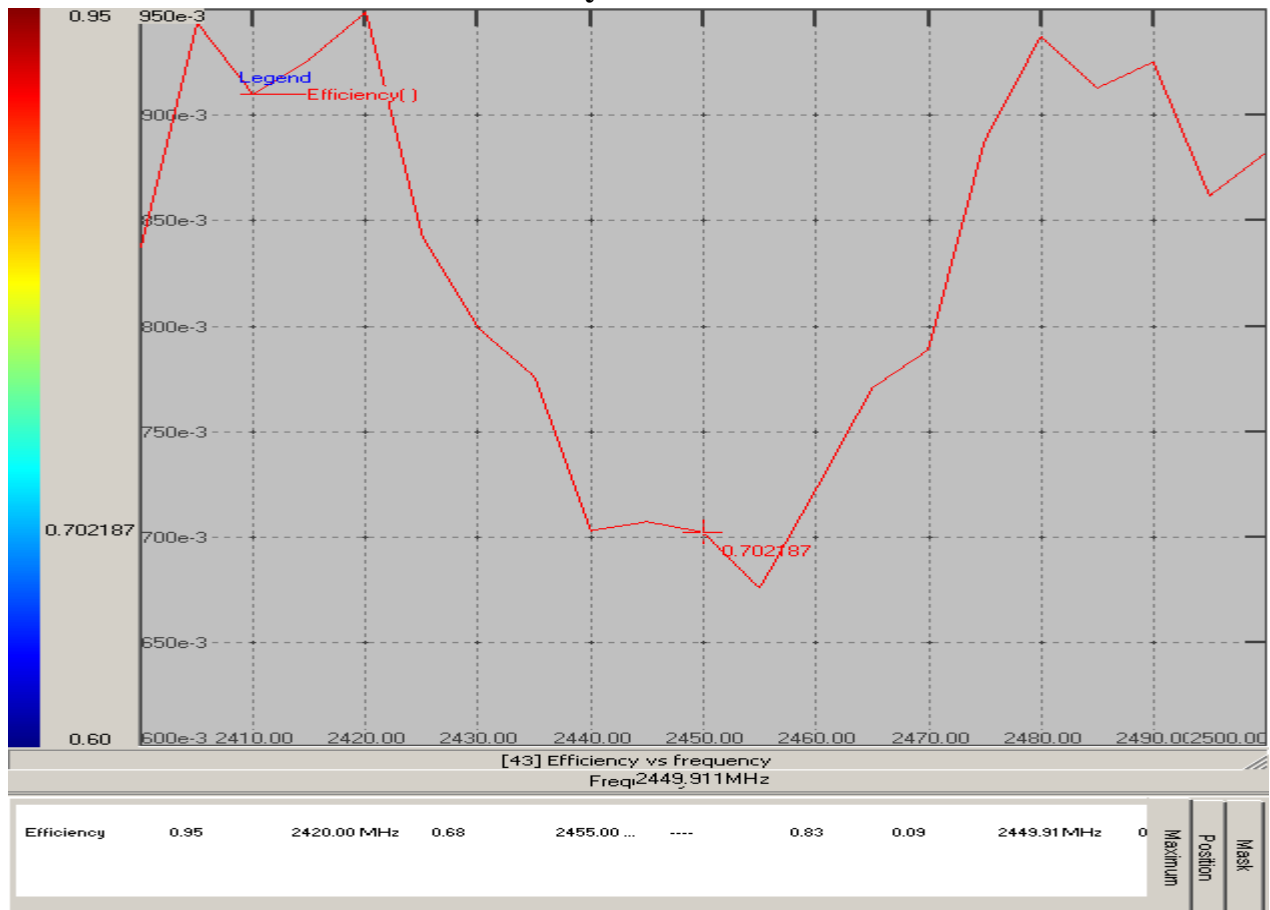
時間日期：2009/04/06

核閱：

6672113032-110 天線全頻帶 Peak gain

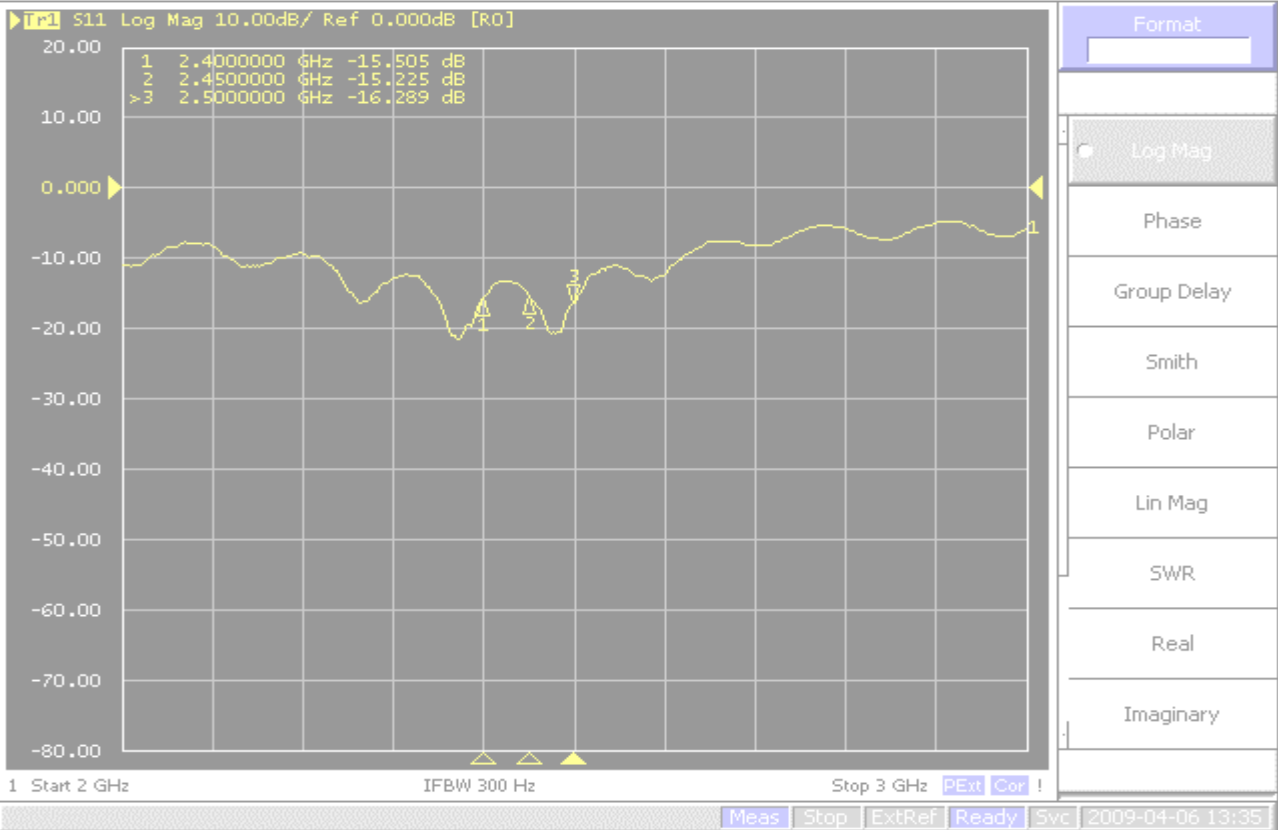


6672113032-110 天線全頻帶 Efficiency



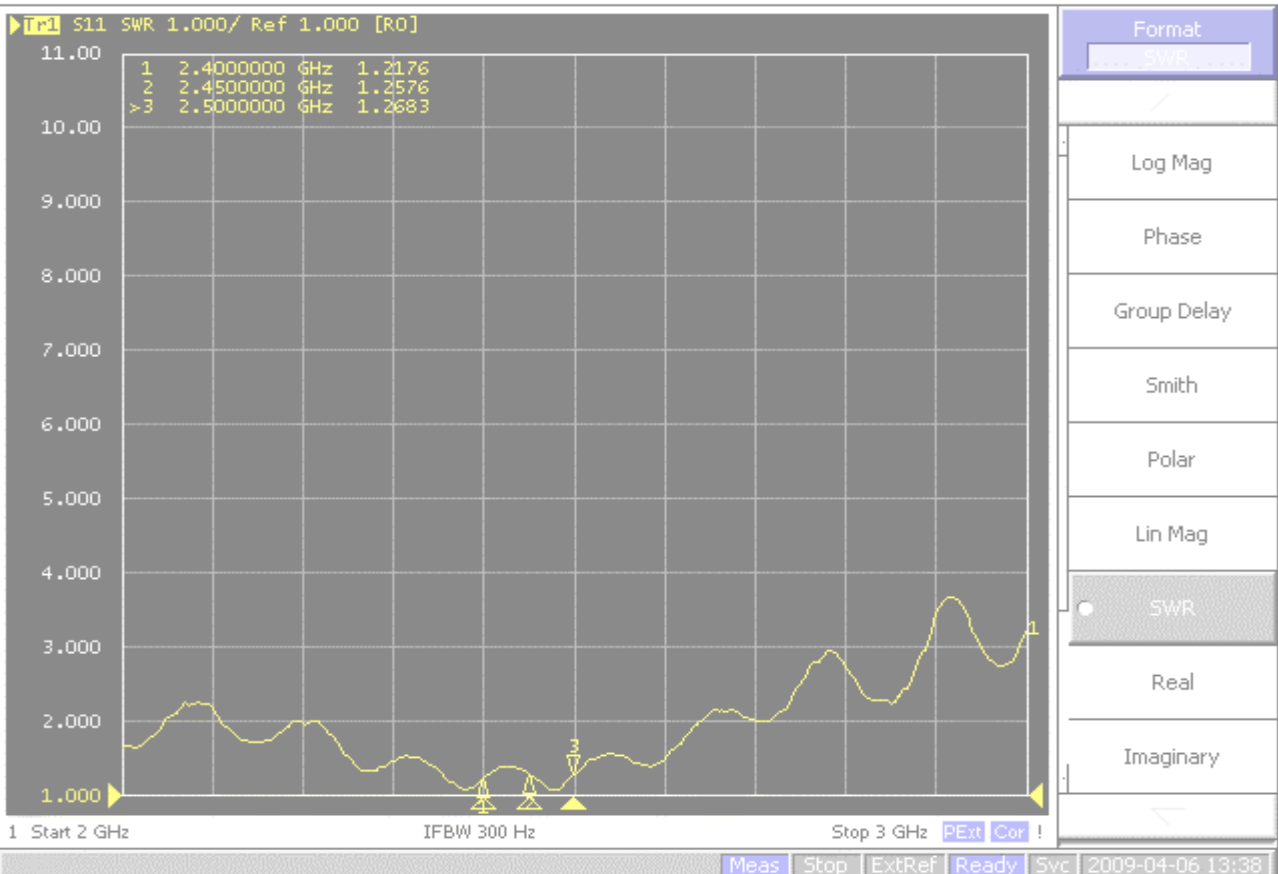
6672113032-110 天線 Return loss

1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State



6672113032-110 天線 VSWR

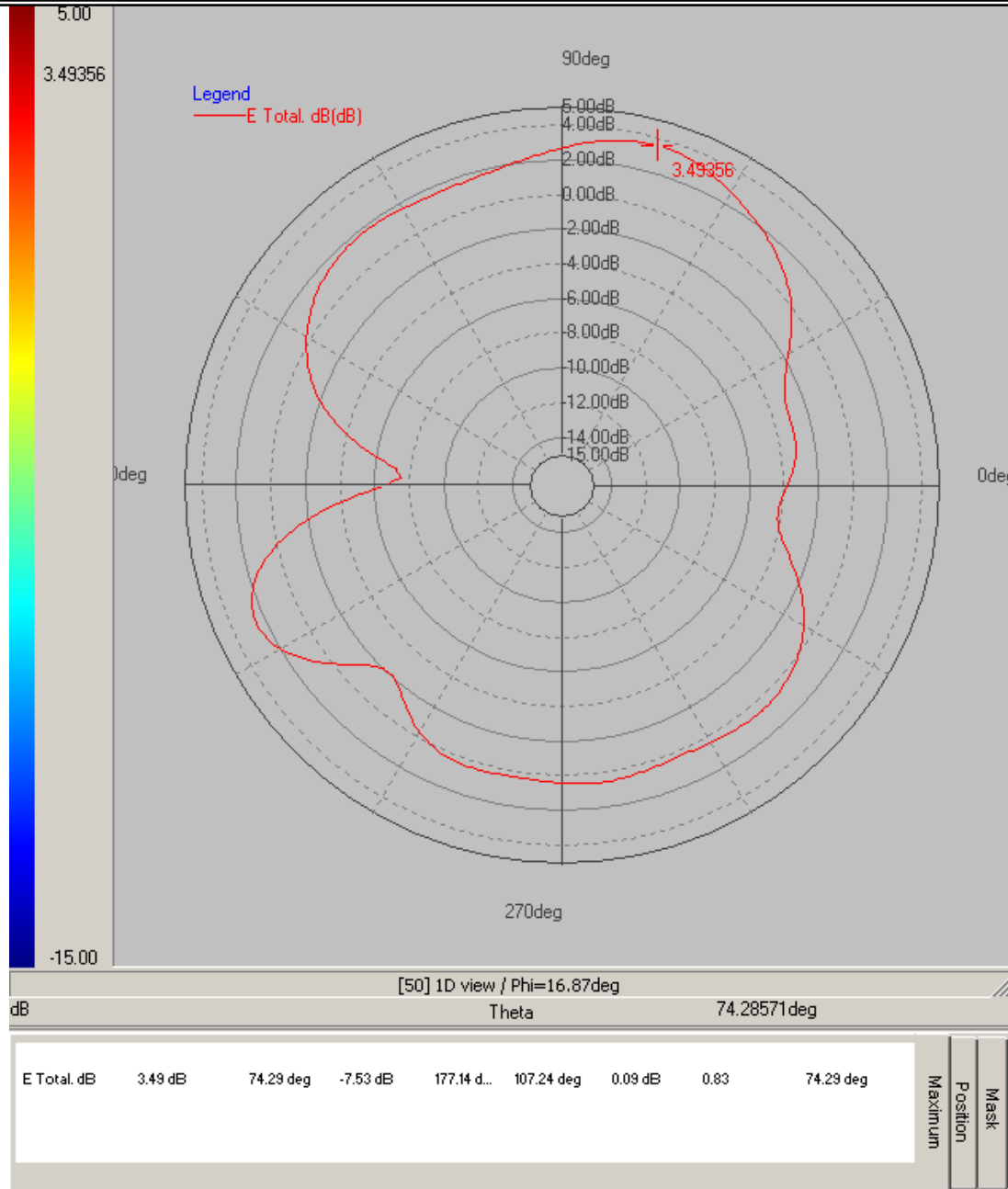
1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State



Brand / Model : 6672113032-110

Remark : 2450MHz 垂直面

Tested by : Wind-Kuo



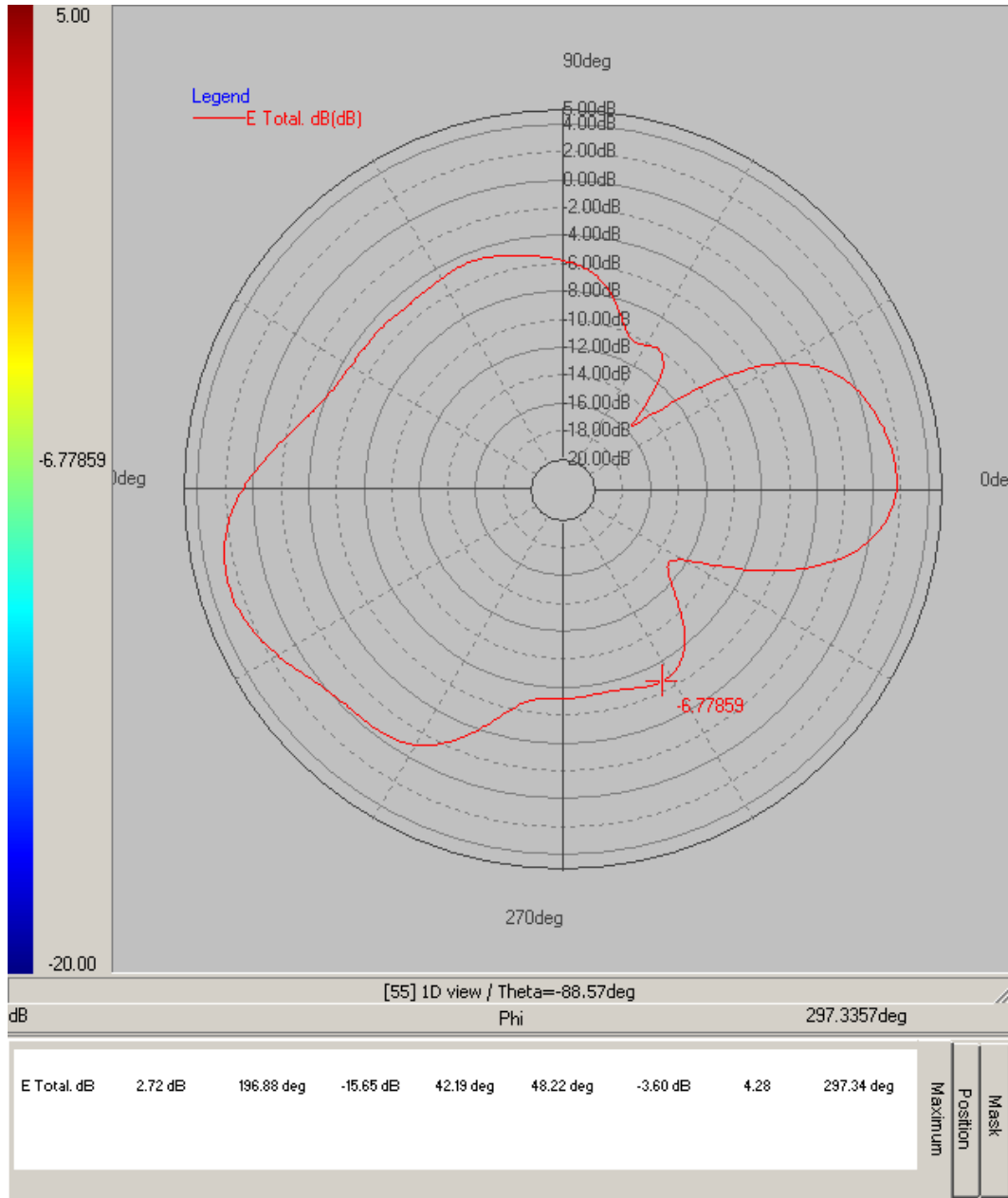
Vertical

Frequency(MHz) :	2450MHz	方位角
Maximum Gain(dB) :	3.49dB	16.87deg
Minimum Gain(dB) :	-7.53dB	177.14deg
Average Gain(dB) :	0.09dB	

Brand / Model : 6672113032-110

Remark : 2450MHz 水平面

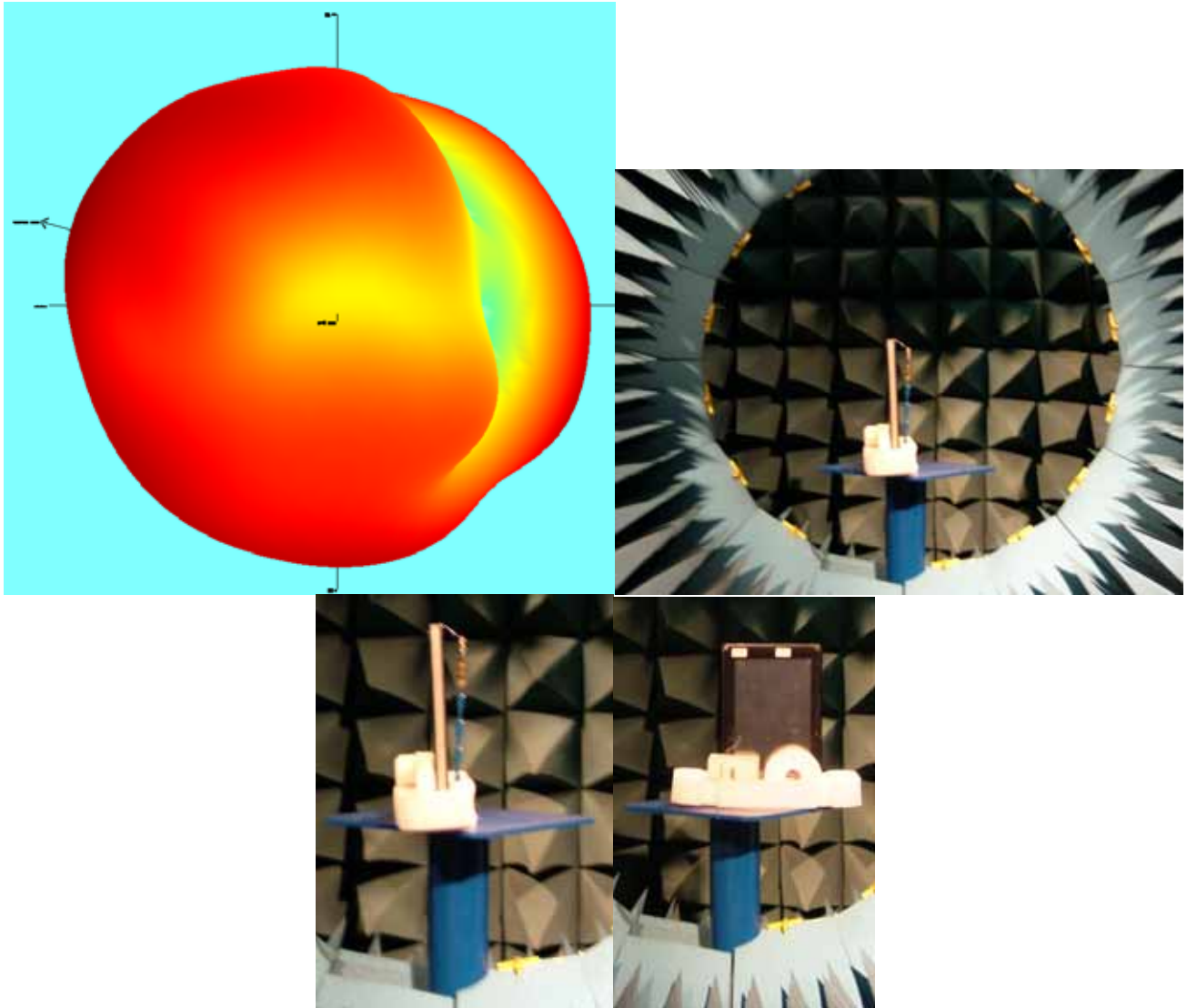
Tested by : Wind-Kuo



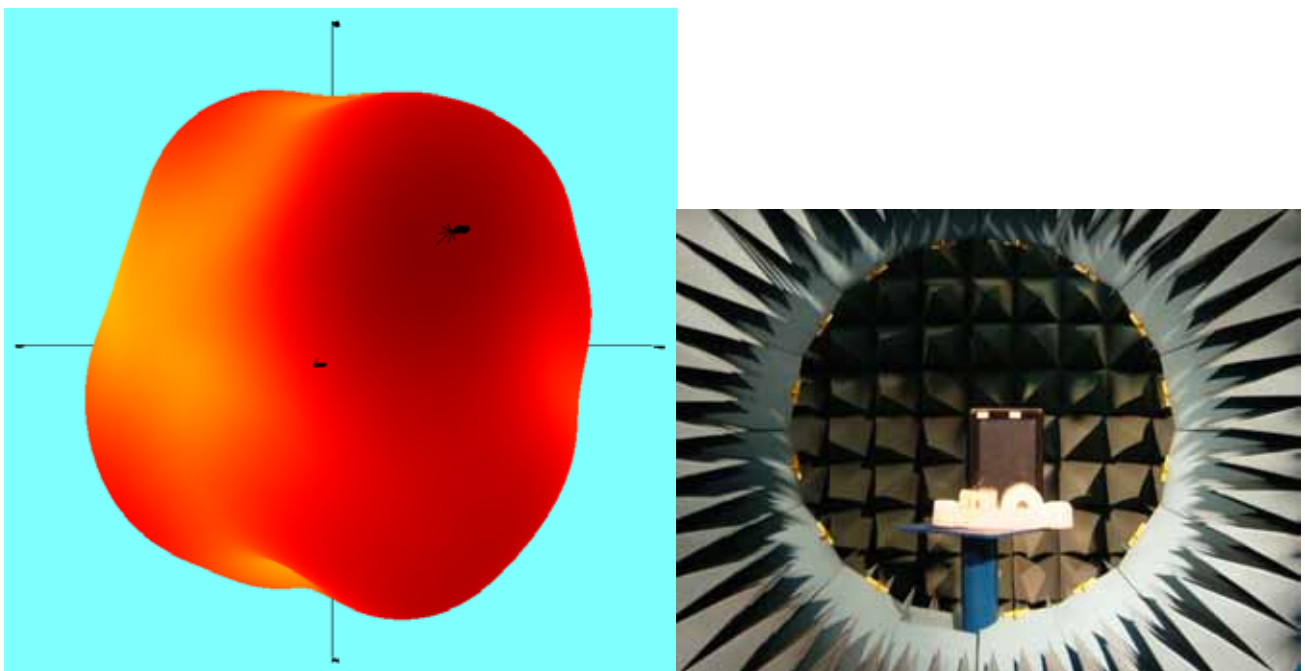
Horizontal

Frequency(MHz) :	2450MHz	俯仰角
Maximum Gain(dB) :	2.72dB	-88.57deg
Minimum Gain(dB) :	-15.65dB	42.19deg
Average Gain(dB) :	-3.60dB	

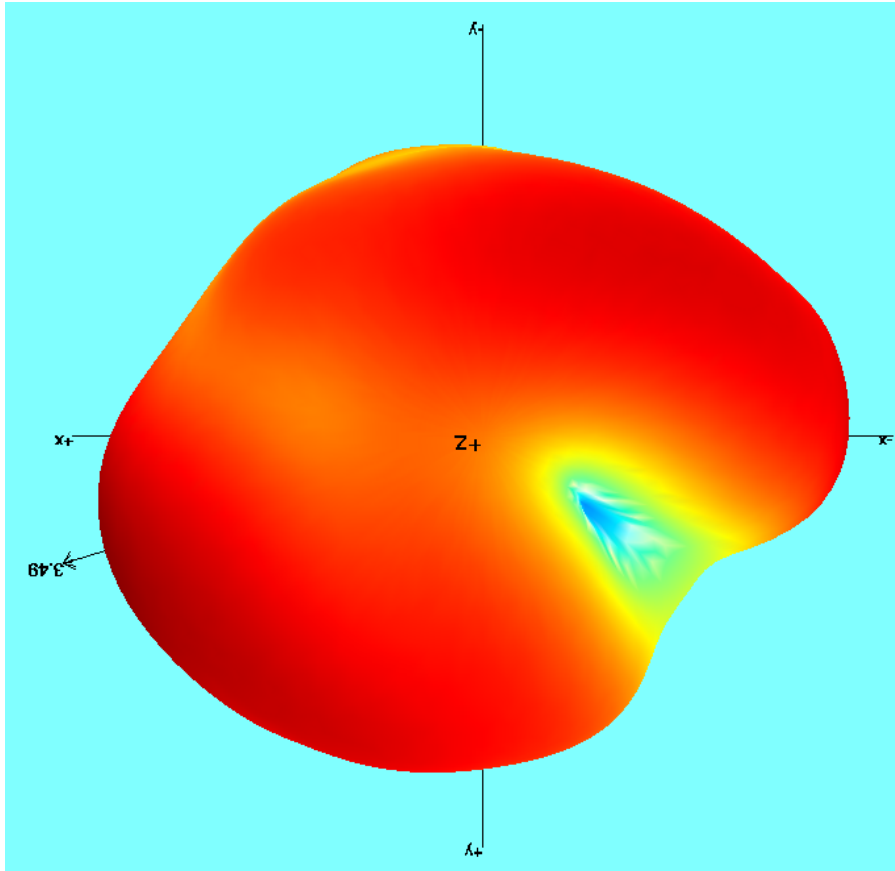
6672113032-110 天線 2450MHz-3D 側視圖



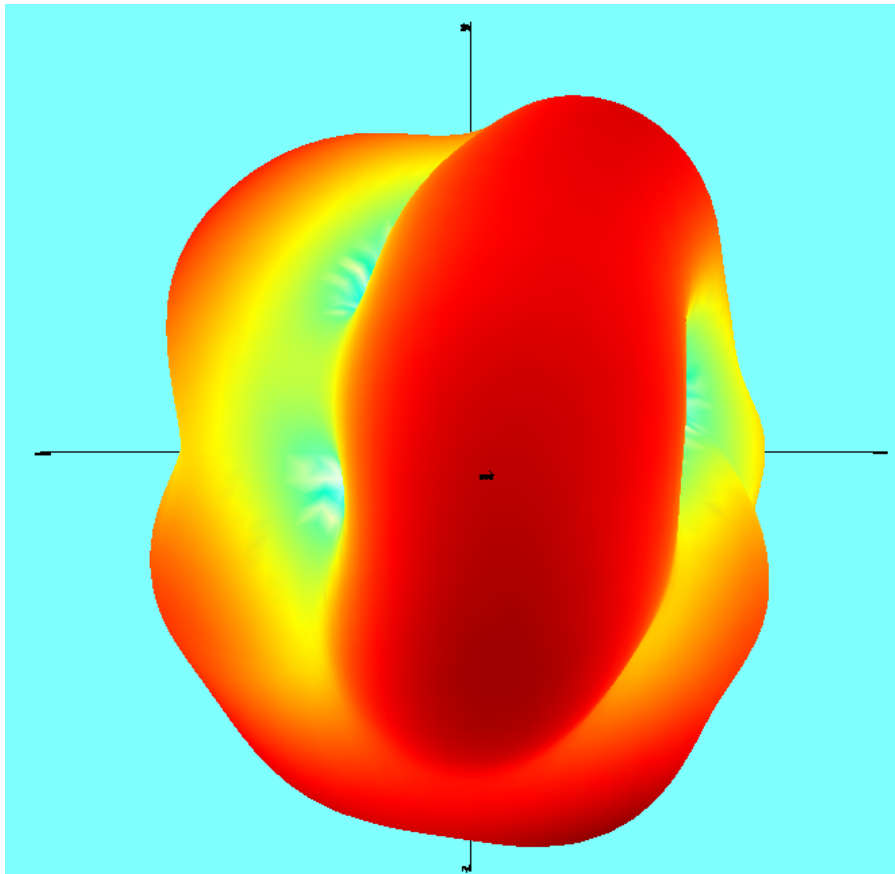
6672113032-110 天線 2450MHz-3D 前視圖



6672113032-110 天線 2450MHz-3D 俯視圖



6672113032-110 天線 2450MHz-3D 後視圖



PRODUCT SPECIFICATION

製品規格

No. PRS-1176

MHF series micro coaxial connector

(Product No. Plug 20278, Rec. 20279)

Qualification Test Report No. TR-1021, TR-08020

8	S08038	K.O	Feb/29/08	EK	Prepared by	Reviewed by	Approved by
7	S3008	K.O	MAR/24/03	K.K	K.Ohbayashi	E,Kawabe	K.Katabuchi
6	S2084	K.O	DEC/19/02	K.K			
REV.	ECN	BY	DATE	APP.	JUN / 25 / 01	Jun / 25 / 01	Jun / 29 / 01
REVISION RECORD							

DOCUMENT CLASSIFICATION	TITLE	No.
Product Specification 製品規格	MHF series micro coaxial connector	PRS-1176
<p>1. Scope / 序言 MHF series micro coaxial connector is a wire to board connector for AWG#36,32,30 coaxial cable . MHF series micro coaxial connector は、AWG # 36,32,30同軸ケーブルの基板対ワイヤーコネクタである。</p> <p>2. Objectives / 目的 This specification covers the requirements for product performance and test methods of MHF series microcoaxial connector 本規格は、MHF series micro coaxial connector の性能と試験条件について規定する。</p> <p>3. Part No. , construction , material and finish / 構成、材料及び仕上げ (1) Part No. Plug : 20278-***R-08,-13,-32,-18 , Receptacle : 20279-001E-01 (2) Construction, material and finish of the connector are covered as each drawings. 構成、材料及び仕上げは、各図面に指定されている通りとする。</p> <p>4. Applicable cable / 適合ケーブル 4-1 Part No. 20278-101R-08, 20278-111R-08, 20278-102R-08, 20278-112R-08 (1) Description Inner conductor : AWG#36(7/0.05) Silver plating annealed copper wire or silver plating tin-copper alloy Dielectric core : Fluoro-plastics ,diameter 0.4(+0.04,-0.02)mm , nominal thickness 0.125mm Outer conductor : 8/5/0.05 , nominal diameter 0.65mm , silver plating annealed copper wire Jacket : Fluoro-plastics , diameter 0.81(+0.04,-0.02)mm , nominal thickness 0.08mm (2) Requirements Characteristic impedance : 50(+2,-2)ohm by TDR method Nominal capacitance(Reference value): 96 pF/m Conductor resistance of inner conductor at 293K (20°C)(Reference value) : 1400 ohm/km Insulation resistance : 1000 mega-ohm.km MIN. Dielectric withstand voltage : no breakdown at AC1000V for 1 minutes.</p> <p>(1) 構成 中心導体 : AWG # 36 (7 / 0.05), 銀メッキ軟銅線または銀メッキすず入り銅線 誘電体 : フッ素樹脂, 外径0.4(+0.04,-0.02), 標準厚さ0.125mm 外部導体 : 8 / 5 / 0.05, 標準外径0.65mm, 銀メッキ軟銅線 ジャケット : フッ素樹脂, 外径0.81(+0.04,-0.02)mm, 標準厚さ0.08mm</p> <p>(2) 仕様 特性インピーダンス : 50±2Ω (TDR) 標準静電容量(参考値) : 96pF/m 293K (20°C)時の中心導体導体抵抗(参考値) : 1400Ω /km 絶縁抵抗 : 1000MΩ・km以上 耐電圧 : AC1000V・1分間にて絶縁破壊の無い事</p> <p>4-2 Part No. 20278-101R-13, 20278-111R-13, 20278-102R-13, 20278-112R-13 (1) Description Inner conductor : AWG#32(7/0.08) Silver plating annealed copper wire or silver plating tin-copper alloy Dielectric core : Fluoro-plastics , diameter 0.68(+0.04,-0.02)mm , nominal thickness 0.22mm Outer conductor : 16/4/0.05 , nominal diameter 0.93mm , silver plating annealed copper wire Jacket : Fluoro-plastics , diameter 1.13(+0.08,-0.05)mm , nominal thickness 0.1mm</p>		

DOCUMENT CLASSIFICATION	TITLE	No.
Product Specification 製品規格	MHF series micro coaxial connector	PRS-1176

(2) Requirements

Characteristic impedance : 50(+2,-2)ohm by TDR method

Nominal capacitance(Reference value): 97 pF/m

Conductor resistance of inner conductor at 293K (20°C)(Reference value) : 520 ohm/km

Insulation resistance : 1500 mega-ohm.km MIN.

Dielectric withstand voltage : no breakdown at AC1000V for 1 minutes.

(1) 構成

中心導体 : AWG # 32(7/0.08), 銀メッキ軟銅線または銀メッキすず入り銅線

誘電体 : フッ素樹脂, 外径0.68(+0.04,-0.02), 標準厚さ0.22mm

外部導体 : 16/4/0.05, 標準外径0.93mm, 銀メッキ軟銅線

ジャケット : フッ素樹脂, 外径1.13(+0.08,-0.05)mm, 標準厚さ0.1mm

(2) 仕様

特性インピーダンス : $50 \pm 2 \Omega$ (TDR)

標準静電容量(参考値) : 97pF/m

293K(20°C)時の中心導体導体抵抗(参考値) : $520 \Omega / \text{km}$

絶縁抵抗 : 1500M $\Omega \cdot \text{km}$ 以上

耐電圧 : AC1000V・1分間にて絶縁破壊の無い事

4-3 Part No. 20278-101R-32, 20278-111R-32, 20278-102R-32, 20278-112R-32

(1) Description

Inner conductor : AWG#32(7/0.08)

Silver plating annealed copper wire or silver plating tin-copper alloy

Dielectric core : Fluoro-plastics , diameter 0.66(+0.05,-0.05)mm , nominal thickness 0.21mm

First outer conductor : 16/5/0.05, tin plating annealed copper wire

Second outer conductor : 16/6/0.05, nominal diameter 1.12mm , tin plating annealed copper wire

Jacket : Fluoro-plastics , diameter 1.32(+0.1,-0.1)mm , nominal thickness 0.1mm

(2) Requirements

Characteristic impedance : 50(+2,-2)ohm by TDR method

Nominal capacitance(Reference value): 95 pF/m

Conductor resistance of inner conductor at 293K (20°C) (Reference value) : 520 ohm/km

Insulation resistance : 1500 mega-ohm.km MIN.

Dielectric withstand voltage : no breakdown at AC1000V for 1 minutes.

(1) 構成

中心導体 : AWG # 32(7/0.08), 銀メッキ軟銅線または銀メッキすず入り銅線

誘電体 : フッ素樹脂, 外径0.66(+0.05,-0.05), 標準厚さ0.21mm

外部導体(内側) : 16/5/0.05, すずメッキ軟銅線

外部導体(外側) : 16/6/0.05, 標準外径1.12mm, すずメッキ軟銅線

ジャケット : フッ素樹脂, 外径1.32(+0.1,-0.1)mm, 標準厚さ0.1mm

(2) 仕様

特性インピーダンス : $50 \pm 2 \Omega$ (TDR)

標準静電容量(参考値) : 95pF/m

293K(20°C)時の中心導体導体抵抗(参考値) : $520 \Omega / \text{km}$

絶縁抵抗 : 1500M $\Omega \cdot \text{km}$ 以上

耐電圧 : AC1000V・1分間にて絶縁破壊の無い事

DOCUMENT CLASSIFICATION	TITLE	No.
Product Specification 製品規格	MHF series micro coaxial connector	PRS-1176

4-4 Part No. 20278-101R-18, 20278-111R-18, 20278-102R-18, 20278-112R-18

RG178 B/U

(1) Description

Inner conductor : AWG#30(7/0.102) , silver plating copper clad steel wire

Dielectric core : Fluoro-plastics , diameter 0.84(+0.03,-0.03)mm , nominal thickness 0.268mm

Outer conductor : 16/3/0.1 , nominal diameter 1.35mm , silver plating copper wire

Jacket : Fluoro-plastics , diameter 1.8(+0.1,-0.1)mm , nominal thickness 0.23mm

(2) Requirements

Characteristic impedance : 50(+2,-2)ohm by TDR method

Nominal capacitance(Reference value): 95 pF/m

Conductor resistance of inner conductor at 293K (20°C) (Reference value) : 805 ohm/km

Insulation resistance : 1500 mega-ohm.km MIN.

Dielectric withstand voltage : no breakdown at AC2000V for 1 minutes.

(1) 構成

中心導体 : AWG # 30(7/0.102), 銀メッキ銅被鋼線

誘電体 : フッ素樹脂, 外径0.84(±0.03), 標準厚さ0.268mm

外部導体 : 16/3/0.1, 標準外径1.35mm, 銀メッキ軟銅線

ジャケット : フッ素樹脂, 外径1.8(±0.1)mm, 標準厚さ0.23mm

(2) 仕様

特性インピーダンス : 50±2Ω (TDR)

標準静電容量(参考値) : 95pF/m

293K(20°C)時の中心導体導体抵抗(参考値) : 805Ω /km

絶縁抵抗 : 1500MΩ・km以上

耐電圧 : AC2000V・1分間にて絶縁破壊の無い事

5. Ratings / 定格

(1) Rated voltage / 電圧 : AC60Vrms

(2) Nominal characteristic impedance / 公称特性インピーダンス : 50Ω

(3) Frequency / 周波数 : DC~6GHz

(4) VSWR : Plug 1.3 MAX at 0.1~3GHz 1.5 MAX at 3~6GHz

Receptacle 1.3 MAX at 0.1~3GHz. 1.4 MAX at 3~6GHz

(5) Service Temperature / 使用温度範囲 : 233~363K(-40~+90°C)

6. Test methods and performance / 試験及び性能

6-1 Test condition / 試験条件

Unless otherwise specified, all tests and measurements shall be performed under the following conditions in accordance with MIL-STD-202

全ての測定と試験は、MIL-STD-202に基づき以下の条件で行う。

Temperature / 温度 : 288~308K (15~35°C)

Humidity / 湿度 : 45~75%RH

DOCUMENT CLASSIFICATION	TITLE	No.
Product Specification 製品規格	MHF series micro coaxial connector	PRS-1176

6-2-1 Electrical / 電氣的性能

(1) Contact Resistance / 接触抵抗

A. Testing: Solder the receptacle connector to the test board and mate the plug connector together, then measure the contact resistance as shown in Fig.1 by the four terminal method. Apply the low level condition in accordance with MIL-STD-202, Method 307.

Open circuit voltage : 20mV MAX

Circuit current : 10mA MAX. (DC or AC1kHz)

Contact resistance of inner contact : <resistance of A-E> - <resistance of B-E>

Contact resistance of ground contact : <resistance of A-D> - <resistance of B-D>

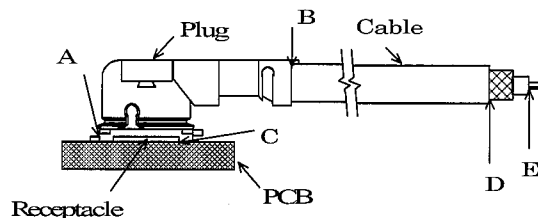


Fig.1

B. Requirements :

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A. 試験法: テスト基板にリセプタクルコネクタを半田付けし、プラグコネクタと嵌合させ、Fig. 1のように4端子法にて下記の条件で測定する。MIL-STD-202 試験法 307 に準拠。

開回路電圧: 20mV以下

試験電流 : 10mA (DCもしくはAC1kHz)

中心導体 : <A-E間の電気抵抗> - <B-E間の電気抵抗>

外部導体 : <A-D間の電気抵抗> - <B-D間の電気抵抗>

B. 必要条件: 中心導体 初期 20mΩ 以下, 試験後 25mΩ 以下

外部導体 初期 10mΩ 以下, 試験後 15mΩ 以下

(2) Insulation resistance / 絶縁抵抗

A. Testing : Mate the plug and receptacle connector together, then apply DC 100 V between the inner contact and the ground contact in accordance with MIL-STD-202, Method 302.

B. Requirements : Initial 500 Mohm MIN. after testing 100 Mohm MIN.

A. 試験法: リセプタクル及びプラグコネクタを互いに嵌合させ、中心導体と外部導体の間に DC 100Vを印加し、測定する。MIL-STD-202 試験法 302 に準拠。

B. 必要条件: 初期 500MΩ 以上 試験後 100MΩ 以上

(3) Dielectric withstanding voltage / 耐電圧

A. Testing : Mate the receptacle and plug connector together, then apply AC 200 Vrms between the inner contact and the ground contact for a minute in accordance with MIL-STD-202, Method 301.

B. Requirements : No creeping discharge, flashover, nor insulator breakdown shall occur.

A. 試験法: リセプタクル及びプラグコネクタを互いに嵌合させ、中心導体と外部導体の間にAC200V(実効値)を一分間印加する。MIL-STD-202 試験法 301 に準拠。

B. 必要条件: 沿面放電、空中放電、絶縁破壊等の異常のないこと。

DOCUMENT CLASSIFICATION	TITLE	No.
Product Specification 製品規格	MHF series micro coaxial connector	PRS-1176

(4) VSWR

A. Testing : Measure the VSWR as shown in Fig.3 by the network analyzer.

Frequency : 100M~6GHz

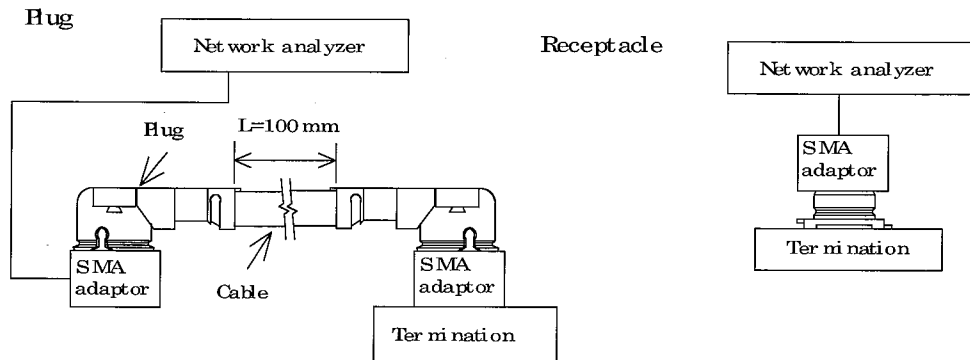


Fig 3

B. Requirements : Plug 1.3 MAX at 0.1~3GHz 1.5 MAX at 3~6GHz

Receptacle 1.3 MAX at 0.1~3GHz. 1.4 MAX at 3~6GHz

A. 試験法 : ネットワークアナライザーにて Fig.3 のように VSWR を測定する。

周波数 : 100M~6GHz

B. 必要条件 : Plug 1.3 以下 0.1~3GHz 1.5 以下 3~6GHz

Receptacle 1.3 以下 0.1~3GHz 1.4 以下 3~6GHz

6-2-2 Mechanical / 機械的性能

(1) Unmating force / 抜去力

A. Testing : Unmate the receptacle connector (soldered to the test board) and plug at a speed 25 ± 3 mm/minutes along the mating by the push-on/pull-off machine .

B. Requirements :

Total unmating force : Initial 5N MIN. after 30 cycles 3N MIN.

Unmating force of inner contact : Initial 0.15N MIN. after 30 cycles 0.1N MIN

A. 試験法 : 挿抜試験機を用いて、基板に半田付けしたリセプタクルとプラグを嵌合軸と平行に毎分 25 ± 3 mm の速度で挿抜する。

B. 必要条件 :

総合抜去力 : 初回抜去力 5N 以上 , 30 回後抜去力 3N 以上

中心導体 : 初回抜去力 0.15N 以上 , 30 回後抜去力 0.1N 以上

(2) Crimp strength / 引張強度

A. Testing : Pull the cable as shown in Fig.5 at a speed 25 ± 3 mm/minutes by tensile strength machine.

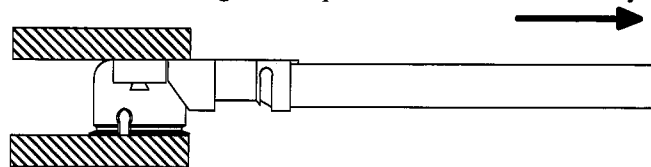


Fig.5

B. Requirements : 20278-1 **R-08,13,32 : 10N MIN, 20278-1 **R-18 : 15N MIN,

A. 試験法 : 引張試験機を用いて、毎分 25 ± 3 mm の速度でケーブルを引張り、強度を測定する。

B. 必要条件 : 20278-1 **R-08,13,32 : 10N 以上, 20278-1 **R-18 : 15N 以上

DOCUMENT CLASSIFICATION	TITLE	No.
Product Specification 製品規格	MHF series micro coaxial connector	PRS-1176

(3) Durability / 耐久性

A. Testing : Mate and umate the receptacle connector (soldered to the test board) and plug 30 cycles at a speed 25 ± 3 mm/minutes along the mating by the push-on/pull-off machine .

B.Requirements :

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A.試験法:挿抜試験機を用いて、基板に半田付けしたリセプタクルとプラグを嵌合軸と平行に毎分 25 ± 3 mmの速度で30回挿抜する。

B.必要条件 中心導体接触抵抗 : 初期 $20\text{m}\Omega$ 以下, 試験後 $25\text{m}\Omega$ 以下
外部導体接触抵抗 : 初期 $10\text{m}\Omega$ 以下, 試験後 $15\text{m}\Omega$ 以下

(4) Contact resistance with force on the cable / ケーブルに荷重を加えた後の接触抵抗

A. Testing : Apply force on the cable as shown in Fig.2.

During the testing, run 100mA DC to check electrical discontinuity.

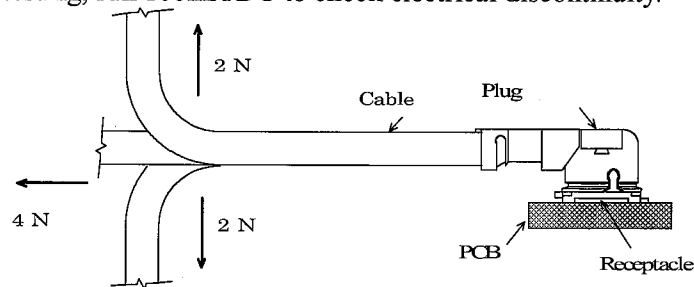


Fig.2

B.Requirements

Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.

Electrical discontinuity : No electrical discontinuity grater than 1 micro-sec. shall occur.

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A.試験法:Fig. 2のようにケーブルに力を加える。尚、試験中にDC100mAの電流を流して電氣的瞬断を確認する。

B.必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。
電流瞬断 : 試験中、1マイクロ秒を超える電氣的瞬断の無いこと。
中心導体接触抵抗 : 初期 $20\text{m}\Omega$ 以下, 試験後 $25\text{m}\Omega$ 以下
外部導体接触抵抗 : 初期 $10\text{m}\Omega$ 以下, 試験後 $15\text{m}\Omega$ 以下

(5) Vibration / 振動

A. Testing : Apply the following vibration to the mating connector .

During the testing, run 100mA DC to check electrical discontinuity.

Frequency : 10Hz \rightarrow 100Hz \rightarrow 10Hz / approx 15 minutes.

Half amplitude ,Peak value of acceleration: 1.5mm or 59m/s^2 (6G)

Directions , cycle : 3 mutually perpendicular direction ,

5 cycles(approx 75min)about each direction

B.Requirements

Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.

Electrical discontinuity : No electrical discontinuity grater than 1micro-sec. shall occur.

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

DOCUMENT CLASSIFICATION	TITLE	No.
Product Specification 製品規格	MHF series micro coaxial connector	PRS-1176

A. 試験法: 嵌合状態のコネクタを、下記の振動を加える。尚、試験中にDC100mAの電流を流して電氣的瞬断を確認する。

周波数 : 10Hz→100Hz→10Hz / 約15分間

片振幅, 加速度: 1.5mm or 59m/s² (6G)

方向, サイクル: 3つの互いに直角な方向について各5サイクル(約75分)実施

B. 必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。
電流瞬断 : 試験中、1 マイクロ秒を超える電氣的瞬断の無いこと。
中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下
外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

(6) Shock / 衝撃

A. Testing : Apply the following vibration to the mating connector in accordance with MIL-STD-202, Method 213, Condition B. During the testing, run 100mA DC to check electrical discontinuity.

Peak value of acceleration: 735m/s² (75G)

Duration : 11msec

Wave Form : half sinusoidal

Directions , cycle : 6 mutually perpendicular direction , 3 cycles about each direction

B. Requirements

Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.

Electrical discontinuity : No electrical discontinuity grater than 1 micro-sec. shall occur.

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A. 試験法: 嵌合状態のコネクタを、衝撃試験機に取り付け、下記の衝撃を加える。尚、試験中にDC100mAの電流を流して電氣的瞬断を確認する。MIN-STD-202 試験法 213 試験条件 B に準拠。

最大加速度: 735m/s² (75G)

標準持続時間: 11msec.

波形: 半波正弦波

方向: 直交する6方向、各3回

B. 必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。
電流瞬断 : 試験中、1 マイクロ秒を超える電氣的瞬断の無いこと。
中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下
外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

6-2-3 Environmental / 耐環境性

(1) Thermal shock/ 温度サイクル

A. Testing : Apply the following environment to the mating connector .

Temperature ,duration

:233K/30minutes→278~308K/5minutes MAX.→363K/30minutes→278~308K/5minutes MAX.

(-40°C)

(5~35°C)

(90°C)

(5~35°C)

No. of cycles : 5 cycles

B. Requirements

Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

Insulation resistance : initial 500 mega-ohm MIN. after testing 100 mega-ohm MIN.

DOCUMENT CLASSIFICATION	TITLE	No.
Product Specification 製品規格	MHF series micro coaxial connector	PRS-1176

A. 試験法: 嵌合状態のコネクタを、下記の雰囲気中に放置する。

1サイクルの条件

: 233K / 30分 → 278 ~ 308K / 5分以下 → 363K / 30分 → 278 ~ 308K / 5分以下
(-40°C) (5 ~ 35°C) (90°C) (5 ~ 35°C)

実施サイクル : 5サイクル

B. 必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。

中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下

外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

絶縁抵抗 : 初期 500MΩ 以上 試験後 100MΩ 以上

(2) Humidity / 湿度

A. Testing : Apply the following environment to the mating connector in accordance with MIL-STD-202, Method 103, Condition B.

Temperature : 313 ± 2 K (40 ± 2°C)

Humidity : 90 ~ 95%RH

Duration : 96 hours

B. Requirements

Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

Insulation resistance : initial 500 mega-ohm MIN. after testing 100 mega-ohm MIN.

A. 試験法: 嵌合状態のコネクタを、下記の雰囲気中に放置する。MIL-STD-202 試験法 103 条件 B に準拠。

温度: 313 ± 2K (40 ± 2°C)

湿度: 90 ~ 95%RH

時間: 96時間

B. 必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。

中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下

外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

絶縁抵抗 : 初期 500MΩ 以上 試験後 100MΩ 以上

(3) Salt water spray / 塩水噴霧

A. Testing : Apply the following environment to the mating connector in accordance with MIL-STD-202, Method 101, Condition B.

Temperature : 308 ± 2 K (35 ± 2°C)

Salt water density by weight : 5 ± 1%

Duration : 48 hours

B. Requirements : Appearance no abnormality adversely affecting the performance shall occur.

A. 試験法: 嵌合状態のコネクタを、下記の雰囲気中に放置する。

温度 : 308 ± 2K (35 ± 2°C)

塩水濃度: 5 ± 1% (重量比)

時間 : 48時間

B. 必要条件 : 外観 著しい腐食の無い事。

DOCUMENT CLASSIFICATION	TITLE	No.
Product Specification 製品規格	MHF series micro coaxial connector	PRS-1176

(4) High temperature life / 高温

A. Testing : Apply the following environment to the mating connector.

Temperature : 363 ± 2 K ($90 \pm 2^\circ\text{C}$) Duration : 96 hours

B. Requirements

Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A. 試験法: 嵌合状態のコネクタを、下記の雰囲気中に放置する。

温度: 363 ± 2 K ($90 \pm 2^\circ\text{C}$) 時間: 96時間

B. 必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。

中心導体接触抵抗 : 初期 $20\text{m}\Omega$ 以下, 試験後 $25\text{m}\Omega$ 以下

外部導体接触抵抗 : 初期 $10\text{m}\Omega$ 以下, 試験後 $15\text{m}\Omega$ 以下

6-2-4 Solder / 半田付け関連

(1) Solderability / 半田付け性

A. Testing : Dip the solder tine of the contact in the solder bath at 518 ± 5 ($245 \pm 5^\circ\text{C}$) for 5 ± 0.5 sec.

After immersing the tine in the flux of RMA or R type for 5 to 10 seconds in accordance with MIL-STD-202, Method 208.

B. Requirements : More than 95% of the dipped surface shall be evenly wet.

A. 試験法: コネクタの半田付け部を 518 ± 5 K ($245 \pm 5^\circ\text{C}$) の半田槽内に 5 ± 0.5 秒浸す。フラックスは、RMA
又は R 型を使用し 5~10 秒間浸すものとする。MIL-STD-202, 試験法 208 に準拠。

B. 必要条件: 浸した面積の 95% 以上に半田がむらなく付着すること。

(2) Reflow soldering heat resistance / 半田耐熱性

A. Testing : Put on the receptacle connector to PCB, apply the heat 2 cycles as shown in Fig. 4

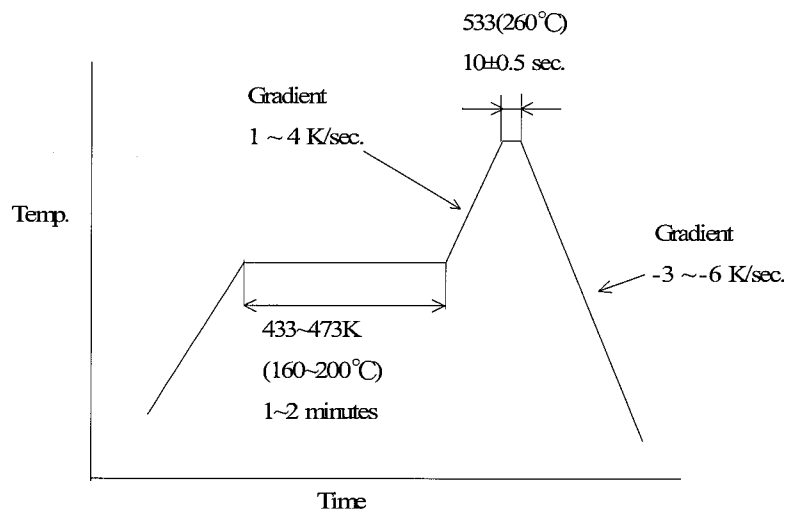


Fig.4

B. Requirements : Appearance no abnormality adversely affecting the performance shall occur.

A. 試験法: 基板にリセプタクルコネクタを置き、Fig. 4の条件で2回リフローを行う。

B. 必要条件: 機能を損なう変形及び欠陥の無い事。

DOCUMENT CLASSIFICATION Product Specification 製品規格	TITLE MHF series micro coaxial connector	No. PRS-1176
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6-2-5 試験順序と試料数 / Test Sequence and Sample Quantity

Test Item 試験項目	Group / グループ														
	A	B	C	D	E	F	G	H	I	L	M	N	O	P	
(1) Contact Resistance 接触抵抗					1 3	1 3	1 3	1 3	1 4	1 4		1 3			
(2) Insulation resistance 絶縁抵抗									2 5	2 5					
(3) Dielectric withstanding voltage 耐電圧	1														
(4) VSWR		1													
(5) Crimp strength 引張強度			1												
(6) Unmating force 抜去力				1											
(7) Durability 耐久性					2										
(8) Contact resistance with force on the cable ケーブルに荷重を加えた後の 接触抵抗						2									
(9) Vibration 振動							2								
(10) Shock 衝撃								2							
(11) Thermal shock 温度サイクル									3						
(12) Humidity 湿度										3					
(13) Salt water spray 塩水噴霧											1				
(14) High temperature life 高温												2			
(15) Solderability 半田付け性													1		
(16) Reflow soldering heat resistance 半田耐熱性														1	
Sample QTY pcs. 試料数	Plug プラグ	10	5	10	10	10	10	10	10	10	10	10	10	----	----
	Receptacle リセプタクル	10	5	----	10	10	10	10	10	10	10	10	10	10	10
Test Board 基板数	pcs.	10	5	----	10	10	10	10	10	10	10	10	10	----	10

No.06027-1
Feb / 26/'08

材料証明書
MATERIAL CERTIFICATE

当社製品には下記の材料が使われている事を証明致します。

WE HEREBY CERTIFY THAT THE FOLLOWING MATERIALS ARE USED IN OUR PRODUCT.

PRODUCT NAME : MHF series micro coaxial connector PLUG & RECEPTACLE VERTICAL

Plug, Non halogen free type

Part No.	Contents	Housing	Contact	Ground contact
20278-101R-08	材質名/ Material	PBT	Phosphor bronze	Phosphor bronze
20278-111R-08				
20278-101R-13	型名/ Cat No.	DURANEX 3116	C5210R-H	C5191R-1/2H
20278-111R-13				
20278-101R-32	材料メーカー	WINTECH POLYMER LTD.	Nippon Mining &	HARADA METAL
20278-111R-32	Manufacturer		Metals Co.,Ltd.	INDUSTRY Co.,Ltd.
20278-101R-18				
20278-111R-18	UL94難燃性	V-0	-----	-----
20308-101R-13	UL94 flame			
20308-111R-13	class			
20308-101R-32				
20308-111R-32	UL file No.	E213445	-----	-----
20351-101R-37				
20351-111R-37				

添付資料 : ULカード写し / UL CARD COPY

APPROVAL	CHECK	ORIGINATOR
T.Harada Feb/26/'08	T.Tagawa Feb/26/'08	K.Ohbayashi Feb/26/'08

Plug, Halogen free type

Part No.	Contents	Housing	Contact	Ground contact
20278-102R-08	材質名/ Material	PBT	Phosphor bronze	Phosphor bronze
20278-112R-08	型名/ Cat No.	XFR4840 GF10	C5210R-H	C5191R-1/2H
20278-102R-13	材料メーカー	WINTECH POLYMER LTD.	Nippon Mining & Metals Co.,Ltd.	HARADA METAL INDUSTRY Co.,Ltd.
20278-112R-13	Manufacturer			
20278-102R-32	UL94難燃性	V-0	-----	-----
20278-112R-32	UL94 flame class			
20278-102R-18	UL file No.	E213445	-----	-----
20278-112R-18				
20351-102R-37				
20351-112R-37				

添付資料：ULカード写し / UL CARD COPY

Receptacle

Part No.	Contents	Housing	Contact	Ground contact
20279-001E-01	材質名/ Material	LCP	Brass	Phosphor bronze
20314-001E-01	型名/ Cat No.	VECTRA E130i	C2680R-o	C5191R-1/2H
	材料メーカー	Polyplastics Co.,Ltd	Nippon Mining & Metals Co.,Ltd.	HARADA METAL INDUSTRY Co.,Ltd.
	Manufacturer			
	UL94難燃性	V-0	-----	-----
	UL94 flame class			
	UL file No.	E 106764	-----	-----

添付資料：ULカード写し / UL CARD COPY

QMFZ2 Component - Plastics

Friday, October 24, 2003

E213445

WINTECH POLYMER LTD

18-1 KONAN 2-CHOME MINATO-KU TOKYO 108-8280 JP

Material Designation: **3116(e)**

Product Description: Polybutylene Terephthalate (PBT), designated "Duranex" furnished as pellets.

Color	Min. Thick. (mm)	Flame Class	HWI	HAI	RTI Elec	RTI Imp	RTI Str	IEC GWIT	IEC GWFI
ALL	0.75	V-0	4	0	130	-	130	-	-
	1.5	V-0	3	0	130	120	130	-	-
NC, BK	3	5VA	2	0	130	120	130	-	-
CTI: 2	IEC CTI (V): -	HVTR: 3			D495: 6			IEC Ball Pressure (° C): -	
Dielectric Strength (kV/mm): 23		Volume Resistivity (10⁹ohm-cm): 16						Dimensional Stability(%):0.0	
ISO Tensile Strength (MPa): -		ISO Flexural Strength (MPa): -						ISO Heat Deflection (C): -	
ISO Tensile Impact (kJ/m²): -		ISO Izod Impact (kJ/m²): -						ISO Charpy Impact(kJ/m²): -	

(e) Virgin and regrind from 1 to 50 by weight incl. have the same basic material characteristics (at a minimum thickness of 0.75 mm), except for 310EP which has a lower as received Tensile Impact value from 26 to 50 percent regrind.

Report Date: 11/15/2000

Underwriters Laboratories IncR

UL94 small-scale test data does not pertain to building materials, furnishings and related contents. UL 94 small-scale test data is intended solely for determining the flammability of plastic materials used in components and parts of end-product devices and appliances, where the acceptability of the combination is determined by ULI.

Component - Plastics

E213445

WINTECH POLYMER LTD

18-1 KONAN 2-CHOME, MINATO-KU, TOKYO 108-8280 JP

XFR 4840 GF10

Polybutylene Terephthalate (PBT), "Duranex", furnished as pellets

Color	Min Thk (mm)	Flame Class	HWI	HAI	RTI Elec	RTI Imp	RTI Str
ALL	0.75	V-0	1	0	75	75	75
	1.5	V-0	1	0	75	75	75
	3.0	V-0	1	0	75	75	75

Comparative Tracking Index (CTI): **1**

Dimensional Stability (%): -

High-Voltage Arc Tracking Rate
(HVTR): **0**High Volt, Low Current Arc Resis (D495): **5**Dielectric Strength (kV/mm): **24**Volume Resistivity (10xohm-cm): **14**

UL94 small-scale test data does not pertain to building materials, furnishings and related contents. UL94 small-scale test data is intended solely for determining the flammability of plastic materials used in the components and parts of end-product devices and appliances, where the acceptability of the combination is determined by ULL.

Report Date: 2006-07-24
Last Revised: 2006-07-25

Underwriters Laboratories Inc®

**IEC and ISO Test Methods**

Test Name	Test Method	Units	Thickness	
			Tested (mm)	Value
IEC Flammability	IEC 60695-11-10	Class (color)	0.75	V-0 (ALL)
			1.5	V-0 (ALL)
			3.0	V-0 (ALL)
Glow-Wire Flammability (GWFI)	IEC 60695-2-12	C	-	-
Glow-Wire Ignition (GWIT)	IEC 60695-2-13	C	-	-
IEC Comparative Tracking Index	IEC 60112	Volts (Max)	-	-
IEC Ball Pressure	IEC 60695-10-2	C	-	-
ISO Heat Deflection (1.80 MPa)	ISO 75-2	C	-	-
ISO Tensile Strength	ISO 527-2	MPa	-	-
ISO Flexural Strength	ISO 178	MPa	-	-
ISO Tensile Impact	ISO 8256	kJ/m2	-	-
ISO Izod Impact	ISO 180	kJ/m2	-	-
ISO Charpy Impact	ISO 179-2	kJ/m2	-	-

Underwriters Laboratories Inc®

QMFZ2 Component - Plastics

Friday, October 24, 2003

E106764

POLYPLASTICS CO LTD

VECTRA DIV 18-1 KONAN 2-CHOME MINATO-KU TOKYO 108-8280 JAPAN

Material Designation: **E130i(d)(e)**

Product Description: Liquid Crystal Polymer (LCP), thermotropic aromatic polyester, designated "Vectra" furnished as pellets.

Color	Min. Thick. (mm)	Flame Class	HWI	HAI	RTI Elec	RTI Imp	RTI Str	IEC GWIT	IEC GWFI
ALL	0.75	V-0	2	4	240	220	240	-	-
	1.5	V-0	1	4	240	220	240	-	-
	3.0	V-0	0	4	240	220	240	-	-

CTI: 4

HVTR: 0

D495: 5

IEC Ball Pressure (°C): -

Dielectric Strength (kV/mm): 39

Volume Resistivity (10⁹ohm-cm): 16

Dimensional Stability(%): 0

ISO Tensile Strength (MPa): -

ISO Flexural Strength (MPa): -

ISO Heat Deflection (°C): -

ISO Tensile Impact (kJ/m²): -

ISO Izod Impact (kJ/m²): -

ISO Charpy Impact (kJ/m²): -

(d) Virgin and regrind up to 50% by weight incl. have the same basic material characteristics for colors NC and BK.

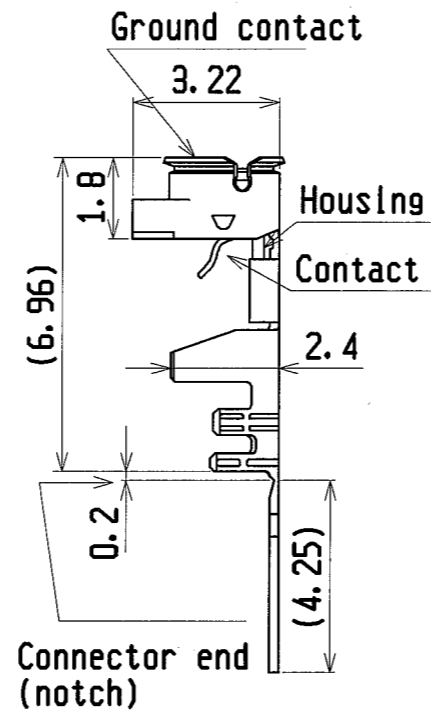
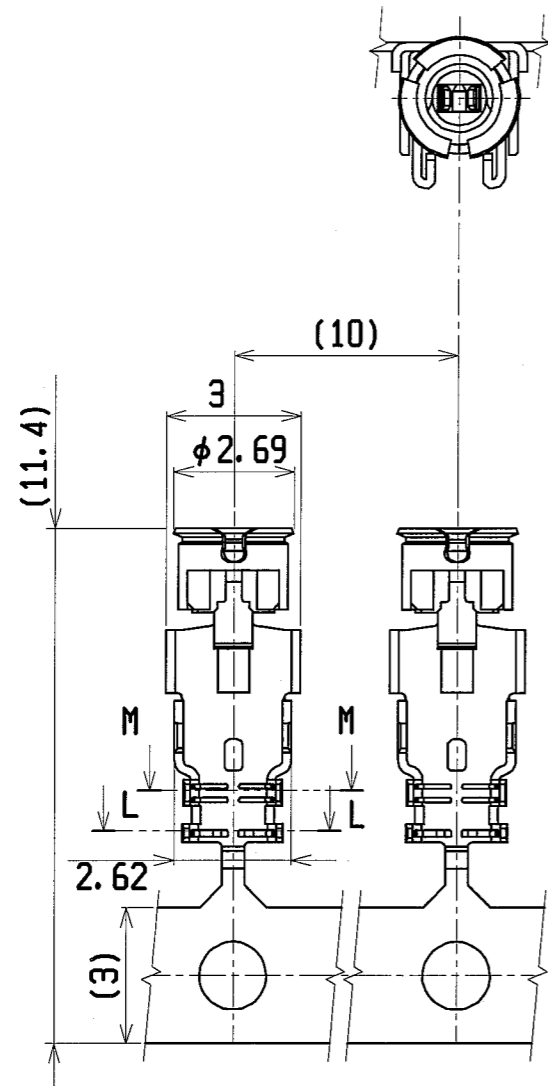
(e) In addition, regrind at 26 to 50% have the same basic characteristics at a minimum of 1.5mm except RTI's for the Mechanical w/Impact property is 180C.

Report Date: 8/19/1992

Underwriters Laboratories Inc®

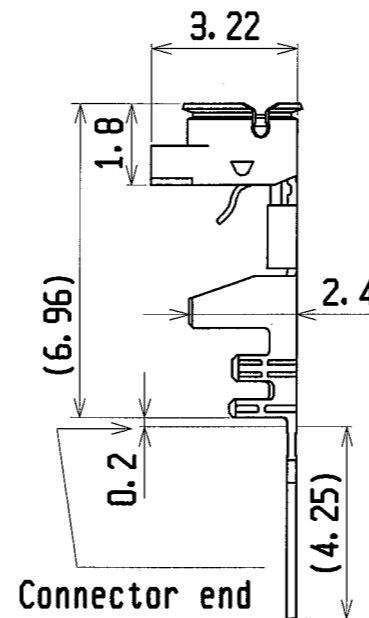
UL94 small-scale test data does not pertain to building materials, furnishings and related contents. UL 94 small-scale test data is intended solely for determining the flammability of plastic materials used in components and parts of end-product devices and appliances, where the acceptability of the combination is determined by ULI.

PART NO.
20278-***R-***



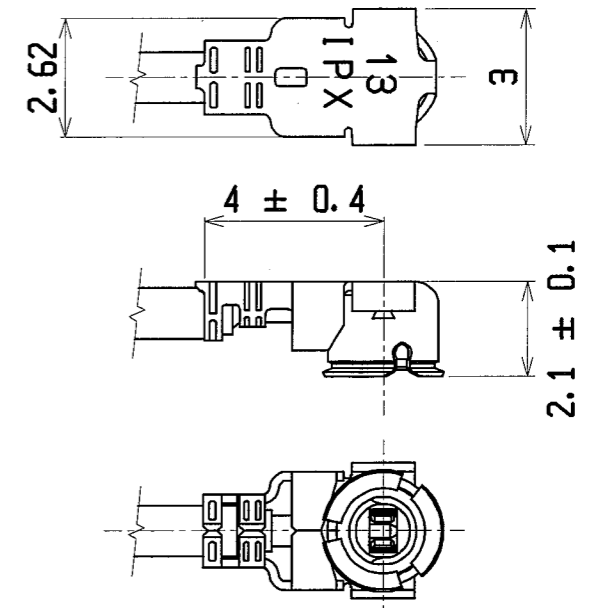
Part No. 20278-101R-08
20278-102R-08
20278-101R-13
20278-102R-13
20278-101R-32
20278-102R-32

For hand tool
(with notch)



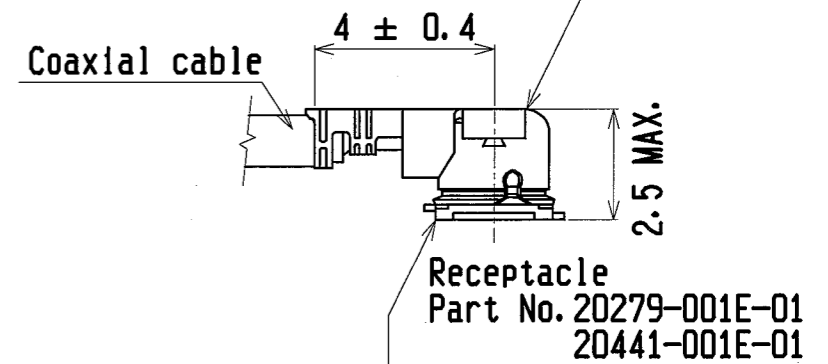
Part No. 20278-111R-08
20278-112R-08
20278-111R-13
20278-112R-13
20278-111R-32
20278-112R-32

For semi auto
termination machine
(without notch)



Cable Ass'y

Plug
P/N 20278-1**R-08
P/N 20278-1**R-13
P/N 20278-1**R-32



MATING

GENERAL TOLERANCE		
6 MAX.	±0.2	
6 OVER MAX. 30	±0.3	
30 OVER MAX. 120	±0.5	
ANGLE	±2°	

19C	Z08056	K.O	Feb/04/08	EK	DESIGN'D BY	DATE
18C	Z07346	K.O	Jul/10/08	E.K	K. Ohbayashi	JUN/13/01
17C	Z05233	K.O	May/18/05	T.H	CHK'D BY	DATE
16C	Z05024	K.O	Jan/20/05	T.H		
15C	Z04398	K.O	Nov/12/04	T.H	APP'D BY	DATE
REV	ECN	BY	DATE	APP	K. Katabuchi	JUN/13/01
REV. RECORD					CUSTOMER	PROJECTION
SERIES No. 2814					COPY	6/1 mm

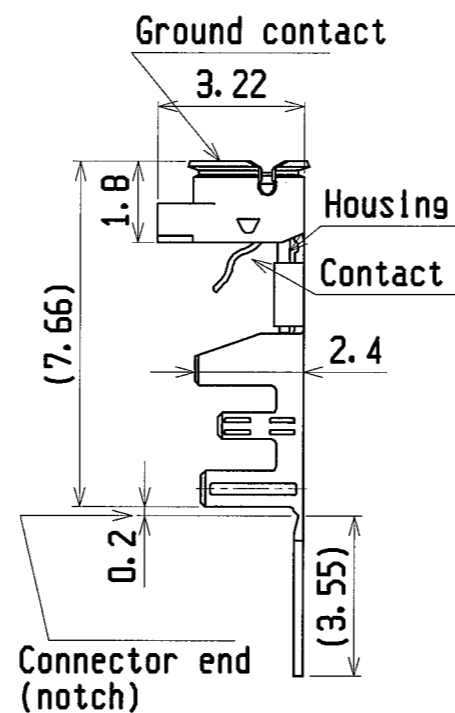
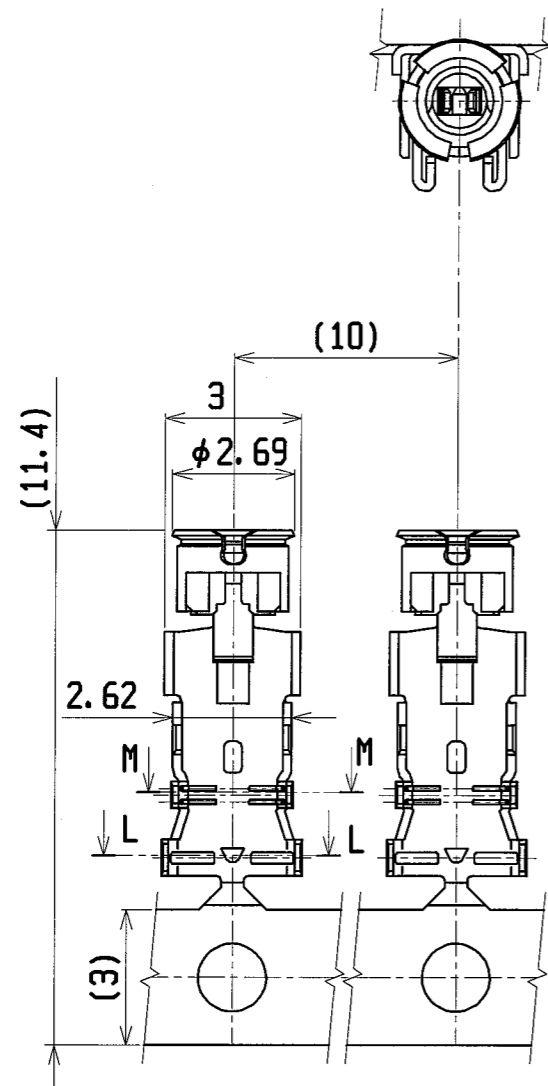
I-PEX Interconnect and Packaging Electronics TOKYO, JAPAN

TITLE: MHF series micro coaxial connector plug vertical (ground contact : gold plating)

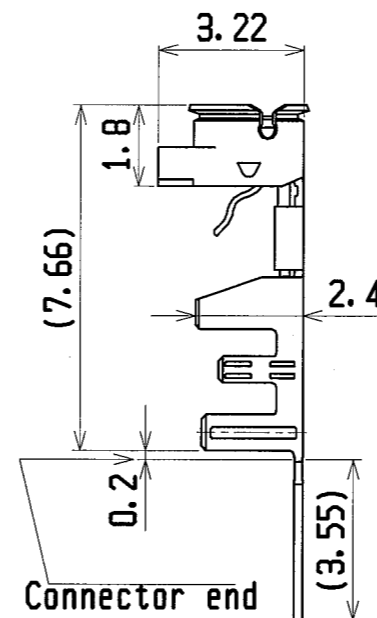
General

SCALE: 6/1 mm UNIT: mm DWG. No. 20278 SHEET REV. 1/4 19C

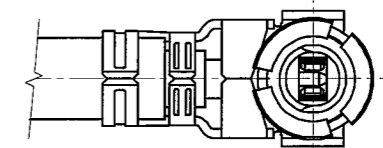
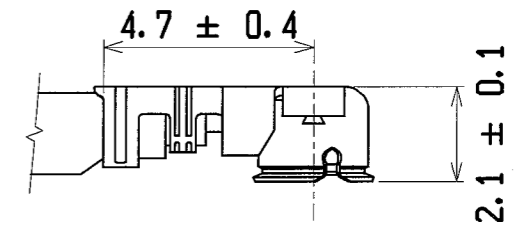
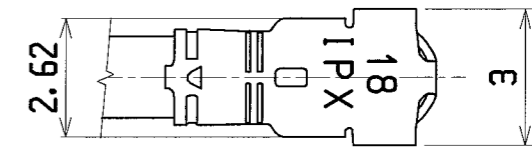
PART NO.
20278-***R-***



Part No. 20278-101R-18
20278-102R-18
For hand tool
(with notch)

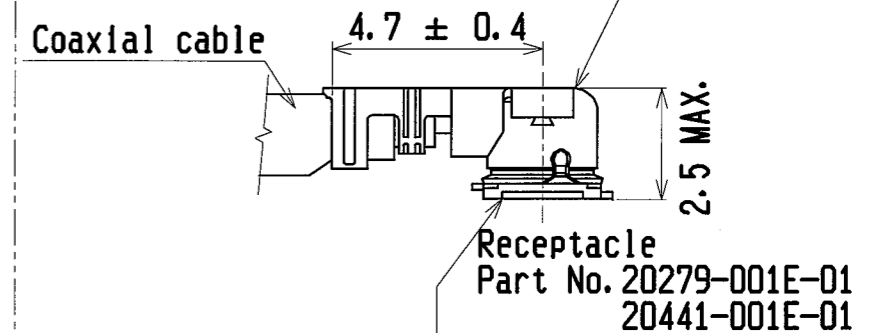


Part No. 20278-111R-18
20278-112R-18
For semi auto
termination machine
(without notch)



Cable Ass'y

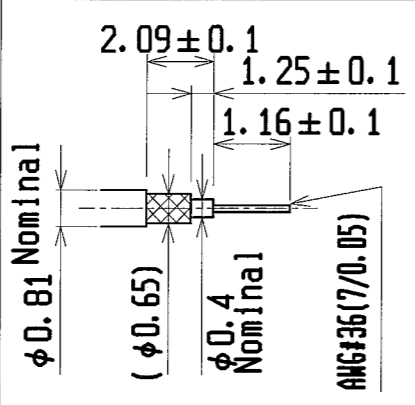
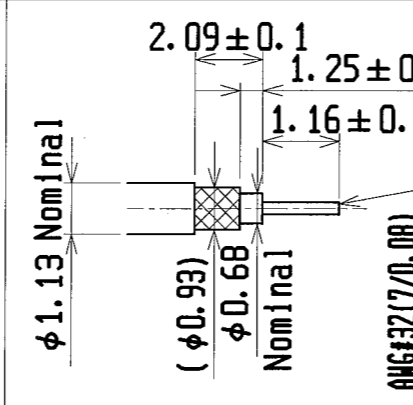
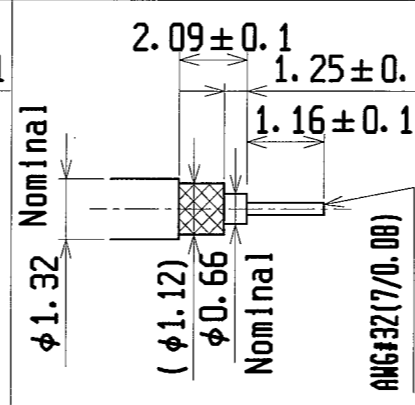
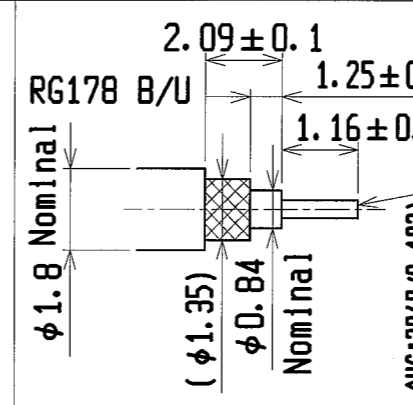
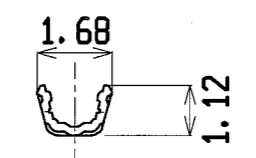
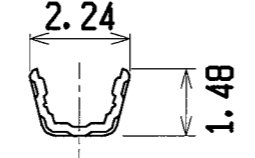
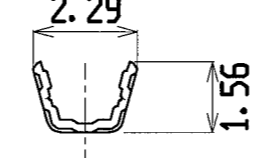
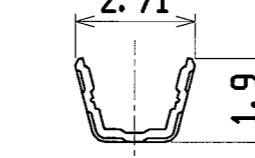
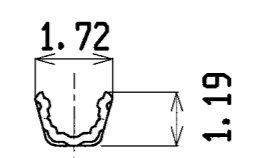
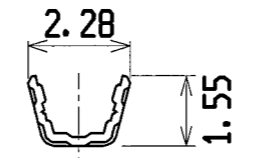
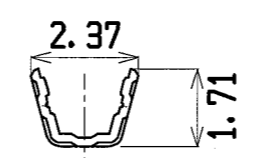
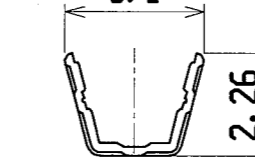
Plug
P/N 20278-1**R-18



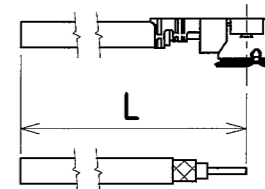
MATING

GENERAL TOLERANCE	
6 MAX.	±0.2
6 OVER MAX. 30	±0.3
30 OVER MAX. 120	±0.5
ANGLE	±2°

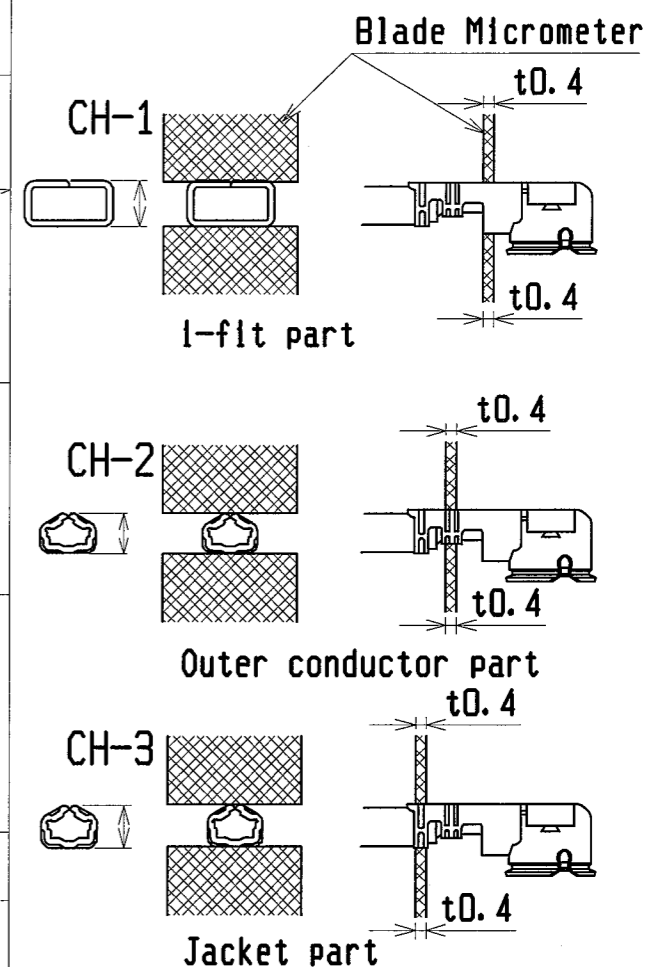
DESIGN D BY	DATE	I-PEX Interconnect and Packaging Electronics TOKYO, JAPAN	TITLE MHF series micro coaxial connector plug vertical (ground contact : gold plating) General	
CHK' D BY	DATE			
APP' D BY	DATE			
REV ECN BY DATE APP	CUSTOMER COPY	PROJECTION	SCALE UNIT DWG. No.	SHEET REV.
SERIES No. 2814	COPY	6/1 mm	20278	2/4 19C

Part No. of non halogen free type	20278-101R-08 20278-111R-08	20278-101R-13 20278-111R-13	20278-101R-32 20278-111R-32	20278-101R-18 20278-111R-18	
Part No. of halogen free type	20278-102R-08 20278-112R-08	20278-102R-13 20278-112R-13	20278-102R-32 20278-112R-32	20278-102R-18 20278-112R-18	
Housing color	White	Black	Black	White	
Applicable cable nominal dimension	 2.09 ± 0.1 1.25 ± 0.1 1.16 ± 0.1 $\phi 0.81$ Nominal $(\phi 0.65)$ $\phi 0.4$ Nominal AWG#36(7/0.05)	 2.09 ± 0.1 1.25 ± 0.1 1.16 ± 0.1 $\phi 1.13$ Nominal $(\phi 0.93)$ $\phi 0.68$ Nominal AWG#32(7/0.08)	 2.09 ± 0.1 1.25 ± 0.1 1.16 ± 0.1 $\phi 1.32$ Nominal $(\phi 1.12)$ $\phi 0.66$ Nominal AWG#32(7/0.08)	 2.09 ± 0.1 1.25 ± 0.1 1.16 ± 0.1 $\phi 1.8$ Nominal RG178 B/U $(\phi 1.35)$ $\phi 0.84$ Nominal AWG#30(7/0.102)	
Braided shield of Outer conductor 外部導体の編組	Single / 1重編組	Single / 1重編組	Double / 2重編組	Single / 1重編組	
P/N of hand Tool	90187-008C	90187-013C	90187-032C	90233-018	
P/N of semi auto termination machine	90213-008C	90213-013C	90213-032C	90232-018	
Sect. M-M	 1.68 1.12	 2.24 1.48	 2.29 1.56	 2.71 1.9	
Sect. L-L	 1.72 1.19	 2.28 1.55	 2.37 1.71	 3.1 2.26	
Crimp Height	CH-1	1.34~1.40	1.34~1.40	1.34~1.40	1.34~1.40
	CH-2	0.76~0.84	1.06~1.14	1.20~1.30	1.41~1.49
	CH-3	0.85~0.97	1.15~1.35	1.26~1.46	1.70~1.80

Cable cut length




Crimp Height



NOTE-1

中心導体, 外部導体への半田コーティングは不可
Must not use solder coated
inner conductor and outer conductor.

DESIGN D BY	DATE	 I-PEX Interconnect and Packaging Electronics TOKYO, JAPAN	General							
CHK' D BY	DATE									
APP' D BY	DATE									
REV	ECN	BY	DATE	APP	TITLE	SCALE	UNIT	DWG. No.	SHEET	REV.
REV. RECORD					CUSTOMER COPY	PROJECTION	mm	20278	3/4	19C
SERIES No. 2814										

Notes

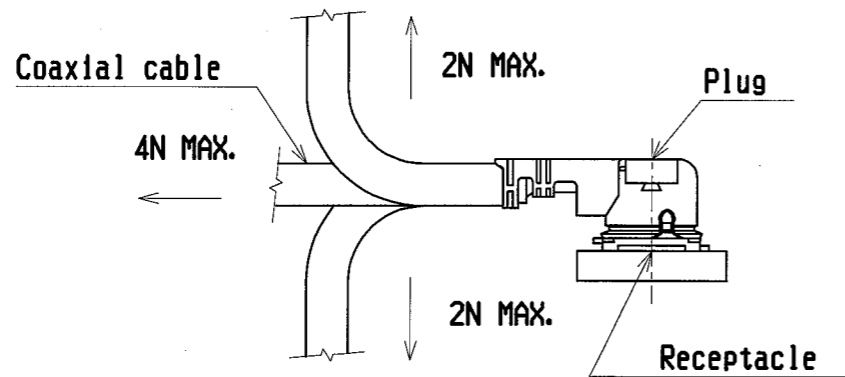
1. Material

- (1) Housing : PBT , UL94V-0
- (2) Contact
phosphor bronze
gold plating 0.1 μ m MIN.
over nickel 1.27 μ m MIN.
- (3) Ground contact
phosphor bronze
gold plating 0.05 μ m MIN.
over nickel 1.27 μ m MIN.

2. Packing : reel

3. Mating partner part No.
: 20279-001E-01, 20441-001E-01

4. Permissible load of cable at mating



5. Suggestions for mating & unmating operation.

5-1 Mating.

Please mate the connector straightly to vertical direction as much as possible, adjusting the mating axis of plug and receptacle. As excessive slant angle mating may break the connector, please don't do it.

1. 材料

- (1) ハウジング : PBT, UL94V-0
- (2) コンタクト
りん青銅
金メッキ0.1 μ m MIN.
下地 ニッケル1.27 μ m MIN.
- (3) グランドコンタクト
りん青銅
金メッキ0.05 μ m MIN.
下地 ニッケル1.27 μ m MIN.

2. 梱包 : リール

3. かん合相手 part No.
: 20279-001E-01, 20441-001E-01

4. コネクタかん合後のケーブルに対する荷重

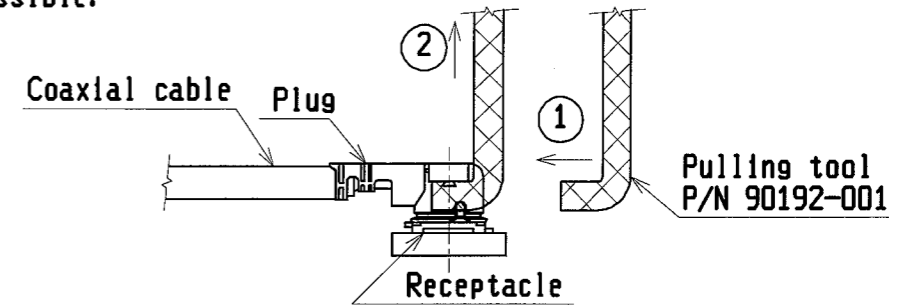
5. コネクタかん合時および抜去時の注意

5-1 コネクタ挿入時

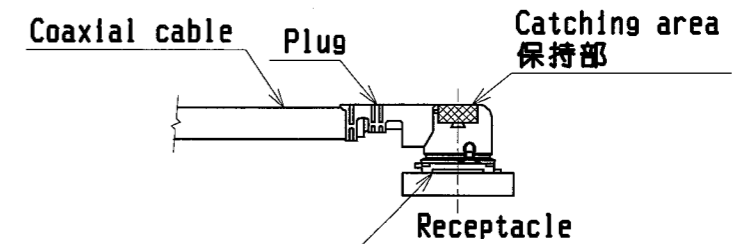
PlugとReceptacleのかん合軸を合わせ、できるだけ垂直に挿入して下さい。極端な斜め挿入は行わないで下さい。コネクタ破損の原因となりますので、過度なこじり挿入は行わないで下さい。

5-2 Unmating.

- (1) In case of unmating by pulling tool.
Please use the pulling tool as the following drawing, and please pull plug to vertical direction as directly as possible.



- (2) In case of unmating directly by hand
Please catch the catching area of plug, and please pull plug to vertical direction as directly as possible.



5-2 コネクタ抜去時

- (1) 抜去ジグを用いる場合
下図のようにできるだけ垂直に引き抜いて下さい。

- (2) 手で直接引き抜く場合
下図の保持部をつかみ、できるだけ垂直に引き抜いて下さい。

5-3 Crimp over standards of outer conductor

Standards: Less than 10% from total numbers of outer conductor
(Numbers of outer conductor's crimp over from outer conductor's barrel)

5-4 Caution about Heat shrinkage tubes

Please be careful not to melt housing when using heat shrinkage tubes. It will become cause of open circuit.

6. This is 'Pb-free' connector.

5-3 外部導体はみ出し量


外部導体はみ出し量規定 : 外部導体トータル本数の10%以下 (外部導体パレルの外はみ出し量)

5-4 熱収縮チューブについての注意

熱収縮チューブで外部導体を覆う場合は、導通不良の原因となりますので、熱によりハウジングを溶融させないように注意してください。

6. 本コネクタは'Pb-free'である

GENERAL TOLERANCE	
6 MAX.	±0.2
6 OVER MAX. 30	±0.3
30 OVER MAX. 120	±0.5
ANGLE	±2°

DESIGN'D BY	DATE	 I-PEX Interconnect and Packaging Electronics TOKYO, JAPAN	TITLE MHF series micro coaxial connector plug vertical (ground contact : gold plating)	General	
CHK'D BY	DATE				
APP'D BY	DATE				
REV	ECN	BY	DATE	APP	SCALE UNIT DWG. No. SHEET REV. -/- mm 20278 4/4 19C
REV. RECORD SERIES No. 2814					CUSTOMER COPY PROJECTION

SGS REPORT

SUBJECT: Survey for Environmental-Related Substances

This is applied for the following products:

I-PEX Product Name	I-PEX Part Number
MHF PLUG Connector	20278-112R-**

Attachment:

Survey Form on Environmental Impact Substances Contained in Parts and Materials
SGS TEST REPORT for MHF Plug connector

Please refer to the attached SGS REPORT.

Component name	SGS Report No.
HOUSING (BLACK)	CE_2008_43815 *
HOUSING (BLACK)	CE_2008_52560
HOUSING (WHITE)	CE_2008_50263
HOUSING (WHITE)	CE_2008_52561
CONTACT	CE_2008_31217
GROUND CONTACT	CE_2008_31216

Remark:* The SGS Test Report can be applied to a component.

QUALIFICATION TEST REPORT
テストレポート

No. TR-08020

MHF series micro coaxial connector
 <Plug halogen free type, Ground contact gold plating>
 (Product No. Plug 20278, Rec. 20279)

Product Specification No. PRS-1176

REV.	ECN	BY	DATE	APP.	Prepared by	Reviewed by	Approved by
0	T08015	K.O	Feb/29/'08	/	K.Ohbayashi Feb/29/'08	/	E.Kawabe Feb/29/'08
REVISION RECORD							

DOCUMENT CLASSIFICATION	TITLE	No.
Test Report	MHF Connector	TR-08020

1.Purpose / 目的

Testing was performed on the MHF series micro coaxial connector to determine meets the requirement of I-PEX specification,PRS-1176

MHF series micro coaxial connector の性能を製品規格 PRS-1176 に基づいて評価する。

2.Conclusion / 結論

All the specimen met the requirements of PRS-1176.

全ての試料が製品規格(PRS-1176)の条件を満足した。

3.Sample / 試料

(1) Plug: Part No.20278-112R-13 (20278-102R-13)

Cable : AWG#32 coaxial cable (jacket diameter 1.13mm)

(2) Receptacle : part No.20279-001E-01

4.Method / 試験方法

Refer to product specification,PRS-1176

製品規格(PRS-1176)参照。

DOCUMENT CLASSIFICATION Test Report	TITLE MHF Connector	No. TR-08020
--	------------------------	-----------------

4-1 試験順序と試料数 / Test Sequence and Sample Quantity

Test Item 試験項目		Group / グループ													
		A	B	C	D	E	F	G	H	I	L	M	N	O	P
(1)	Contact Resistance 接触抵抗					1 3	1 3	1 3	1 3	1 4	1 4		1 3		
(2)	Insulation resistance 絶縁抵抗									2 5	2 5				
(3)	Dielectric withstanding voltage 耐電圧	1													
(4)	VSWR		1												
(5)	Crimp strength 引張強度			1											
(6)	Unmating force 抜去力				1										
(7)	Durability 耐久性					2									
(8)	Contact resistance with force on the cable ケーブルに荷重を加えた後の 接触抵抗						2								
(9)	Vibration 振動							2							
(10)	Shock 衝撃								2						
(11)	Thermal shock 温度サイクル									3					
(12)	Humidity 湿度										3				
(13)	Salt water spray 塩水噴霧											1			
(14)	High temperature life 高温												2		
(15)	Solderability 半田付け性													1	
(16)	Reflow soldering heat resistance 半田耐熱性														1
Sample QTY pcs. 試料数	Plug プラグ	10	5	10	10	10	10	10	10	10	10	10	10	----	----
	Receptacle リセプタクル	10	5	----	10	10	10	10	10	10	10	10	10	10	10
Test Board 基板数	pcs.	10	5	----	10	10	10	10	10	10	10	10	10	----	10

DOCUMENT CLASSIFICATION Test Report	TITLE MHF Connector	No. TR-08020
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5. Results / 結果

	Test items 試験項目	Measurements 測定項目	Spec. 規格	n 試料数	Unit 単位	Data 結果				Judge 判定	
						AVE.(X) 平均	MAX. 最大	MIN. 最小	S S		
A	Dielectric withstanding voltage 耐電圧	Initial	Spec : No creeping discharge, flashover, nor insulator breakdown shall occur. 規格:沿面放電,空中放電,絶縁破壊等の異常の無き事							
		20278-112R-13+OD1.13cable	-----	10	-----	Results : No abnormality(異常無し)				OK	
B	VSWR Plug	20278-112R-13+OD1.13cable	0.1 ~ 3GHz	1.3 MAX.	5	-----	1.165	1.17	1.16	-----	OK
			3 ~ 6GHz	1.5 MAX.	5	-----	1.152	1.16	1.14	-----	OK
	VSWR Receptacle	20279-001E-01	0.1 ~ 3GHz	1.3 MAX.	5	-----	1.120	1.13	1.12	-----	OK
			3 ~ 6GHz	1.4 MAX.	5	-----	1.216	1.24	1.20	-----	OK
C	Un mating force 抜去力	Total force	Initial	5 MIN.	10	N	21.29	23.2	19.3	1.02	OK
			30 cycles	3 MIN.	10	N	10.81	11.9	9.2	0.73	OK
		Inner contact	Initial	0.15 MIN.	10	N	0.369	0.39	0.35	0.014	OK
			30 cycles	0.10 MIN.	10	N	0.230	0.25	0.22	0.011	OK
D	Crimp strength 引張強度	20278-112R-13+OD1.13cable	10 MIN.	10	N	16.85	18.6	15.2	0.97	OK	
E	Durability (耐久性) 20278-112R-13+OD1.13cable	Contact resistance of inner contact (中心導体接触抵抗)									
		Initial	20 MAX.	10	milli-ohm	6.93	7.6	6.4	0.38	OK	
		After testing	25 MAX.	10	milli-ohm	7.25	8.7	6.6	0.61	OK	
		Contact resistance of ground contact (外部導体接触抵抗)									
		Initial	10 MAX.	10	milli-ohm	3.01	3.4	2.4	0.31	OK	
		After testing	15 MAX.	10	milli-ohm	3.97	4.5	2.7	0.57	OK	
		Appearance 外観	Initial	No abnormality	10	-----	No abnormality (異常無し)				OK
			After testing	No abnormality	10	-----	No abnormality (異常無し)				OK
F	Contact resistance with force on cable (ケーブルに荷重を加えた後の接触抵抗) 20278-112R-13+OD1.13cable	Contact resistance of inner contact (中心導体接触抵抗)									
		Initial	20 MAX.	10	milli-ohm	6.78	7.5	6.5	0.34	OK	
		After testing	25 MAX.	10	milli-ohm	6.80	7.4	6.4	0.35	OK	
		Contact resistance of ground contact (外部導体接触抵抗)									
		Initial	10 MAX.	10	milli-ohm	2.89	3.2	2.1	0.35	OK	
		After testing	15 MAX.	10	milli-ohm	3.21	4.0	2.3	0.45	OK	
		Electrical discontinuity 電流瞬断		Spec. : No electrical discontinuity grater than 1 μ sec. shall occur. 規格:1 μ 秒以上の電流瞬断の無い事						
		After testing	No abnormality	10	-----	Results : No discontinuity				OK	
Appearance 外観	Initial	No abnormality	10	-----	No abnormality (異常無し)				OK		
	After testing	No abnormality	10	-----	No abnormality (異常無し)				OK		

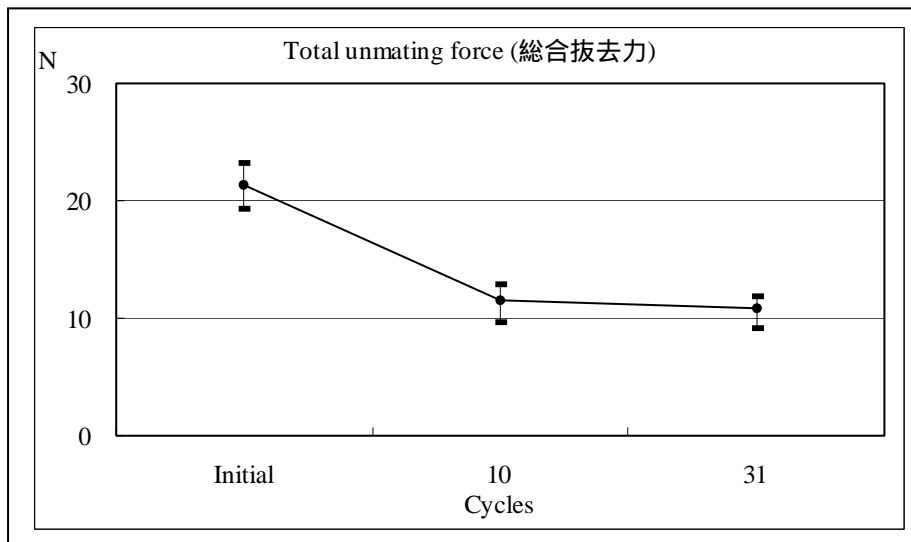
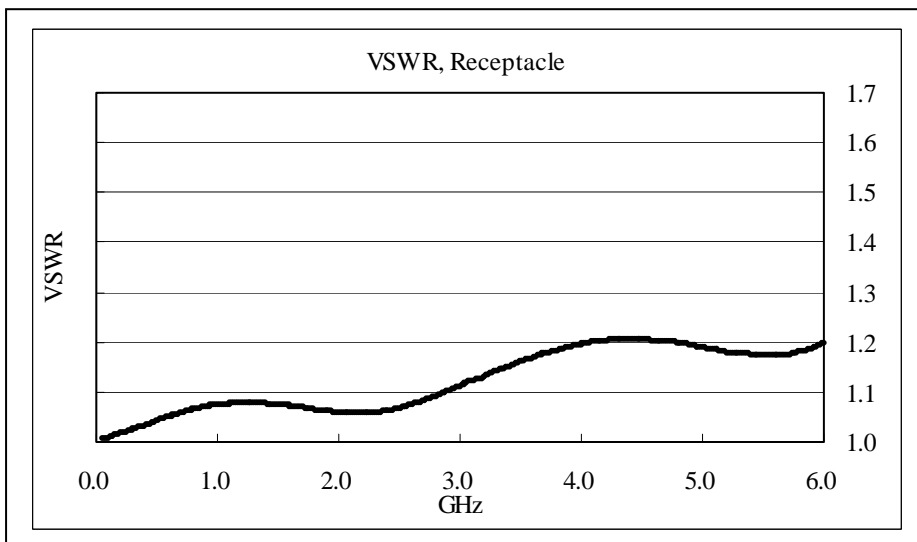
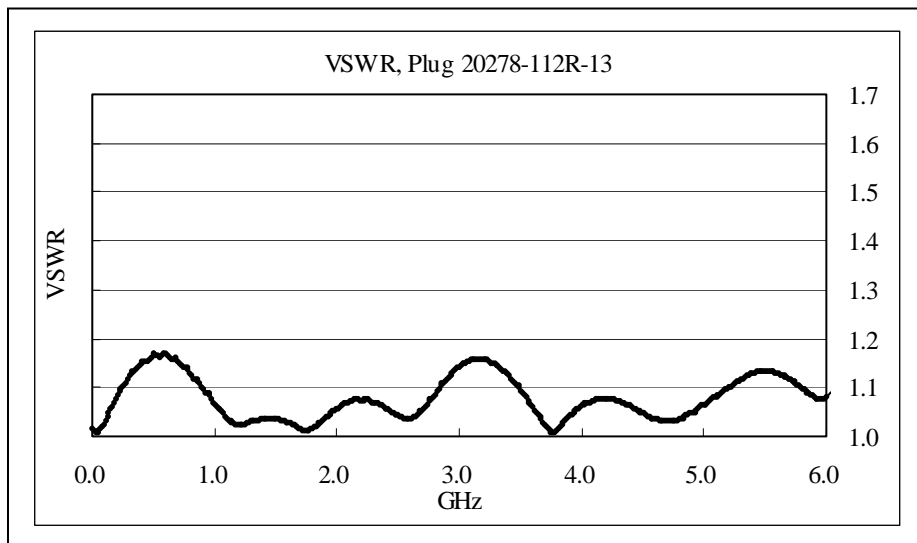
DOCUMENT CLASSIFICATION	TITLE	No.
Test Report	MHF Connector	TR-08020

Test items	Measurements	Spec.	n	Unit	Data				Judge				
					AVE.(X)	MAX.	MIN.	S					
試験項目	測定項目	規格	試料数	単位	結果				判定				
					平均	最大	最小	S					
G Vibration (振動)													
20278-112R-13 +OD1.13cable	Contact resistance of inner contact (中心導体接触抵抗)												
	Initial	20 MAX.	10	milli-ohm	7.03	7.6	6.6	0.45	OK				
	After testing	25 MAX.	10	milli-ohm	7.24	7.6	6.5	0.47	OK				
	Contact resistance of ground contact (外部導体接触抵抗)												
	Initial	10 MAX.	10	milli-ohm	2.84	3.6	2.4	0.40	OK				
	After testing	15 MAX.	10	milli-ohm	2.87	3.6	2.3	0.44	OK				
	Electrical discontinuity 電流瞬断	Spec. : No electrical discontinuity grater than 1 μ sec. shall occur. 規格:1 μ 秒以上の電流瞬断の無い事							-----	10	-----	Results : No discontinuity	OK
	Appearance 外観	Initial	No abnormality	10	-----	No abnormality (異常無し)				OK			
		After testing	No abnormality	10	-----	No abnormality (異常無し)				OK			
	H Shock (衝撃)												
20278-112R-13 +OD1.13cable	Contact resistance of inner contact (中心導体接触抵抗)												
	Initial	20 MAX.	10	milli-ohm	6.93	7.4	6.5	0.32	OK				
	After testing	25 MAX.	10	milli-ohm	7.05	7.5	6.5	0.36	OK				
	Contact resistance of ground contact (外部導体接触抵抗)												
	Initial	10 MAX.	10	milli-ohm	2.93	3.5	2.3	0.33	OK				
	After testing	15 MAX.	10	milli-ohm	3.01	3.5	2.5	0.36	OK				
	Electrical discontinuity 電流瞬断	Spec. : No electrical discontinuity grater than 1 μ sec. shall occur. 規格:1 μ 秒以上の電流瞬断の無い事							-----	10	-----	Results : No discontinuity	OK
	Appearance 外観	Initial	No abnormality	10	-----	No abnormality (異常無し)				OK			
		After testing	No abnormality	10	-----	No abnormality (異常無し)				OK			
	I Thermal shock (温度サイクル)												
20278-112R-13 +OD1.13cable	Contact resistance of inner contact (中心導体接触抵抗)												
	Initial	20 MAX.	10	milli-ohm	6.72	7.5	6.4	0.26	OK				
	After testing	25 MAX.	10	milli-ohm	6.86	7.6	6.4	0.30	OK				
	Contact resistance of ground contact (外部導体接触抵抗)												
	Initial	10 MAX.	10	milli-ohm	2.66	3.5	2.5	0.34	OK				
	After testing	15 MAX.	10	milli-ohm	2.72	3.5	2.3	0.37	OK				
	Insulation resistance	Initial	500 MIN.	10	Mega-ohm	10,000 (Minimum value)				OK			
		After testing	100 MIN.	10	Mega-ohm	10,000 (Minimum value)				OK			
	Appearance 外観	Initial	No abnormality	10	-----	No abnormality (異常無し)				OK			
		After testing	No abnormality	10	-----	No abnormality (異常無し)				OK			

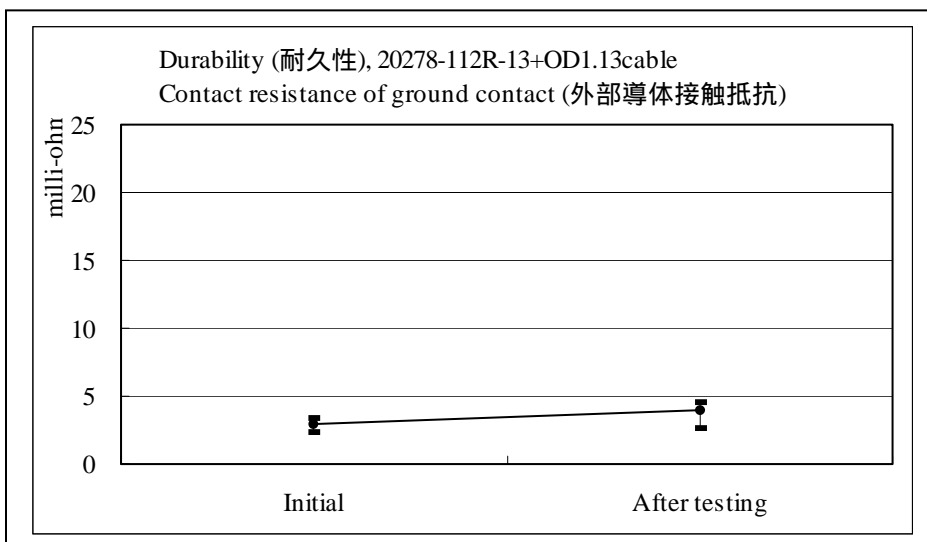
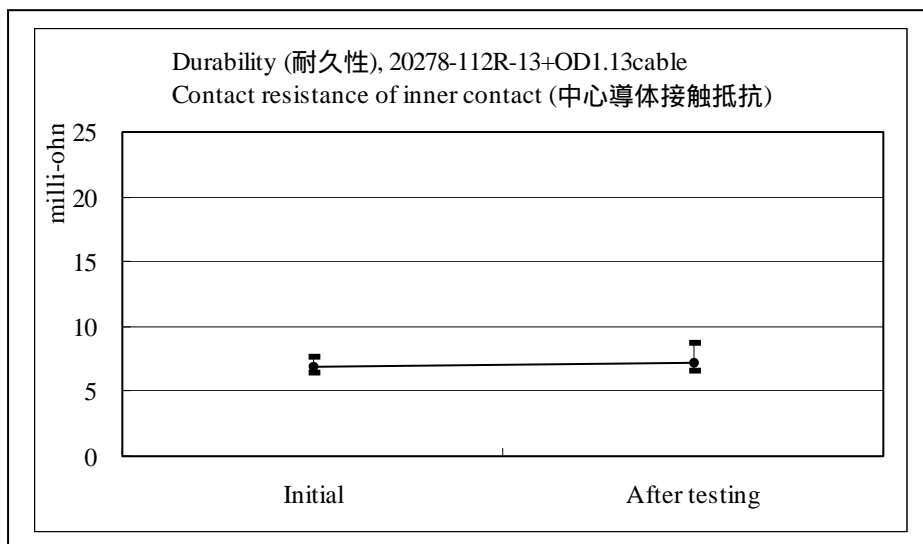
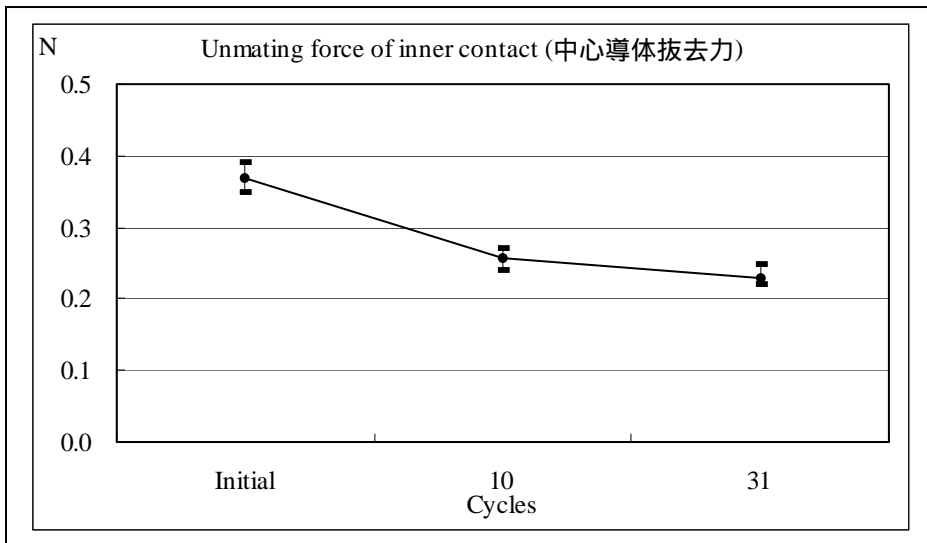
DOCUMENT CLASSIFICATION	TITLE	No.
Test Report	MHF Connector	TR-08020

	Test items	Measurements	Spec.	n	Unit	Data				Judge	
						AVE.(X)	MAX.	MIN.	S		
	試験項目	測定項目	規格	試料数	単位	結果				判定	
						平均	最大	最小	S		
J	Humidity (湿度)										
	20278-112R-13 +OD1.13cable	Contact resistance of inner contact (中心導体接触抵抗)									
		Initial	20 MAX.	10	milli-ohm	7.05	7.6	6.3	0.44	OK	
		After testing	25 MAX.	10	milli-ohm	7.21	7.9	6.8	0.50	OK	
		Contact resistance of ground contact (外部導体接触抵抗)									
		Initial	10 MAX.	10	milli-ohm	2.91	3.3	2.4	0.23	OK	
		After testing	15 MAX.	10	milli-ohm	3.02	3.3	2.7	0.23	OK	
		Insulation resistance	Initial	500 MIN.	10	Mega-ohm	10,000 (Minimum value)				OK
			After testing	100 MIN.	10	Mega-ohm	10,000 (Minimum value)				OK
		Appearance 外觀	Initial	No abnormality	10	-----	No abnormality (異常無し)				OK
			After testing	No abnormality	10	-----	No abnormality (異常無し)				OK
K	Salt water spray 塩水噴霧	20278-112R-13 +OD1.13cable	Initial	No abnormality	10	-----	No abnormality (異常無し)				OK
			After testing	No abnormality	10	-----	No abnormality (異常無し)				OK
L	High temperature life (高温)										
	20278-112R-13 +OD1.13cable	Contact resistance of inner contact (中心導体接触抵抗)									
		Initial	20 MAX.	10	milli-ohm	7.09	7.7	6.4	0.39	OK	
		After testing	25 MAX.	10	milli-ohm	8.15	8.9	7.1	0.69	OK	
		Contact resistance of ground contact (外部導体接触抵抗)									
		Initial	10 MAX.	10	milli-ohm	2.87	3.6	2.6	0.27	OK	
		After testing	15 MAX.	10	milli-ohm	3.93	4.7	3.1	0.34	OK	
	Appearance 外觀	Initial	No abnormality	10	-----	No abnormality (異常無し)				OK	
		After testing	No abnormality	10	-----	No abnormality (異常無し)				OK	
M	Solderability 半田付け性		More than 95% of the dipped surface shall be evenly wet. 浸した面積の95%以上に半田がむらなく付着すること。								
			-----	10	-----	No abnormality (異常無し)				OK	
N	Reflow soldering heat resistance 半田耐熱性		No abnormality	10	-----	No abnormality (異常無し)				OK	

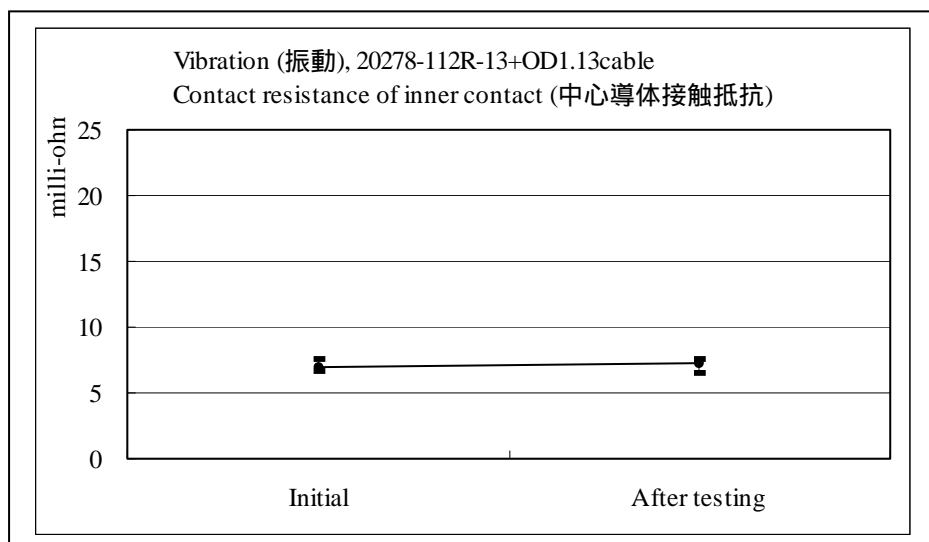
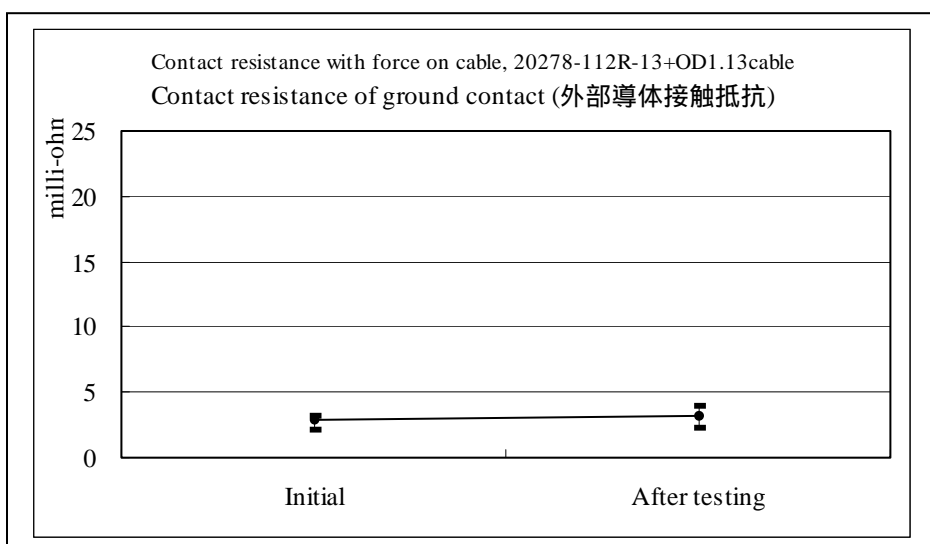
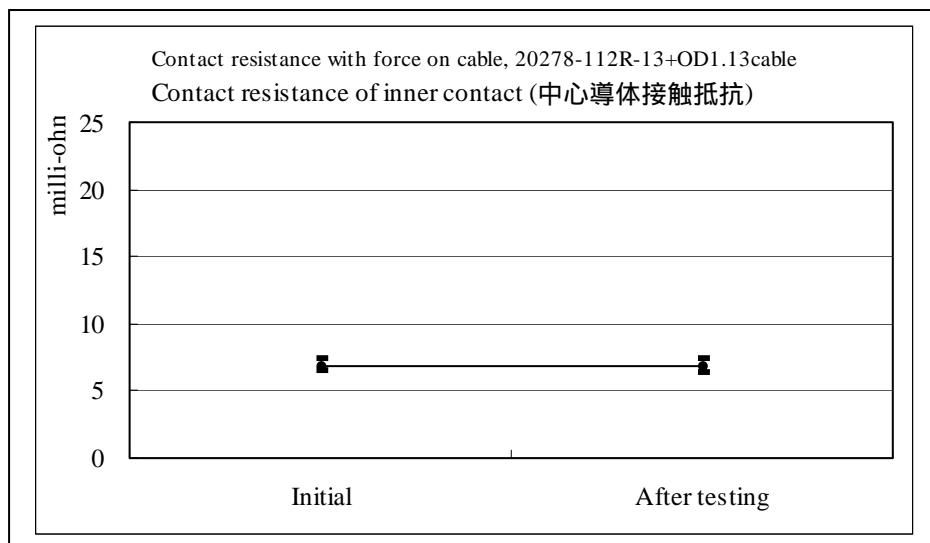
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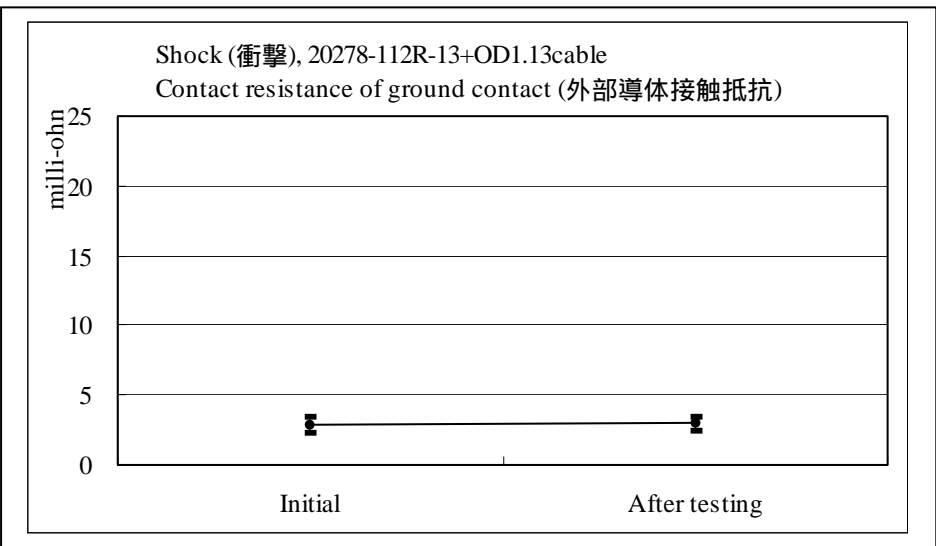
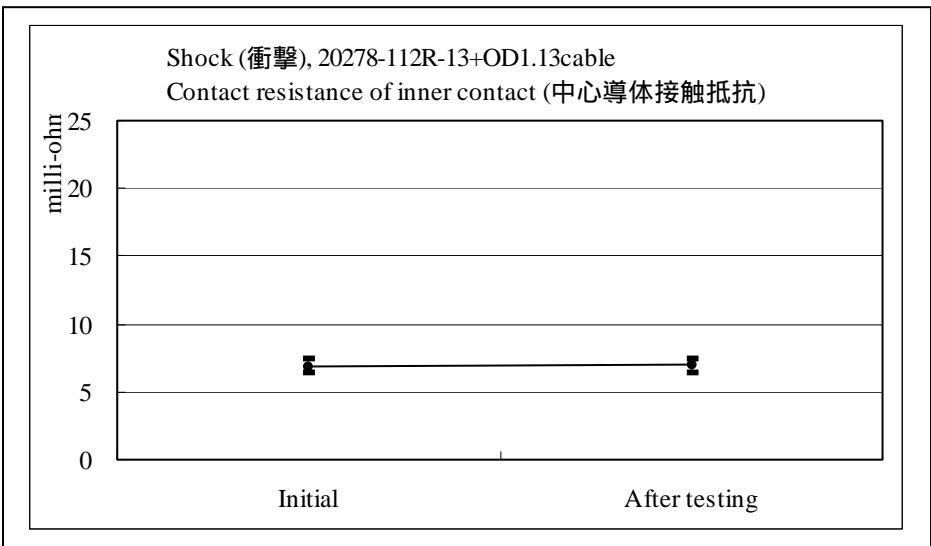
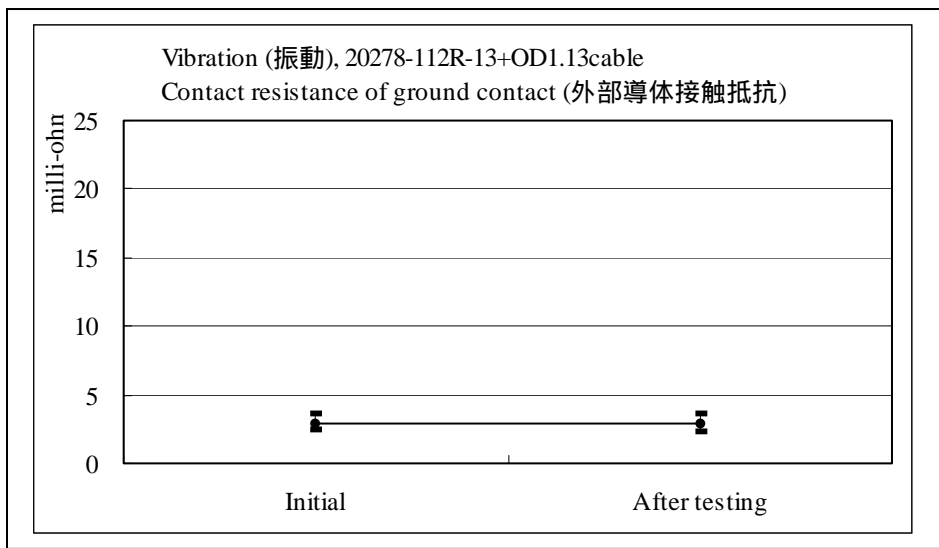
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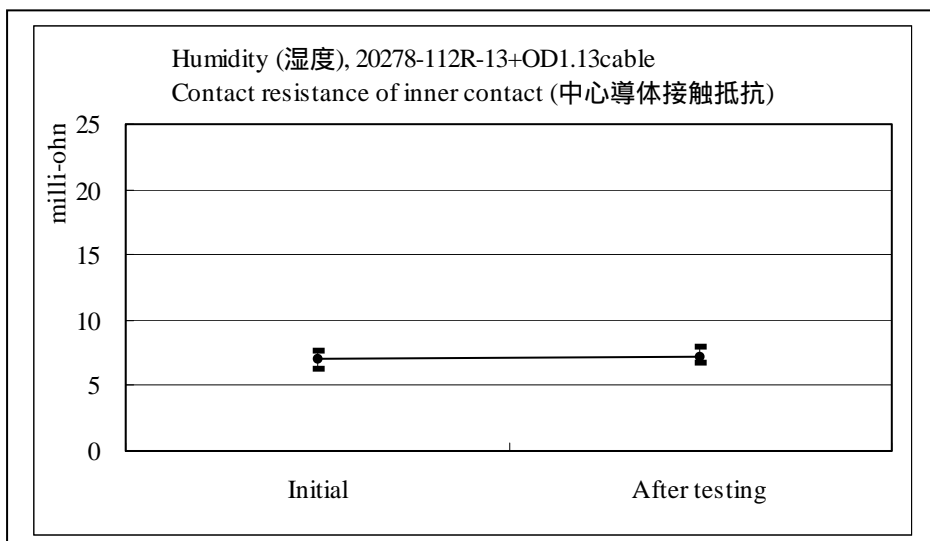
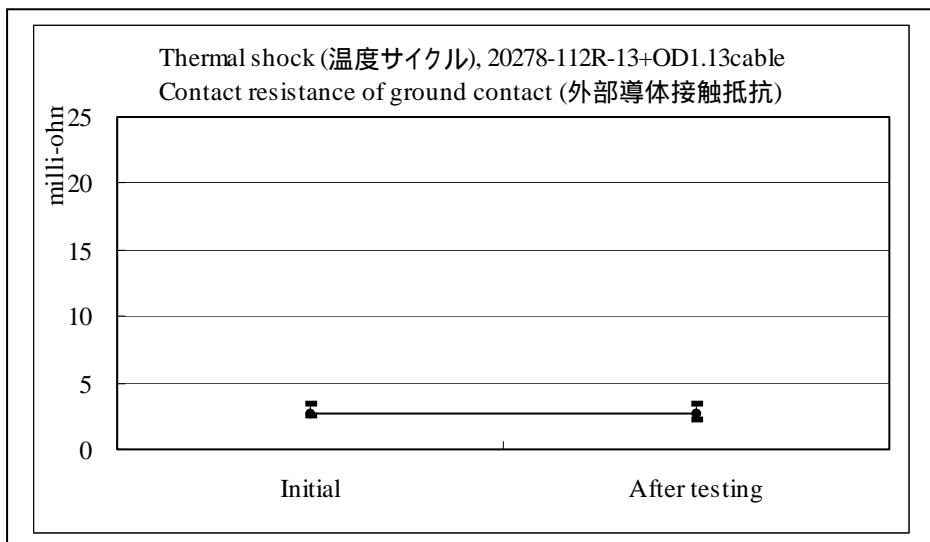
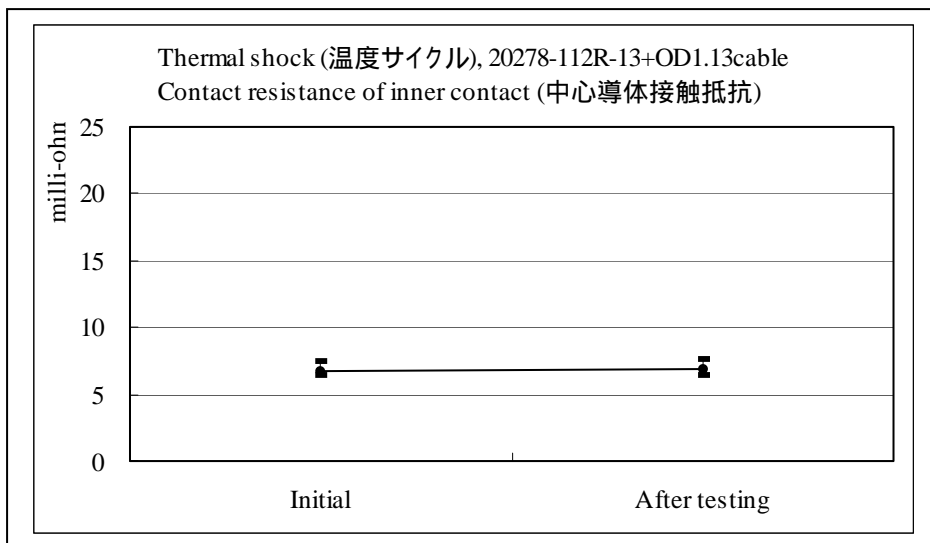
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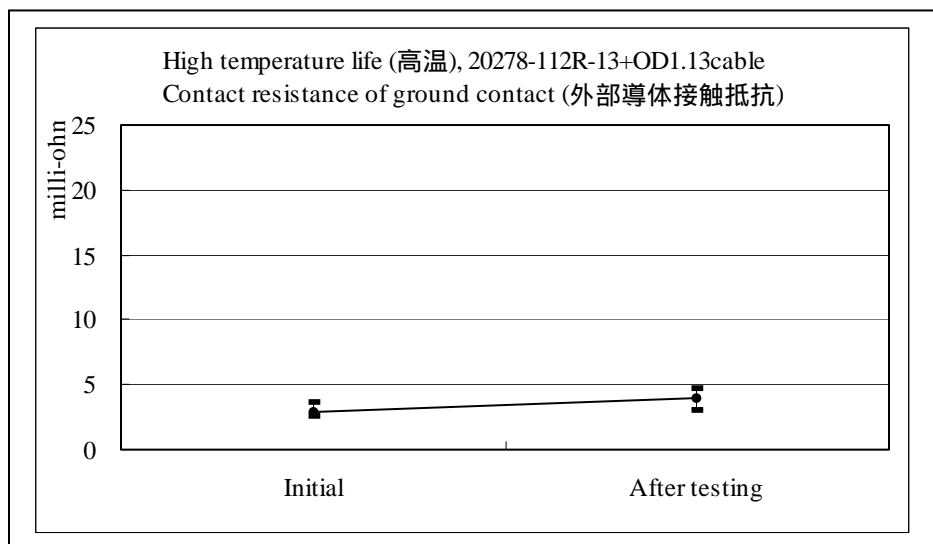
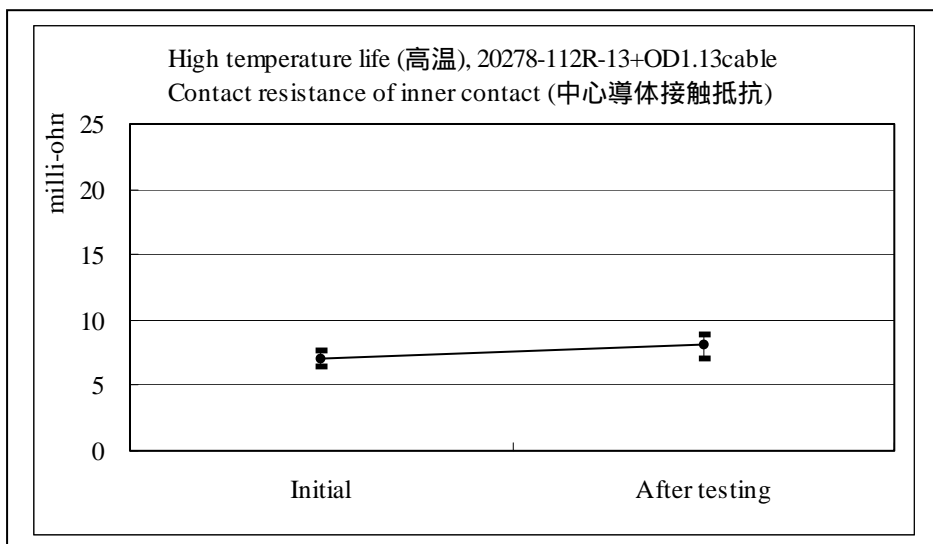
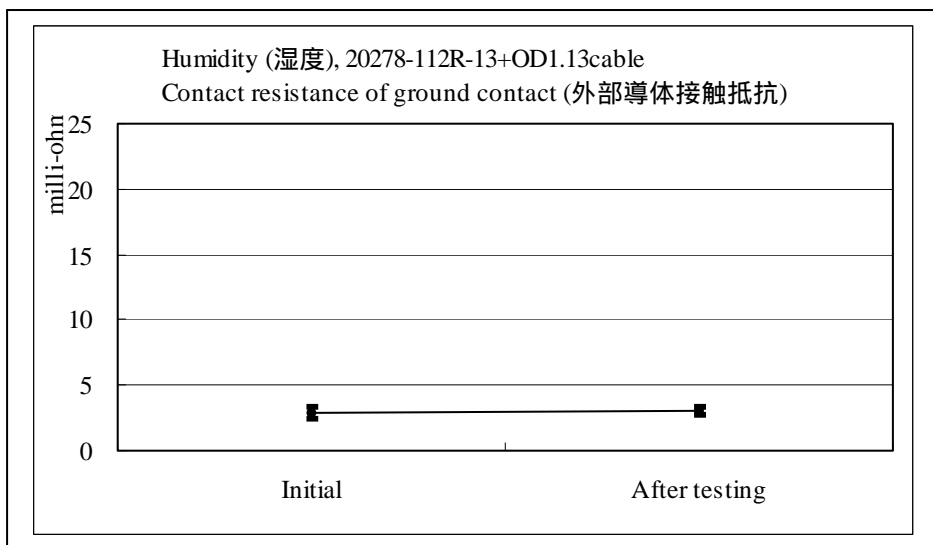
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DOCUMENT CLASSIFICATION Test Report	TITLE MHF Connector	No. TR-08020
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DOCUMENT CLASSIFICATION Test Report	TITLE MHF Connector	No. TR-08020
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Test Report

No. : CE/2008/43815 Date : 2008/04/21 Page : 1 of 14

I-PEX JP CO., LTD.
6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



The following sample(s) was/were submitted and identified by/on behalf of the client as :

Sample Description : MHF 4 PLUG HOUSING
Style/Item No. : 2597
Sample Receiving Date : 2008/04/14
Testing Period : 2008/04/14 TO 2008/04/21

=====
Test Result(s) : Please refer to next page(s).



Chenyu Kung / Operation Manager
Signed for and on behalf of
SGS TAIWAN LTD.
Chemical Laboratory – Taipei

Test Report

No. : CE/2008/43815 Date : 2008/04/21 Page : 2 of 14

I-PEX JP CO., LTD.
6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



Test Result(s)

PART NAME NO.1 : BLACK PLASTIC

Test Item (s):	Unit	Method	MDL	Result
				No.1
Cadmium (Cd)	mg/kg	With reference to IEC 62321/2nd CDV (111/95/CDV). Determination of Cadmium by ICP-AES.	2	n.d.
Lead (Pb)	mg/kg	With reference to IEC 62321/2nd CDV (111/95/CDV). Determination of Lead by ICP-AES.	2	n.d.
Mercury (Hg)	mg/kg	With reference to IEC 62321/2nd CDV (111/95/CDV). Determination of Mercury by ICP-AES.	2	n.d.
Hexavalent Chromium Cr(VI) by alkaline extraction	mg/kg	With reference to IEC 62321/2nd CDV (111/95/CDV). Determination of Hexavalent Chromium for non-metallic samples by UV/Vis Spectrometry.	2	n.d.
Antimony (Sb)	mg/kg	With reference to US EPA Method 3050B for Antimony Content. Analysis was performed by ICP-AES.	2	n.d.
Antimony trioxide (Sb ₂ O ₃)	mg/kg	With reference to US EPA Method 3050B for Antimony Content. Analysis was performed by ICP-AES. (See Note 11)	2.4	n.d.
Polychlorinated Biphenyls (PCBs) (CAS No.: 001336-36-3)	mg/kg	With reference to US EPA 3540C method. Analysis was performed by GC/MS.	0.5	n.d.
Polychlorinated Terphenyls (PCTs)	mg/kg	With reference to US EPA 3540C method. Analysis was performed by GC/MS.	0.5	n.d.
Chlorinated Paraffin (C10~C13) (CAS No.: 010871-26-2)	%	With reference to US EPA 3540C method. Analysis was performed by GC/MS.	0.01	n.d.
Polychlorinated Naphthalene (PCNs)	mg/kg	With reference to US EPA 3540C method. Analysis was performed by GC/MS.	5	n.d.
Mirex (CAS No.: 002385-85-5)	mg/kg	With reference to US EPA 8270D method. Analysis was performed by GC/MS.	4	n.d.
PVC	**	Analysis was performed by FTIR and FLAME Test.	-	Negative
TBBP-A-bis (CAS No.: 21850-44-2)	mg/kg	With reference to US EPA 3540C method. Analysis was performed by HPLC/DAD/MS.	5	n.d.

Test Report

No. : CE/2008/43815 Date : 2008/04/21 Page : 3 of 14

I-PEX JP CO., LTD.
6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



Test Item (s):	Unit	Method	MDL	Result
				No.1
Hexabromocyclododecane (HBCDD) (CAS No.: 025637-99-4)	mg/kg	With reference to US EPA 8270D method. Analysis was performed by GC/MS.	5	n.d.
PFOA	mg/kg	With reference to US EPA 3540C : 1996 method for PFOA Content. Analysis was performed by LC/MS.	1	n.d.
PFOS	mg/kg	With reference to US EPA 3540C : 1996 method for PFOS Content. Analysis was performed by LC/MS.	1	n.d.
Sum of PBBs			-	n.d.
Monobromobiphenyl			5	n.d.
Dibromobiphenyl			5	n.d.
Tribromobiphenyl			5	n.d.
Tetrabromobiphenyl			5	n.d.
Pentabromobiphenyl			5	n.d.
Hexabromobiphenyl			5	n.d.
Heptabromobiphenyl			5	n.d.
Octabromobiphenyl			5	n.d.
Nonabromobiphenyl			5	n.d.
Decabromobiphenyl			5	n.d.
Sum of PBDEs (Mono to Nona) (Note 4)	mg/kg	With reference to IEC 62321/2nd CDV (111/95/CDV). Determination of PBB and PBDE by GC/MS.	-	n.d.
Monobromodiphenyl ether			5	n.d.
Dibromodiphenyl ether			5	n.d.
Tribromodiphenyl ether			5	n.d.
Tetrabromodiphenyl ether			5	n.d.
Pentabromodiphenyl ether			5	n.d.
Hexabromodiphenyl ether			5	n.d.
Heptabromodiphenyl ether			5	n.d.
Octabromodiphenyl ether			5	n.d.
Nonabromodiphenyl ether			5	n.d.
Decabromodiphenyl ether			5	n.d.
Sum of PBDEs (Mono to Deca)			-	n.d.
Organic-tin compounds	---	---	---	---
Triphenyl Tin (TphT) (CAS No.: 000668-34-8)	mg/kg	With reference to DIN 38407-13. Analysis was performed by GC/FPD.	0.03	n.d.

Test Report

No. : CE/2008/43815 Date : 2008/04/21 Page : 4 of 14

I-PEX JP CO., LTD.

6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



Test Item (s):	Unit	Method	MDL	Result
				No.1
Tributyl Tin (TBT) (CAS No.: 000688-73-3)	mg/kg	With reference to DIN 38407-13. Analysis was performed by GC/FPD.	0.03	n.d.
Tributyl Tin Oxide (TBTO) (CAS No.: 000056-35-9)	mg/kg	With reference to DIN 38407-13. Analysis was performed by GC/FPD. (See Note 12)	0.03	n.d.
Halogen	---	With reference to BS EN 14582:2007. Analysis was performed by IC method for F, Cl, Br, I content.	---	---
Halogen-Fluorine (F) (CAS No.: 007782-41-4)	mg/kg	With reference to BS EN 14582:2007. Analysis was performed by IC method for Fluorine content.	50	100
Halogen-Chlorine (Cl) (CAS No.: 007782-50-5)	mg/kg	With reference to BS EN 14582:2007. Analysis was performed by IC method for Chlorine content.	50	n.d.
Halogen-Bromine (Br) (CAS No.: 007726-95-6)	mg/kg	With reference to BS EN 14582:2007. Analysis was performed by IC method for Bromine content.	50	n.d.
Halogen-Iodine (I) (CAS No.: 007553-56-2)	mg/kg	With reference to BS EN 14582:2007. Analysis was performed by IC method for Iodine content.	50	n.d.
AZO	---	---	---	---
1): 4-AMINODIPHENYL (CAS No.: 000092-67-1)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
2): BENZIDINE (CAS No.: 000092-87-5)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
3): 4-CHLORO-O-TOLUIDINE (CAS No.: 000095-69-2)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
4): 2-NAPHTHYLAMINE (CAS No.: 000091-59-8)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
5): O-AMINOAZOTOLUENE (CAS No.: 000097-56-3)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
6): 2-AMINO-4-NITROTOLUENE (CAS No.: 000099-55-8)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
7): P-CHLOROANILINE (CAS No.: 000106-47-8)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
8): 2,4-DIAMINOANISOLE (CAS No.: 000615-05-4)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.

Test Report

No. : CE/2008/43815 Date : 2008/04/21 Page : 5 of 14

I-PEX JP CO., LTD.

6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



Test Item (s):	Unit	Method	MDL	Result
				No.1
9): 4,4'-DIAMINODIPHENYLMETHANE (CAS No.: 000101-77-9)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
10): 3,3'-DICHLOROBENZIDINE (CAS No.: 000091-94-1)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
11): 3,3'-DIMETHOXYBENZIDINE (CAS No.: 000119-90-4)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
12): 3,3'-DIMETHYLBENZIDINE (CAS No.: 000119-93-7)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
13): 3,3'-DIMETHYL-4,4'-DIAMINODIPHENYLMETHANE (CAS No.: 000838-88-0)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
14): P-CRESIDINE (2-METHOXY-5-METHYLANILINE) (CAS No.: 000120-71-8)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
15): 4,4'-METHYLENE-BIS-(2-CHLOROANILINE) (CAS No.: 000101-14-4)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
16): 4,4'-OXYDIANILINE (CAS No.: 000101-80-4)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
17): 4,4'-THIODIANILINE (CAS No.: 000139-65-1)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
18): O-TOLUIDINE (CAS No.: 000095-53-4)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
19): 2,4-TOLUYLENEDIAMINE (CAS No.: 000095-80-7)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
20): 2,4,5-TRIMETHYLANILINE (CAS No.: 000137-17-7)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
21): O-ANISIDINE (CAS No.: 000090-04-0)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
22): P-AMINOAZOBENZENE (CAS No.: 000060-09-3)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
23): 2,4-XYLIDINE (CAS No.: 000095-68-1)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
24): 2,6-XYLIDINE (CAS No.: 000087-62-7)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.

Test Report

No. : CE/2008/43815 Date : 2008/04/21 Page : 6 of 14

I-PEX JP CO., LTD.

6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



Test Item (s):	Unit	Method	MDL	Result
				No.1
Phthalates	---	---	---	---
DBP (Dibutyl phthalate) (CAS No.: 000084-74-2)	%	With reference to Chromatographia Vol.47, No.784, 1998. Analysis was performed by GC/MS. (prohibited by 2005/84/EC).	0.003	n.d.
DINP (Di-isononyl phthalate) (CAS No.: 028553-12-0)	%	With reference to Chromatographia Vol.47, No.784, 1998. Analysis was performed by GC/MS. (prohibited by 2005/84/EC).	0.003	n.d.
DEHP (Di- (2-ethylhexyl) phthalate) (CAS No.: 000117-81-7)	%	With reference to Chromatographia Vol.47, No.784, 1998. Analysis was performed by GC/MS. (prohibited by 2005/84/EC).	0.003	n.d.
DIDP (Di-isodecyl phthalate) (CAS No.: 026761-40-0)	%	With reference to Chromatographia Vol.47, No.784, 1998. Analysis was performed by GC/MS. (prohibited by 2005/84/EC).	0.003	n.d.
DNOP (Di-n-octyl phthalate) (CAS No.: 000117-84-0)	%	With reference to Chromatographia Vol.47, No.784, 1998. Analysis was performed by GC/MS. (prohibited by 2005/84/EC).	0.003	n.d.
BBP (Benzyl butyl phthalate) (CAS No.: 000085-68-7)	%	With reference to Chromatographia Vol.47, No.784, 1998. Analysis was performed by GC/MS. (prohibited by 2005/84/EC).	0.003	n.d.

- Note :
1. mg/kg = ppm
 2. n.d. = Not Detected
 3. MDL = Method Detection Limit
 4. According to 2005/717/EC DecaBDE is exempt.
 5. " - " = Not Regulated
 6. " --- " = Not Conducted
 7. ** = Qualitative analysis (No Unit)
 8. Negative = Undetectable / Positive = Detectable
 9. Negative = "< 1.0 %", Positive = "> 1.0 %"
 10. The MDL is 5ppm for the single compound of CP
 11. Antimony trioxide(Sb₂O₃): Calculate from antimony content multiply 1.197 factor.
 12. Tributyl tin oxide [(C₄H₉)₃Sn]₂ O: Calculate from Tributyltin content multiply 1.0276 factor.

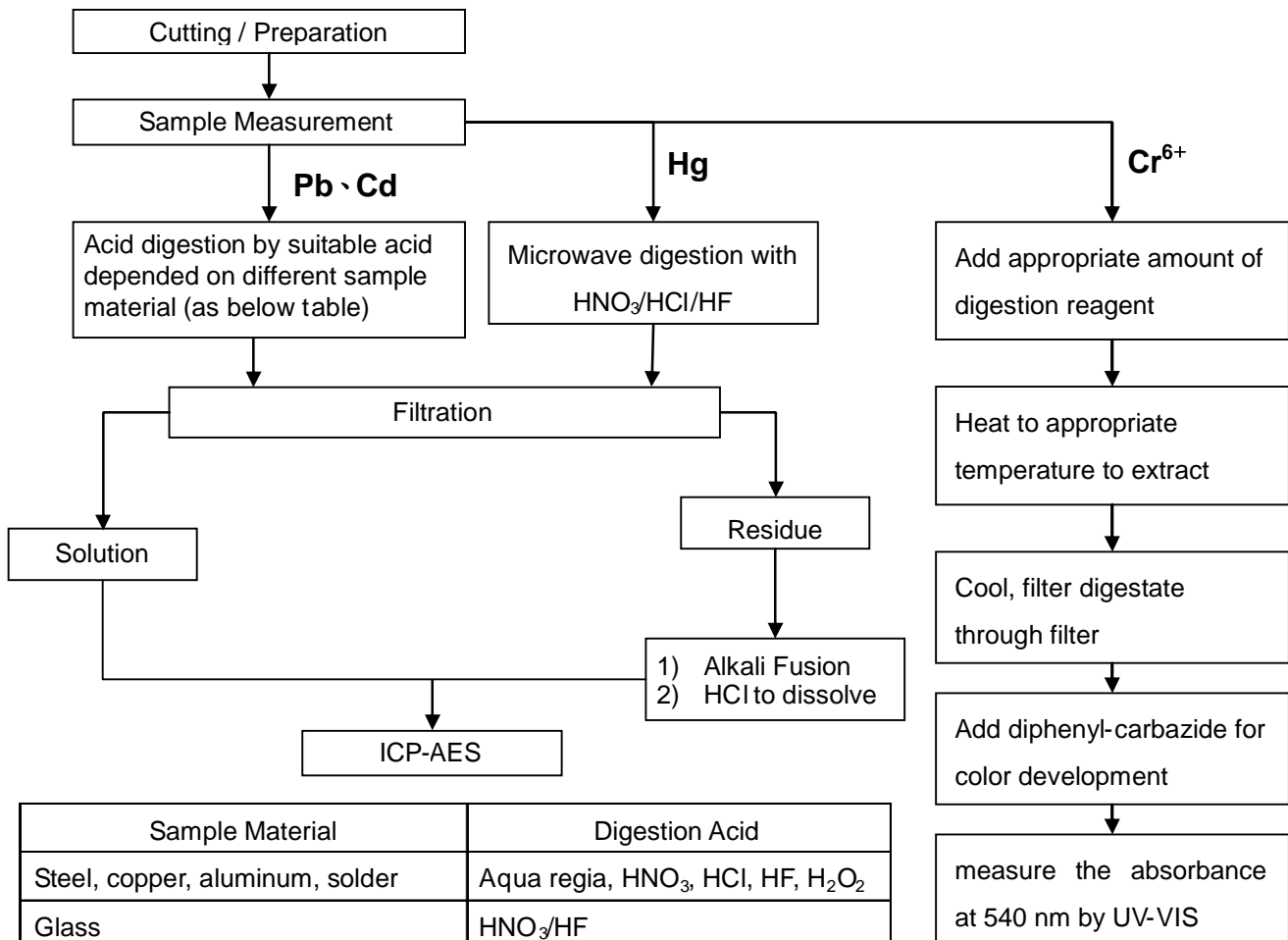
Test Report

No. : CE/2008/43815 Date : 2008/04/21 Page : 7 of 14

I-PEX JP CO., LTD.
6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



- 1) These samples were dissolved totally by pre-conditioning method according to below flow chart.
(Cr⁶⁺ test method excluded)
- 2) Name of the person who made measurement: Troy Chang
- 3) Name of the person in charge of measurement: Chenyu Kung



Sample Material	Digestion Acid
Steel, copper, aluminum, solder	Aqua regia, HNO ₃ , HCl, HF, H ₂ O ₂
Glass	HNO ₃ /HF
Gold, platinum, palladium, ceramic	Aqua regia
Silver	HNO ₃
Plastic	H ₂ SO ₄ , H ₂ O ₂ , HNO ₃ , HCl
Others	Any acid to total digestion

Test Report

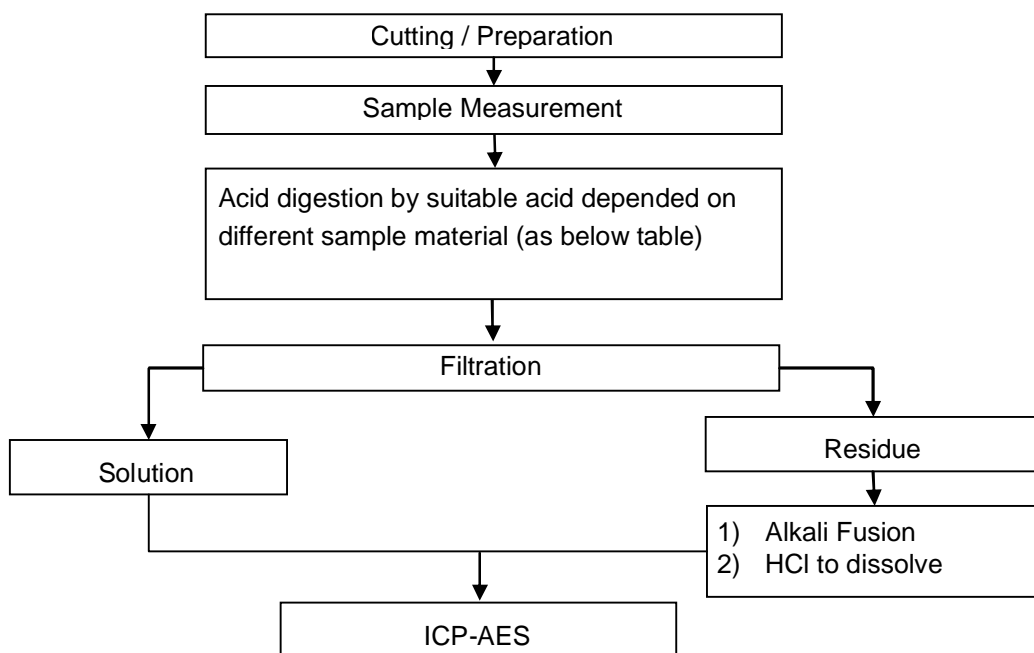
No. : CE/2008/43815 Date : 2008/04/21 Page : 8 of 14

I-PEX JP CO., LTD.
6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



- 1) These samples were dissolved totally by pre-conditioning method according to below flow chart.
- 2) Name of the person who made measurement: Troy Chang
- 3) Name of the person in charge of measurement: Chenyu Kung

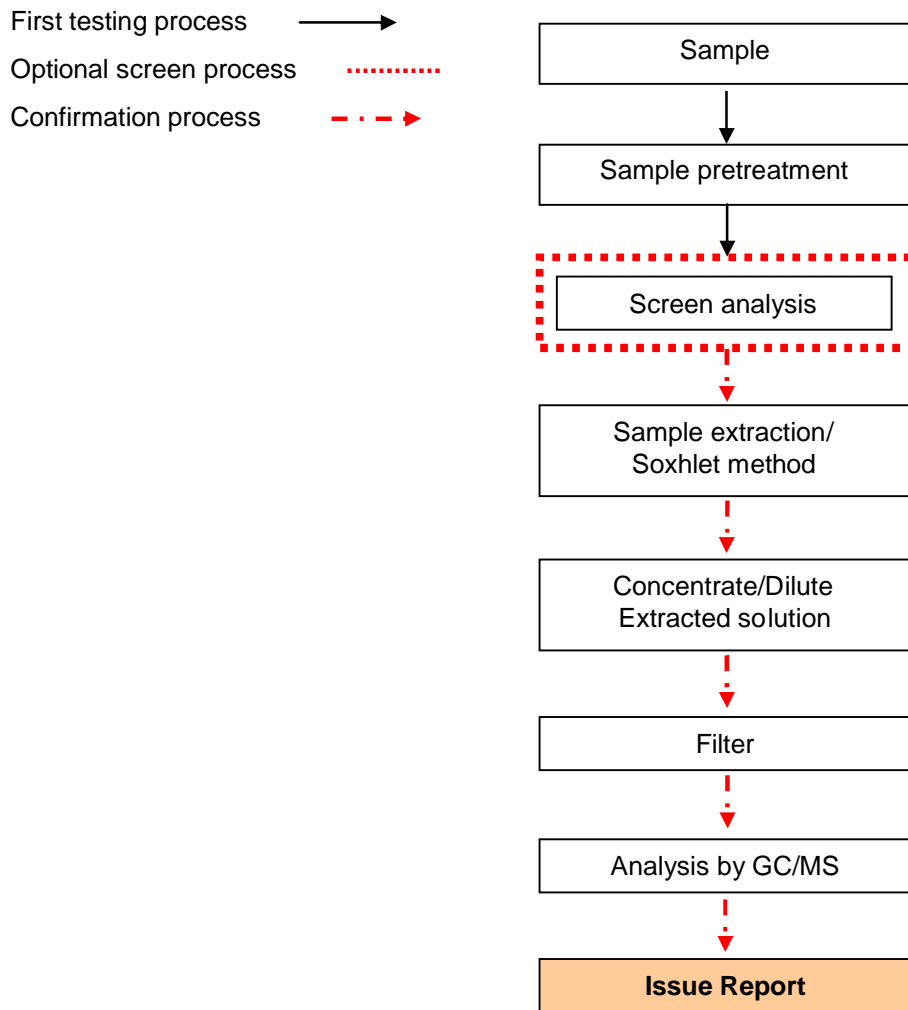
Flow Chart of Digestion for elements analysis



Steel, copper, aluminum, solder	Aqua regia, HNO ₃ , HCl, HF, H ₂ O ₂
Glass	HNO ₃ /HF
Gold, platinum, palladium, ceramic	Aqua regia
Silver	HNO ₃
Plastic	H ₂ SO ₄ , H ₂ O ₂ , HNO ₃ , HCl
Others	Any acid to total digestion

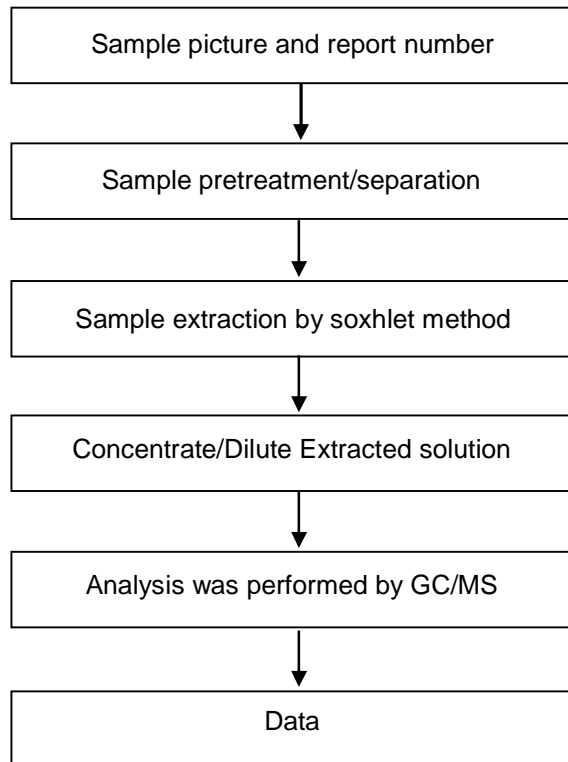


PBB/PBDE analytical FLOW CHART





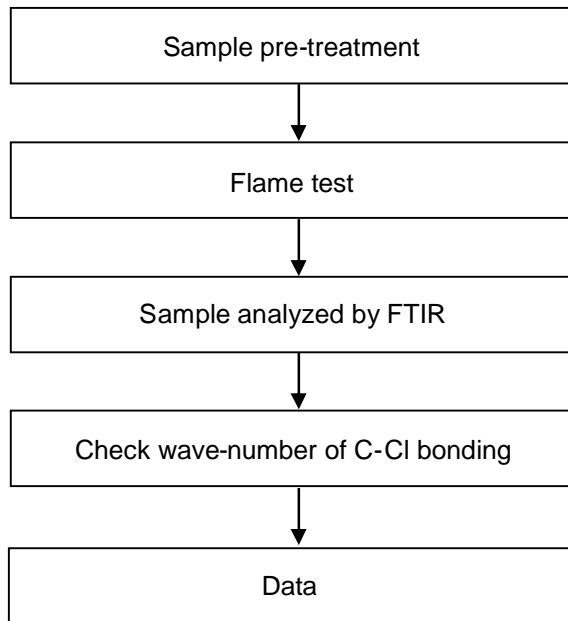
Analytical flow chart of phthalate content





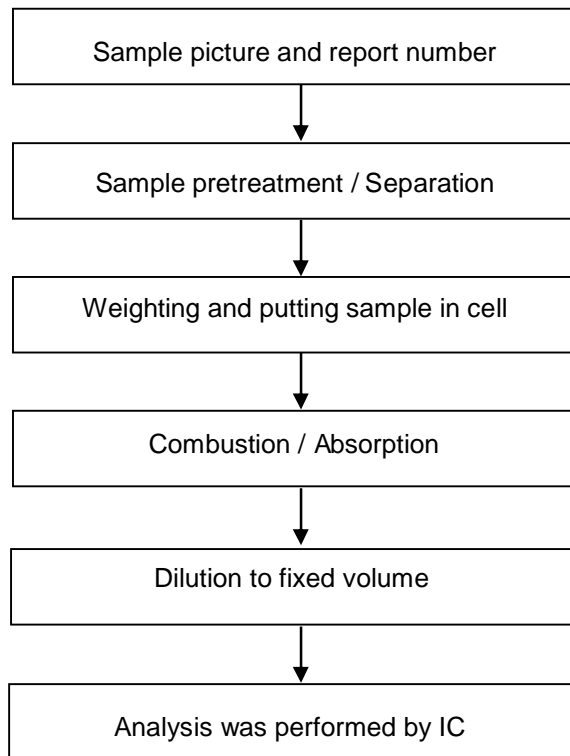
Analysis flow chart for determination of PVC in material

- 1) Name of the person who made measurement: Tin Lan
- 2) Name of the person in charge of measurement: Shinjyh Chen



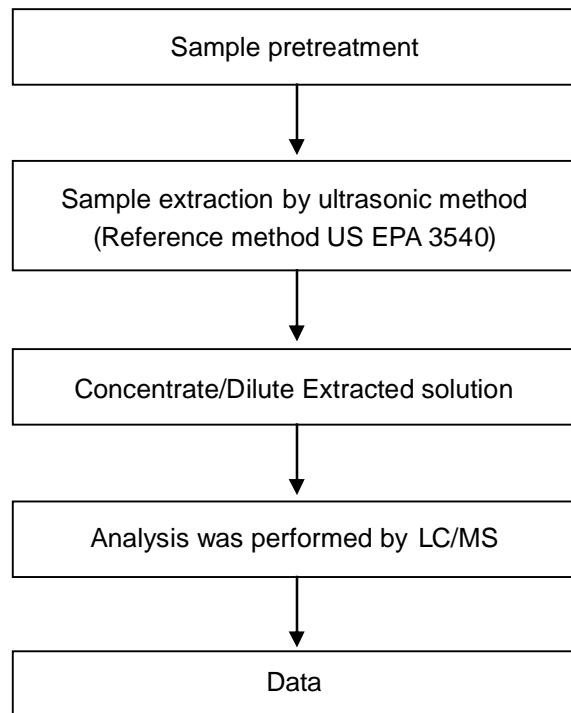


Analytical flow chart of halogen content





Analytical flow chart of PFOA/PFOS content



Test Report

No. : CE/2008/43815 Date : 2008/04/21 Page : 14 of 14

I-PEX JP CO., LTD.
6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



** End of Report **



Test Report

No. : CE/2008/52560 Date : 2008/05/14 Page : 1 of 4

I-PEX JP CO., LTD.
6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



The following sample(s) was/were submitted and identified by/on behalf of the client as :

Sample Description : MHF PLUG HOUSING
Style/Item No. : 1844-011
Sample Receiving Date : 2008/05/09
Testing Period : 2008/05/09 TO 2008/05/14

=====
Test Result(s) : Please refer to next page(s).

Shin-Jyh Chen
Shinjyh Chen / Asst. Manager
Signed for and on behalf of
SGS TAIWAN LTD.
Chemical Laboratory - Taipei

Test Report

No. : CE/2008/52560 Date : 2008/05/14 Page : 2 of 4

I-PEX JP CO., LTD.
6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



Test Result(s)

PART NAME NO.1 : BLACK PLASTIC PELLETS

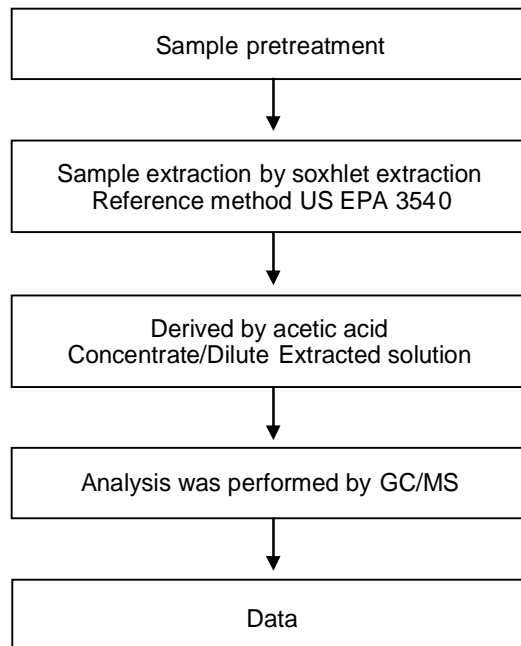
Test Item (s):	Unit	Method	MDL	Result
				No.1
Hexabromocyclododecane (HBCDD) (CAS No.: 025637-99-4)	mg/kg	With reference to US EPA 8270D method. Analysis was performed by GC/MS.	5	n.d.
Tetrabromobisphenol A (TBBP-A) (CAS No.: 000079-94-7)	mg/kg	With reference to DIN 53313. Analysis was performed by GC/MS.	10	n.d.

- Note :
1. mg/kg = ppm
 2. n.d. = Not Detected
 3. MDL = Method Detection Limit



TBBP-A analytical flow chart

- 1) Name of the person who made measurement: Amanda Fu
- 2) Name of the person in charge of measurement: Shinjyh Chen



Test Report

No. : CE/2008/52560 Date : 2008/05/14 Page : 4 of 4

I-PEX JP CO., LTD.

6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



** End of Report **

Test Report

No. : CE/2008/50263 Date : 2008/05/08 Page : 1 of 14


I-PEX JP CO., LTD.
6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



The following sample(s) was/were submitted and identified by/on behalf of the client as :

Sample Description : MHF PLUG HOUSING
Style/Item No. : 1844-012-01
Sample Receiving Date : 2008/05/02
Testing Period : 2008/05/02 TO 2008/05/08

=====
Test Result(s) : Please refer to next page(s).



Chenyu Kung / Operation Manager
Signed for and on behalf of
SGS TAIWAN LTD.
Chemical Laboratory – Taipei

Test Report

No. : CE/2008/50263 Date : 2008/05/08 Page : 2 of 14

I-PEX JP CO., LTD.
6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



Test Result(s)

PART NAME NO.1 : CREAM PLASTIC

Test Item (s):	Unit	Method	MDL	Result
				No.1
Cadmium (Cd)	mg/kg	With reference to IEC 62321/2nd CDV (111/95/CDV). Determination of Cadmium by ICP-AES.	2	n.d.
Lead (Pb)	mg/kg	With reference to IEC 62321/2nd CDV (111/95/CDV). Determination of Lead by ICP-AES.	2	n.d.
Mercury (Hg)	mg/kg	With reference to IEC 62321/2nd CDV (111/95/CDV). Determination of Mercury by ICP-AES.	2	n.d.
Hexavalent Chromium Cr(VI) by alkaline extraction	mg/kg	With reference to IEC 62321/2nd CDV (111/95/CDV). Determination of Hexavalent Chromium for non-metallic samples by UV/Vis Spectrometry.	2	n.d.
Antimony (Sb)	mg/kg	With reference to US EPA Method 3050B for Antimony Content. Analysis was performed by ICP-AES.	2	n.d.
Antimony trioxide (Sb ₂ O ₃)	mg/kg	With reference to US EPA Method 3050B for Antimony Content. Analysis was performed by ICP-AES. (See Note 11)	2.4	n.d.
Polychlorinated Biphenyls (PCBs) (CAS No.: 001336-36-3)	mg/kg	With reference to US EPA 3540C method. Analysis was performed by GC/MS.	0.5	n.d.
Polychlorinated Terphenyls (PCTs)	mg/kg	With reference to US EPA 3540C method. Analysis was performed by GC/MS.	0.5	n.d.
Chlorinated Paraffin (C10~C13) (CAS No.: 010871-26-2)	%	With reference to US EPA 3540C method. Analysis was performed by GC/MS.	0.01	n.d.
Polychlorinated Naphthalene (PCNs)	mg/kg	With reference to US EPA 3540C method. Analysis was performed by GC/MS.	5	n.d.
Mirex (CAS No.: 002385-85-5)	mg/kg	With reference to US EPA 8270D method. Analysis was performed by GC/MS.	4	n.d.
PVC	**	Analysis was performed by FTIR and FLAME Test.	-	Negative

Test Report

No. : CE/2008/50263 Date : 2008/05/08 Page : 3 of 14

I-PEX JP CO., LTD.

6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



Test Item (s):	Unit	Method	MDL	Result
				No.1
TBBP-A-bis (CAS No.: 21850-44-2)	mg/kg	With reference to US EPA 3540C method. Analysis was performed by HPLC/DAD/MS.	5	n.d.
Hexabromocyclododecane (HBCDD) (CAS No.: 025637-99-4)	mg/kg	With reference to US EPA 8270D method. Analysis was performed by GC/MS.	5	n.d.
PFOA	mg/kg	With reference to US EPA 3540C : 1996 method for PFOA Content. Analysis was performed by LC/MS.	1	n.d.
PFOS	mg/kg	With reference to US EPA 3540C : 1996 method for PFOS Content. Analysis was performed by LC/MS.	1	n.d.
Sum of PBBs			-	n.d.
Monobromobiphenyl			5	n.d.
Dibromobiphenyl			5	n.d.
Tribromobiphenyl			5	n.d.
Tetrabromobiphenyl			5	n.d.
Pentabromobiphenyl			5	n.d.
Hexabromobiphenyl			5	n.d.
Heptabromobiphenyl			5	n.d.
Octabromobiphenyl			5	n.d.
Nonabromobiphenyl			5	n.d.
Decabromobiphenyl			5	n.d.
Sum of PBDEs (Mono to Nona) (Note 4)	mg/kg	With reference to IEC 62321/2nd CDV (111/95/CDV). Determination of PBB and PBDE by GC/MS.	-	n.d.
Monobromodiphenyl ether			5	n.d.
Dibromodiphenyl ether			5	n.d.
Tribromodiphenyl ether			5	n.d.
Tetrabromodiphenyl ether			5	n.d.
Pentabromodiphenyl ether			5	n.d.
Hexabromodiphenyl ether			5	n.d.
Heptabromodiphenyl ether			5	n.d.
Octabromodiphenyl ether			5	n.d.
Nonabromodiphenyl ether			5	n.d.
Decabromodiphenyl ether			5	n.d.
Sum of PBDEs (Mono to Deca)			-	n.d.

Test Report

No. : CE/2008/50263 Date : 2008/05/08 Page : 4 of 14

I-PEX JP CO., LTD.

6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



Test Item (s):	Unit	Method	MDL	Result
				No.1
Organic-tin compounds	---	---	---	---
Triphenyl Tin (TphT) (CAS No.: 000668-34-8)	mg/kg	With reference to DIN 38407-13. Analysis was performed by GC/FPD.	0.03	n.d.
Tributyl Tin (TBT) (CAS No.: 000688-73-3)	mg/kg	With reference to DIN 38407-13. Analysis was performed by GC/FPD.	0.03	n.d.
Tributyl Tin Oxide (TBTO) (CAS No.: 000056-35-9)	mg/kg	With reference to DIN 38407-13. Analysis was performed by GC/FPD. (See Note 10)	0.03	n.d.
AZO	---	---	---	---
1): 4-AMINODIPHENYL (CAS No.: 000092-67-1)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
2): BENZIDINE (CAS No.: 000092-87-5)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
3): 4-CHLORO-O-TOLUIDINE (CAS No.: 000095-69-2)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
4): 2-NAPHTHYLAMINE (CAS No.: 000091-59-8)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
5): O-AMINOAZOTOLUENE (CAS No.: 000097-56-3)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
6): 2-AMINO-4-NITROTOLUENE (CAS No.: 000099-55-8)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
7): P-CHLOROANILINE (CAS No.: 000106-47-8)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
8): 2,4-DIAMINOANISOLE (CAS No.: 000615-05-4)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
9): 4,4'-DIAMINODIPHENYLMETHANE (CAS No.: 000101-77-9)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
10): 3,3'-DICHLOROBENZIDINE (CAS No.: 000091-94-1)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
11): 3,3'-DIMETHOXYBENZIDINE (CAS No.: 000119-90-4)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
12): 3,3'-DIMETHYLBENZIDINE (CAS No.: 000119-93-7)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
13): 3,3'-DIMETHYL-4,4'-DIAMINODIPHENYLMETHANE (CAS No.: 000838-88-0)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.

Test Report

No. : CE/2008/50263 Date : 2008/05/08 Page : 5 of 14

I-PEX JP CO., LTD.

6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



Test Item (s):	Unit	Method	MDL	Result
				No.1
14): P-CRESIDINE (2-METHOXY-5-METHYLANILINE) (CAS No.: 000120-71-8)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
15): 4,4'-METHYLENE-BIS- (2-CHLOROANILINE) (CAS No.: 000101-14-4)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
16): 4,4'-OXYDIANILINE (CAS No.: 000101-80-4)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
17): 4,4'-THIODIANILINE (CAS No.: 000139-65-1)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
18): O-TOLUIDINE (CAS No.: 000095-53-4)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
19): 2,4-TOLUYLENEDIAMINE (CAS No.: 000095-80-7)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
20): 2,4,5-TRIMETHYLANILINE (CAS No.: 000137-17-7)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
21): O-ANISIDINE (CAS No.: 000090-04-0)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
22): P-AMINOAZOBENZENE (CAS No.: 000060-09-3)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
23): 2,4-XYLIDINE (CAS No.: 000095-68-1)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
24): 2,6-XYLIDINE (CAS No.: 000087-62-7)	mg/kg	With reference to LMBG 82.02-2. Analysis was performed by GC/MS.	3	n.d.
Phthalates	---	---	---	---
DBP (Dibutyl phthalate) (CAS No.: 000084-74-2)	%	With reference to Chromatographia Vol.47, No.784, 1998. Analysis was performed by GC/MS. (prohibited by 2005/84/EC).	0.003	n.d.
DINP (Di-isononyl phthalate) (CAS No.: 028553-12-0)	%	With reference to Chromatographia Vol.47, No.784, 1998. Analysis was performed by GC/MS. (prohibited by 2005/84/EC).	0.003	n.d.
DEHP (Di- (2-ethylhexyl) phthalate) (CAS No.: 000117-81-7)	%	With reference to Chromatographia Vol.47, No.784, 1998. Analysis was performed by GC/MS. (prohibited by 2005/84/EC).	0.003	n.d.

Test Report

No. : CE/2008/50263 Date : 2008/05/08 Page : 6 of 14

I-PEX JP CO., LTD.

6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



Test Item (s):	Unit	Method	MDL	Result
				No.1
DIDP (Di-isodecyl phthalate) (CAS No.: 026761-40-0)	%	With reference to Chromatographia Vol.47, No.784, 1998. Analysis was performed by GC/MS. (prohibited by 2005/84/EC).	0.003	n.d.
DNOP (Di-n-octyl phthalate) (CAS No.: 000117-84-0)	%	With reference to Chromatographia Vol.47, No.784, 1998. Analysis was performed by GC/MS. (prohibited by 2005/84/EC).	0.003	n.d.
BBP (Benzyl butyl phthalate) (CAS No.: 000085-68-7)	%	With reference to Chromatographia Vol.47, No.784, 1998. Analysis was performed by GC/MS. (prohibited by 2005/84/EC).	0.003	n.d.
Halogen	---	With reference to BS EN 14582:2007. Analysis was performed by IC method for F , Cl , Br, I content.	---	---
Halogen-Fluorine (F) (CAS No.: 007782-41-4)	mg/kg	With reference to BS EN 14582:2007. Analysis was performed by IC method for Fluorine content.	50	1090
Halogen-Chlorine (Cl) (CAS No.: 007782-50-5)	mg/kg	With reference to BS EN 14582:2007. Analysis was performed by IC method for Chlorine content.	50	n.d.
Halogen-Bromine (Br) (CAS No.: 007726-95-6)	mg/kg	With reference to BS EN 14582:2007. Analysis was performed by IC method for Bromine content.	50	n.d.
Halogen-Iodine (I) (CAS No.: 007553-56-2)	mg/kg	With reference to BS EN 14582:2007. Analysis was performed by IC method for Iodine content.	50	n.d.

- Note :
1. mg/kg = ppm
 2. n.d. = Not Detected
 3. MDL = Method Detection Limit
 4. According to 2005/717/EC DecaBDE is exempt.
 5. " - " = Not Regulated
 6. "----" = Not Conducted
 7. ** = Qualitative analysis (No Unit)
 8. Negative = Undetectable / Positive = Detectable
 9. The MDL is 5ppm for the single compound of CP
 10. Tributyl tin oxide [(C₄H₉)₃Sn]₂ O: Calculate from Tributyltin content multiply 1.0276 factor.
 11. Antimony trioxide(Sb₂O₃): Calculate from antimony content multiply 1.197 factor.

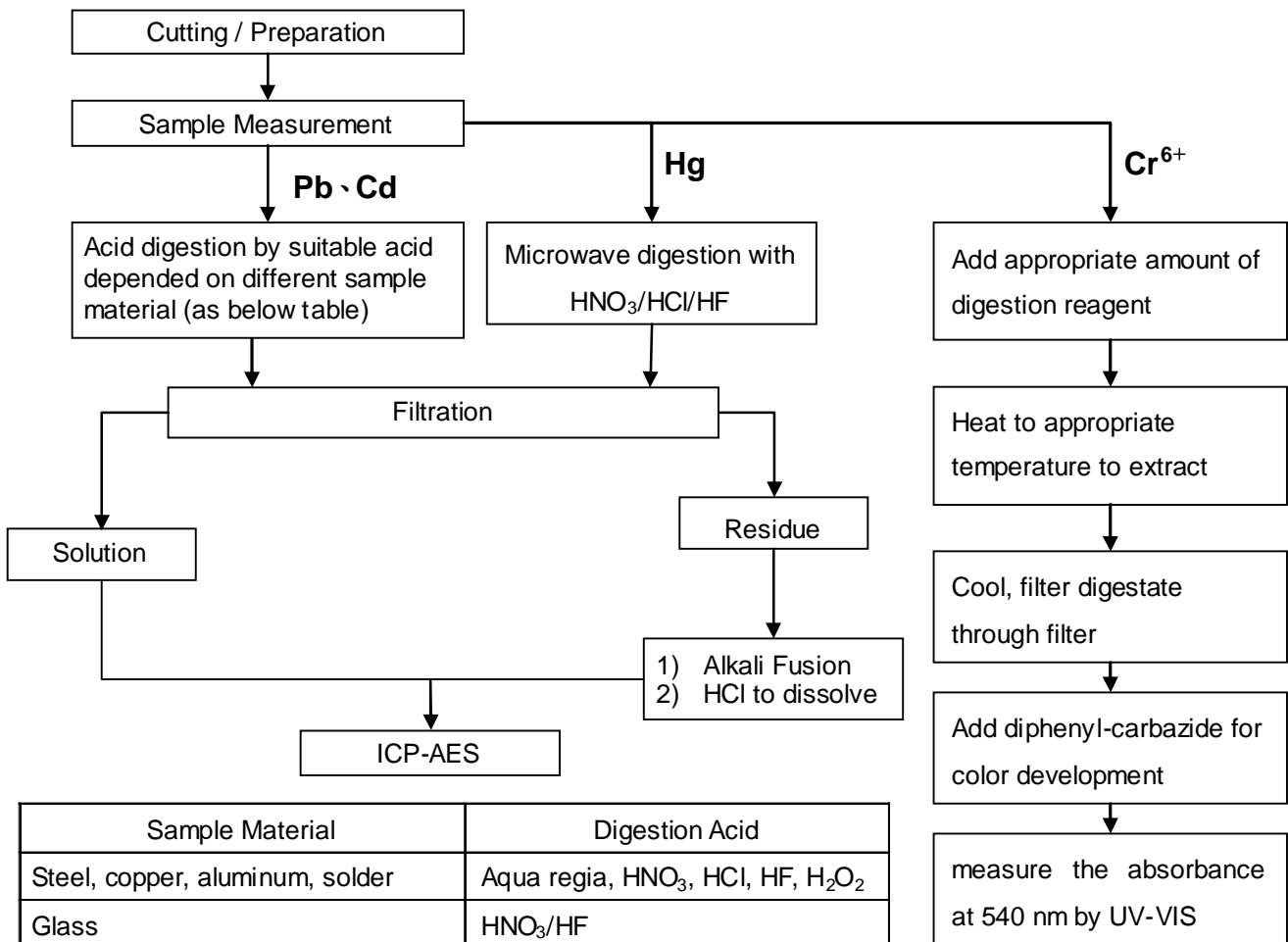
Test Report

No. : CE/2008/50263 Date : 2008/05/08 Page : 7 of 14

I-PEX JP CO., LTD.
6-27-19 HARAMACHIDA MACHIDA-CITY TOKYO 194-0013 JAPAN



- 1) These samples were dissolved totally by pre-conditioning method according to below flow chart.
(Cr⁶⁺ test method excluded)
- 2) Name of the person who made measurement: Troy Chang
- 3) Name of the person in charge of measurement: Chenyu Kung

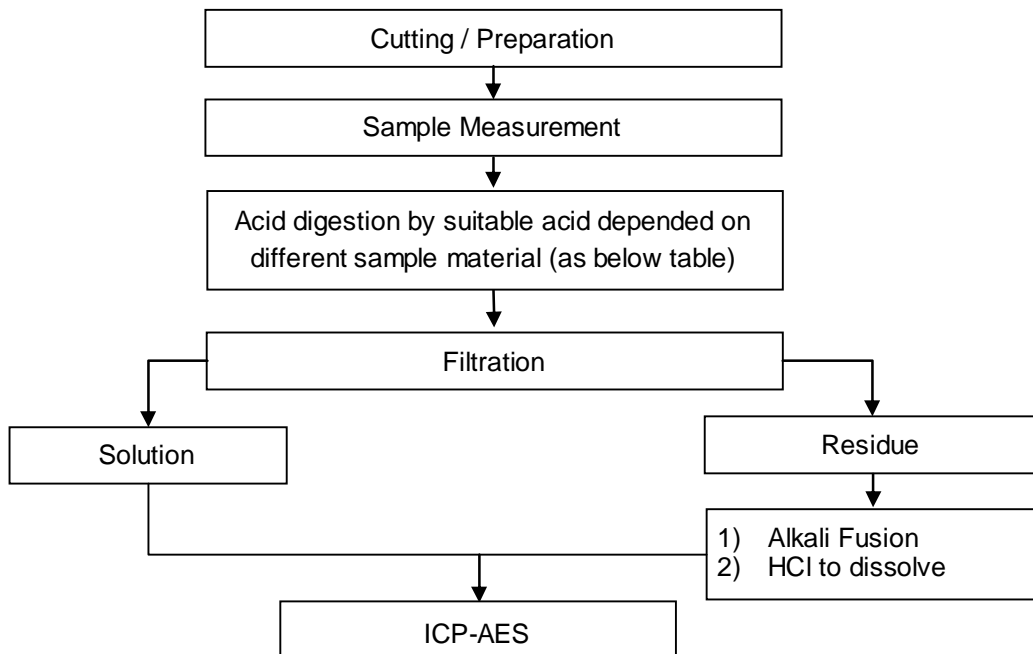


Sample Material	Digestion Acid
Steel, copper, aluminum, solder	Aqua regia, HNO ₃ , HCl, HF, H ₂ O ₂
Glass	HNO ₃ /HF
Gold, platinum, palladium, ceramic	Aqua regia
Silver	HNO ₃
Plastic	H ₂ SO ₄ , H ₂ O ₂ , HNO ₃ , HCl
Others	Any acid to total digestion



- 1) These samples were dissolved totally by pre-conditioning method according to below flow chart.
- 2) Name of the person who made measurement: Troy Chang
- 3) Name of the person in charge of measurement: Chenyu Kung

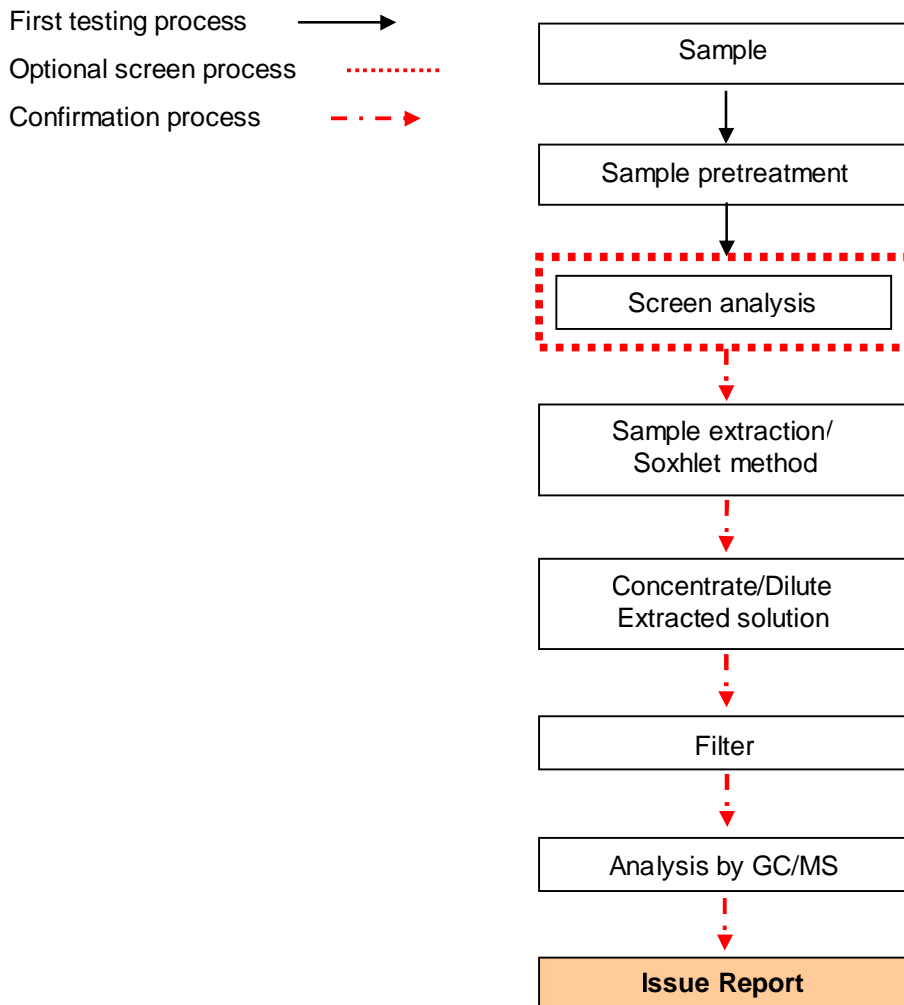
Flow Chart of Digestion for elements analysis



Steel, copper, aluminum, solder	Aqua regia, HNO ₃ , HCl, HF, H ₂ O ₂
Glass	HNO ₃ /HF
Gold, platinum, palladium, ceramic	Aqua regia
Silver	HNO ₃
Plastic	H ₂ SO ₄ , H ₂ O ₂ , HNO ₃ , HCl
Others	Any acid to total digestion



PBB/PBDE analytical FLOW CHART





Analytical flow chart of phthalate content

