

# EMC TEST REPORT

According to

- 1) EN 55022: 1998+A1: 2000
- 2) EN 61000-3-2: 2000
- 3) EN 61000-3-3: 1995
- 4) EN 55024: 1998+A1: 2001  
EN 61000-4-2: 1995+A1: 1998 / EN 61000-4-3: 1996+A1: 1998  
EN 61000-4-4: 1995 / EN61000-4-5: 1995  
EN 61000-4-6: 1996 / EN 61000-4-8: 1993  
EN 61000-4-11: 1994

EUT Name : Smart Card Reader

Model No. : EZ-100PU-C, EZ-100PU-P

Applicant : CASTLES TECHNOLOGY CO., LTD.

6F-1, NO. 190, CHUNG-HSIN RD., SEC. 2, HSIN-TIEN, TAIPEI  
HSIEN, TAIWAN, R. O. C.

Test Engineer : DENNY HUANG

Reviewed by : JASON KUNG

Issued Date: : JUN. 03, 2003

- The test report shall not be reproduced except in full, without the written approval of the laboratory.
- The report can't be used by the client to claim product endorsement by PEP Testing Laboratory.
- This report is only for the equipment which described in page 6.

## TABLE OF CONTENTS

<b>1. General</b>		4
1.1	General Information	
1.2	Place of Measurement	
1.3	Test Standards	
<b>2. Product Information/Product Technical Judgement</b>		6
<b>3. EUT Description</b>		7
<b>4. Modification</b>		8
<b>5. Test Software Used</b>		8
<b>6. Support Equipment Used</b>		9
<b>7. EN 55022 Conducted Disturbance Test</b>		11
7.1	Test Limits	
7.2	Test Setup Photos	
7.3	Test Data	
<b>8. EN 55022 Radiated Disturbance Test</b>		16
8.1	Test Description	
8.2	Test Limits	
8.3	Test Setup photos	
8.4	Test Data	
<b>9. EN 61000-4-2 Electrostatic Discharge Test</b>		22
9.1	Test Description	
9.2	Test Limits	
9.3	Test Setup Drawing	
9.4	Test Data	

<b>10. EN 61000-4-3 Radio-Frequency Electromagnetic Field Test</b>	..... 32
10.1 Test Description	
10.2 Test Limits	
10.3 Test Setup Photo	
<b>11. EN 61000-4-4 Fast Transient Burst Test</b>	..... 38
11.1 Test Description	
11.2 Test Limits	
11.3 Test Setup Photo	
11.4 Test Data	
<b>12. EN 61000-4-5 Surge Immunity Test</b>	..... 44
12.1 Test Description	
12.2 Test Limits	
12.3 Test Setup Photo	
12.4 Test Data	
<b>13. EN 61000-4-6 Conducted Disturbances, Induced By Radio Frequency Test</b>	..... 50
13.1 Test Description	
13.2 Test Limits	
13.3 Test Setup Photo	
13.4 Test Data	
<b>14. EN 61000-4-8 Power Frequency Magnetic Field Immunity Test</b>	.....57
14.1 Test Description	
14.2 Test Setup	
14.3 Test Limits	
14.4 Test Setup Photo	
<b>15. Labeling Requirement, Warning</b>	..... 62
<b>16. The List of Test Instruments</b>	..... 63
<b>17. EUT Photos</b>	..... 65

# 1. General

## 1.1 General Information :

Applicant : CASTLES TECHNOLOGY CO., LTD.

6F-1, NO. 190, CHUNG-HSIN RD., SEC. 2, HSIN-TIEN,  
TAIPEI HSIEN, TAIWAN, R. O. C.

Manufacturer : CASTLES TECHNOLOGY CO., LTD.

6F-1, NO. 190, CHUNG-HSIN RD., SEC. 2, HSIN-TIEN,  
TAIPEI HSIEN, TAIWAN, R. O. C.

Measurement Procedure : EN55022

## 1.2 Place of Measurement

### **PEP TESTING LABORATORY**

*12-3Fl, No. 27-1, Lane 169, Kang-Ning St., Hsi-Chih,  
Taipei Hsien, Taiwan, R. O. C.  
TEL : 8862-26922097 FAX : 8862-26956236*

NVLAP LAB CODE 200097-0  
FCC Registration No. : 90868  
NEMKO Aut. No. : ELA133  
BSMI Aut. No. : SL2-IN-E-11  
VCCI Registration No. : C-493/R-477

### 1.3 Test Standards

Tested for compliance with:

- EN 55022:1998** - Information Technology Equipment – Radio disturbance characteristics - Limits and methods of measurement
- +A1: 2000**
- EN 61000-3-2: 2000** - Electromagnetic compatibility (EMC) Part 3-2: Limits – Limits for harmonic current emissions (equipment input Current up to and including 16A per phase
- EN 61000-3-3:1995** - Electromagnetic compatibility (EMC) Part 3-2: Limits – Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to 16A
- EN 55024:1998** - Information technology equipment – Immunity characteristics
- +A1: 2001** Limits and methods of measurement
- EN 61000-4-2:1995** - Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques, Section 2: Electrostatic discharge immunity test Basic EMC Publication
- +A1: 1998**
- EN 61000-4-3:1996** - Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques, Section 3: Radiated, radio-Frequency, electromagnetic field immunity test
- +A1: 1998**
- EN 61000-4-4:1995** - Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques, Section 4: Electrical fast transient / Burst immunity test Basic EMC publication
- EN 61000-4-5: 1995** - Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques, Section 5: Surge immunity test (includes corrigendum: 1995)
- EN 61000-4-6: 1996** - Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques, Section 6: Immunity to conducted disturbances, induced by radio-frequency fields
- EN 61000-4-8: 1993** - Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques, Section 8: Power frequency magnetic field immunity test Basic EMC publication
- EN 61000-4-11: 1994** - Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques, Section 11: Voltage dips, short interruptions and voltage variations immunity tests

## 2. Product Information

- a. **EUT Name:** Smart Card Reader
- b. **Model No. :** EZ-100PU-C
- c. **CPU Type :** EZU0030
- d. **CPU Frequency :** 6MHz
- e. **Crystal/Oscillator(s)** 6MHz
- f. **Chassis Used :** ABS
- g. **Port/Connector(s) :** USB Port × 1
- h. **Power Rating :** DC 5V ----- From PC
- i. **Condition of the EUT :**  Prototype Sample  Engineering Sample  
 Production Sample
- j. **Test Item Receipt Date :** MAY 26, 2003

### 2a. Product Technical Judgement

Based on the major electrical and mechanical constrictions of the EUT, We hereby declare that the subject product does fully comply with the following EMC requirements without additional test required :

- 1) EN 61000-3-2 : 2000
- 2) EN 61000-3-3 : 1995
- 3) EN 61000-4-11 : 1994

These test standards will be applicable to both of PEP EMC verification and declaration of conformity for technical reference.

### 3. EUT Description

The equipment under test (EUT) is Smart Card Reader model EZ-100PU-C and EZ-100PU-P. These two models have identical electrical design and construction except that model EZ-100PU-C uses COB (Chip On Board) IC and model EZ-100PU-P uses LQPF IC. After verifying these two models, we took the worst-case model: EZ-100PU-C for test. The EUT that compatible with USB interface to PC comes with the function to read data from smart card. DC5V from PC via PC USB port is required to operate EUT. For more detail specification about EUT, please refer to the user's manual.

Test method: The EUT was configured to PC USB port and all corresponding peripherals to PC I/O ports and EUT were setup to proceed with test. The test was carried out on the operating condition of EUT for the maximum disturbance. The worst-case test result was recorded and provided in this report.

As pre-scan, we took radiated emission first. EUT configuration including peripheral devices placement and data cables coupling was compliant with EN 55022 requirement. Test engineer tried to find the worst data cables coupling in order to perform the final test that conducted emission and radiated emission would keep the same configuration under test.

Conducted emission test:

The system was setup with the EMI diagnostic software running. The power line conducted EMI tests were run on the line and neutral conductors of the power cord and the results were recorded. The effect of varying the position of the interface cables has been investigated to find the worst-case configuration that produces maximum emission.

At the frequencies where the peak values of the emission exceeded the applicable limit, the emissions were also measured with the quasi-peak detectors. The average detector also measured the emission either (A) quasi-peak values were under quasi-peak limit but exceeded average limit, or (B) peak values were under quasi-peak limit.

Radiated emission test:

The maximum readings were found by varying the height of antenna and then rotating the turntable. Both polarization of antenna, horizontal and vertical, are measured. The effect of varying the position of the interface cables has been investigated to find the configuration that produces maximum emission.

The highest emissions were also analyzed in details by operating the spectrum analyzer in fixed tuned quasi-peak mode to determine the precise amplitude of the emissions. While doing so, the antenna height was varied between one and four meters, and the turntable was slowly rotated, to maximize the emission.

#### **4. Modification(s):**

N/A

#### **5. Test Software Used**

- (A) Castles EMI program was the software used to operate EUT during the test.
- (B) EMITEST program was the software used to detect PC peripherals and EUT during the test.





**5. Modem (MOD1) × 2**

**FCC ID** : IFAXDM1414

**Manufacturer** : ACEEX

**Model Number** : 1414

**Power Supply** : Linear, 9Vac O/P

**Power Cable** : Non-Shielded , Detachable,1.7m

**Data Cable** : 1 > Shielded , Detachable,1m

2 > Back Shell : Metal

**6. Mouse (MOUS/1 PS/2)**

**FCC ID** : DZL211106

**Manufacturer** : LOGITECH

**Model Number** : M-S43

**Power Supply** : +5Vdc from PS2 of PC

**Power Cord** : N/A

**Data Cable** : 1 > Shielded , Non-detachable,1.8m

2 > Back Shell : Metal

## 7. EN 55022 Conducted Disturbance Test

Test Standard	Model No.	Result
EN 55022:1998	EZ-100PU-C	Passed

### 7.1 Conducted Disturbance Test Limits at Main Ports

Frequency Rang	Limits dB(uV)			
	Class A ITE		Class B ITE	
MHz	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.50	79	66	66-56	56-46
0.50 - 5.0	73	60	56	46
5.0 - 30	73	60	60	50

- Remarks: - If the average limit is met when a quasi-peak detector is used, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary.
- The lower limit shall apply at the transition frequency
  - The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50 MHz.

## 7.2 Conducted Disturbance Test Setup Photo.

< FRONT VIEW >



< REAR VIEW >



### 7.3 Conducted Disturbance Test Data at Main Ports (LISN)

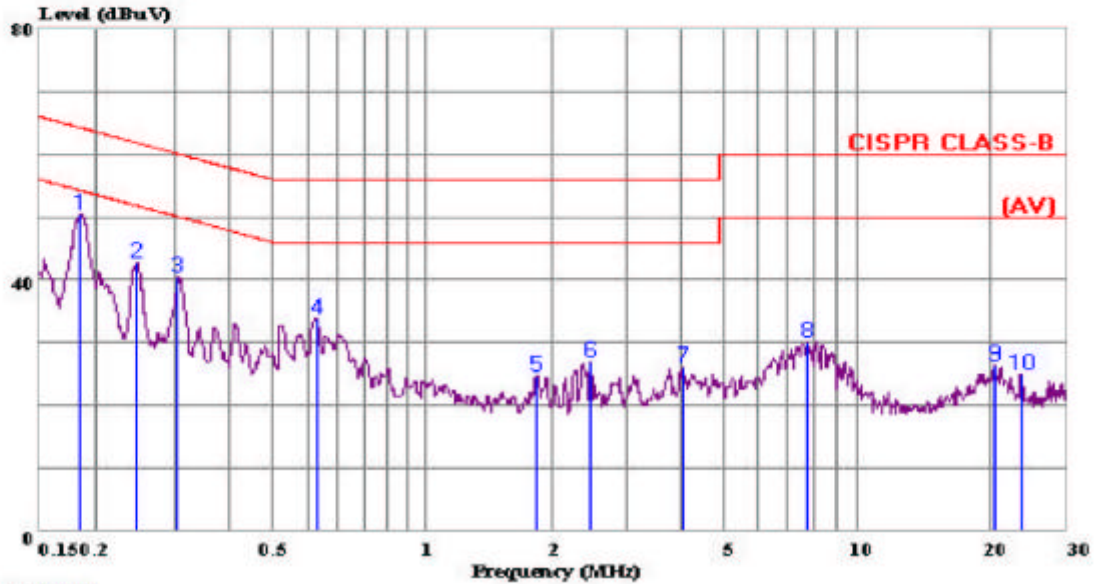
**Model No.** : EZ-100PU-C  
**Frequency range** : 150KHz to 30MHz  
**Detector** : Peak Value  
**Temperature** : 23 °C  
**Humidity** : 52 %

**Test Data :** # 1828 < LINE >  
# 1833 < NEUTRAL >

- Note 1. Level = Read Level + Probe (LISN) Factor + Cable Loss  
2. Over Limit = Level – Limit Line = Margin



Data#: 1828 File#: EN55022-B(QP).EMI Date: 2003-05-26 Time: 14:37:00



Trace: 1827

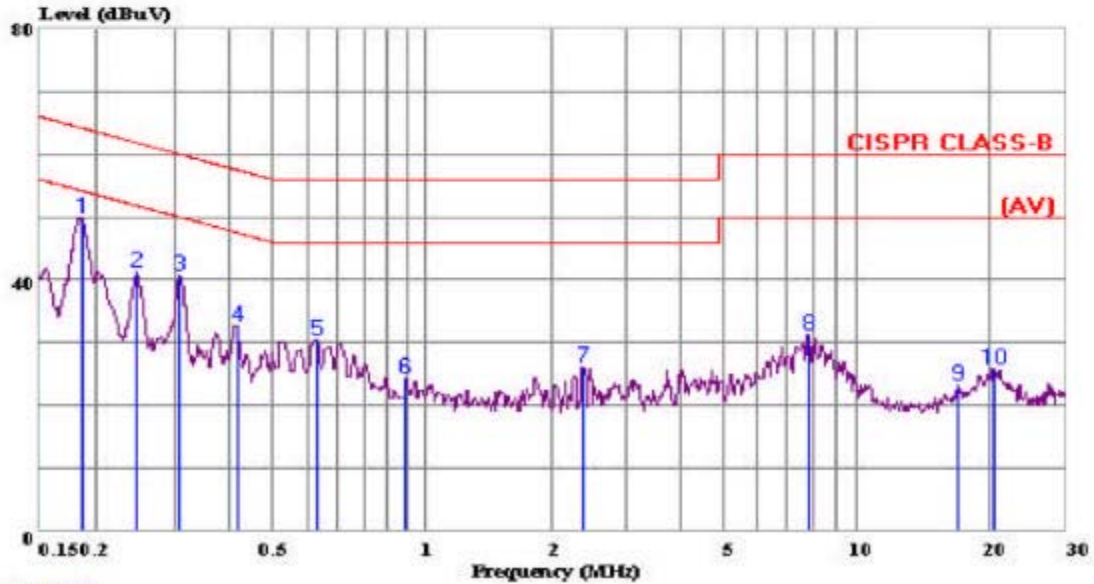
Site : Shih-Chi : Conduction NO.1(Nick)  
 Condition: CISPR CLASS-B LISN.L(16A) LINE  
 eut : E920229  
 power : AC 230V 50Hz  
 memo : Peak Vaule  
 : Final Test

Page: 1

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.184	50.60	-13.68	64.28	50.00	0.30	0.30	
2	0.247	42.83	-19.03	61.86	42.20	0.33	0.30	
3	0.307	40.35	-19.71	60.06	39.80	0.36	0.19	
4	0.627	33.93	-22.07	56.00	33.40	0.40	0.13	
5	1.949	24.70	-31.30	56.00	24.00	0.40	0.30	
6	2.581	26.96	-29.04	56.00	26.20	0.40	0.36	
7	4.136	26.21	-29.79	56.00	25.40	0.41	0.40	
8	7.893	30.15	-29.85	60.00	29.20	0.55	0.40	
9	20.594	26.51	-33.49	60.00	25.01	0.92	0.58	
10	23.636	25.05	-34.95	60.00	23.40	1.05	0.60	



Data#: 1833 File#: EN55022-B(QP).EMI Date: 2003-05-26 Time: 14:40:45



Trace: 1832  
 Site : Shih-Chi : Conduction NO.1(Nick)  
 Condition: CISPR CLASS-B LISN.N(16A) NEUTRAL  
 eut : E920229  
 power : AC 230V 50Hz  
 memo : Peak Vaule  
 : Final Test

Page: 1

	Freq	Level	Over	Limit	Read	Probe	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.186	50.00	-14.20	64.20	49.60	0.10	0.30	
2	0.247	41.20	-20.66	61.86	40.80	0.10	0.30	
3	0.308	40.68	-19.34	60.02	40.40	0.10	0.18	
4	0.417	32.60	-24.91	57.51	32.40	0.10	0.10	
5	0.627	30.48	-25.52	56.00	30.20	0.15	0.13	
6	0.994	24.50	-31.50	56.00	24.00	0.20	0.30	
7	2.487	26.15	-29.85	56.00	25.60	0.20	0.35	
8	7.935	31.35	-28.65	60.00	30.60	0.35	0.40	
9	17.199	23.15	-36.85	60.00	22.00	0.65	0.50	
10	20.594	25.72	-34.28	60.00	24.40	0.74	0.58	

## 8. EN 55022 Radiated Disturbance Test

Test Standard	Model No.	Result
EN 55022	EZ-100PU-C	Passed

### 8.1 Radiated Disturbance Test Description

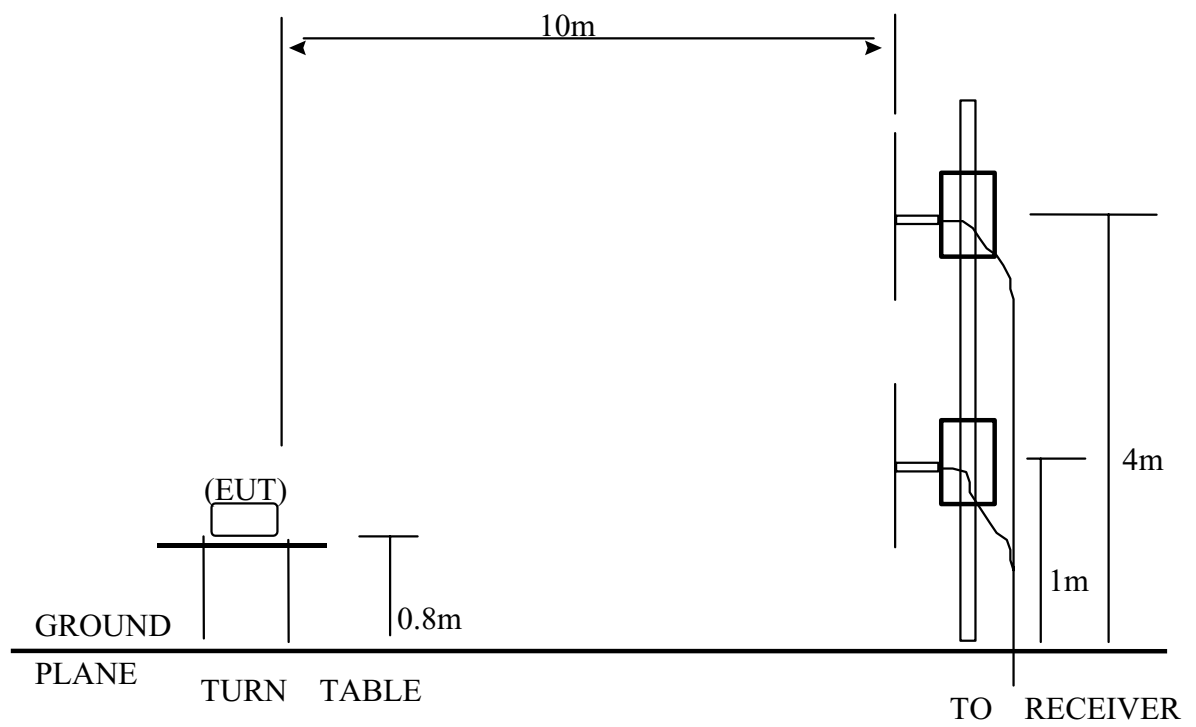
Preliminary measurements were made indoors chamber at 3 meter using broadband antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 1000 MHz using logbicon antenna. Above 1GHz, linearly polarized double ridge horn antenna were used.

Final measurements were made outdoors at 10-meter test range using biconical, dipole antenna or horn antenna. The test equipment was placed on a wooden bench situated on a 1.5x1 meter area adjacent to the measurement area. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined and investigated using Quasi-Peak Adapter. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120kHz.

The half-wave dipole antenna was tuned to the frequency found during preliminary radiated measurements. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission.



## 8.2 Radiated Disturbance Test Setup



EUT = Equipment Under Test

### 8.3 Radiated Disturbance Test Limits

Limits for radiated disturbance of Class A ITE at  
a measuring distance of 10 m

Frequency MHz	Field Strength dB( $\mu$ V/m)
30 to 230	40
230 to 1 000	47
NOTES 1 The lower limit shall apply at the transition frequency. 2 Additional provisions may be required for cases where interference occurs.	

Limits for radiated disturbance of Class B ITE at  
a measuring distance of 10 m

Frequency MHz	Field Strength dB( $\mu$ V/m)
30 to 230	30
230 to 1 000	37
NOTES 1 The lower limit shall apply at the transition frequency. 2 Additional provisions may be required for cases where interference occurs.	

## 8.4 Radiated Disturbance Test Setup Photos.

< FRONT VIEW >



< REAR VIEW >



## 8.5 Radiated Disturbance Test Data

**Model No.** : EZ-100PU-C  
**Frequency range** : 30MHz to 1GHz      **Detector** : Quasi-Peak Value  
**Frequency range** : above 1GHz      **Detector** : Quasi-Peak/Average Value  
**Temperature** : 23° C      **Humidity** : 52 %

**Antenna polarization** : HORIZONTAL ; **Test distance** : 10m ;

Freq. (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Azimuth (°angle)	Antenna High(m)
41.297	18.89	-11.11	30.00	30.03	9.39	0.10	20.63	110.0	4.0
111.712	20.79	- 9.21	30.00	33.88	6.67	0.30	20.06	60.0	4.0
116.747	22.10	- 7.90	30.00	35.28	6.56	0.30	20.04	90.0	4.0
200.251	27.15	- 2.85	30.00	36.75	9.70	0.70	20.00	150.0	4.0
797.470	31.43	- 5.57	37.00	24.95	23.04	2.38	18.94	210.0	3.5
824.595	27.23	- 9.77	37.00	21.00	23.20	2.35	19.32	320.0	3.5

Note :

1. Level = Read Level + Antenna Factor + Cable Loss – Preamp Factor
2. Over Limit = Level – Limit Line

**Model No.** : EZ-100PU-C  
**Frequency range** : 30MHz to 1GHz    **Detector** : Quasi-Peak Value  
**Frequency range** : above 1GHz       **Detector** : Quasi-Peak/Average Value  
**Temperature** : 23° C                    **Humidity** : 52 %

**Antenna polarization : VERTICAL ; Test distance : 10m ;**

Freq. (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Azimuth (°angle)	Antenna High(m)
71.841	22.53	- 7.47	30.00	37.84	4.61	0.24	20.16	90.0	1.0
125.514	24.64	- 5.36	30.00	38.25	5.99	0.40	20.00	195.0	1.0
199.959	22.65	- 7.35	30.00	32.25	9.70	0.70	20.00	250.0	1.0
797.264	24.17	-12.83	37.00	17.69	23.04	2.38	18.94	235.0	1.5
827.603	26.04	-10.96	37.00	19.71	23.29	2.35	19.31	310.0	1.5
936.890	28.91	- 8.09	37.00	19.53	25.40	2.39	18.41	340.0	1.5

Note :

1. Level = Read Level + Antenna Factor + Cable Loss – Preamp Factor
2. Over Limit = Level – Limit Line

## 9. EN 61000-4-2 Electrostatic Discharge Test

Test standard	Model No.	Result
EN 61000-4-2	EZ-100PU-C, EZ-100PU-P	A

The test results shall be classified on the basis of the operating conditions and the functional specifications of the equipment under test , as in the following , unless different specifications are given by product committees or product specifications :

*Performance Criterion :*

*A) normal performance within the specification limits ;*

*B) temporary degradation or loss of function or performance which is self-recoverable ;*

*C) temporary degradation or loss of function or performance which requires operator intervention or system reset ;*

## 9.1 Electrostatic Discharge Test Description

This standard relates to equipment, systems, sub-systems and peripherals which may be involved in static electricity discharges owing to environmental and installation conditions. such as low relative humidity, use of low-conductivity (artificial-fibre) carpets, vinyl garments, etc., which may exist in allocations classified in standards relevant to electrical and electronic equipment.

The test set-up shall consist of a wooden table, 0.8 m high standing on the ground reference plane. A horizontal coupling plane(HCP), 1.6 m x 0.8 m, shall be placed on the table. The EUT and cables shall be isolated from the coupling plane by an insulating support 0.5 mm thick .

A ground reference plane shall be provided on floor of the laboratory. It shall be metallic sheet of 0.25 mm minimum thickness. The minimum size of the reference plane is 1 m, the exact size depending on the dimensions of the EUT .

It shall project beyond the EUT or coupling plane by at least 0.5 m on all sides. and shall be connected to the protective grounding system.

In order to minimize the impact of environmental parameters on test results, the tests shall be carried out in climatic and electromagnetic reference conditions.

### Climatic conditions

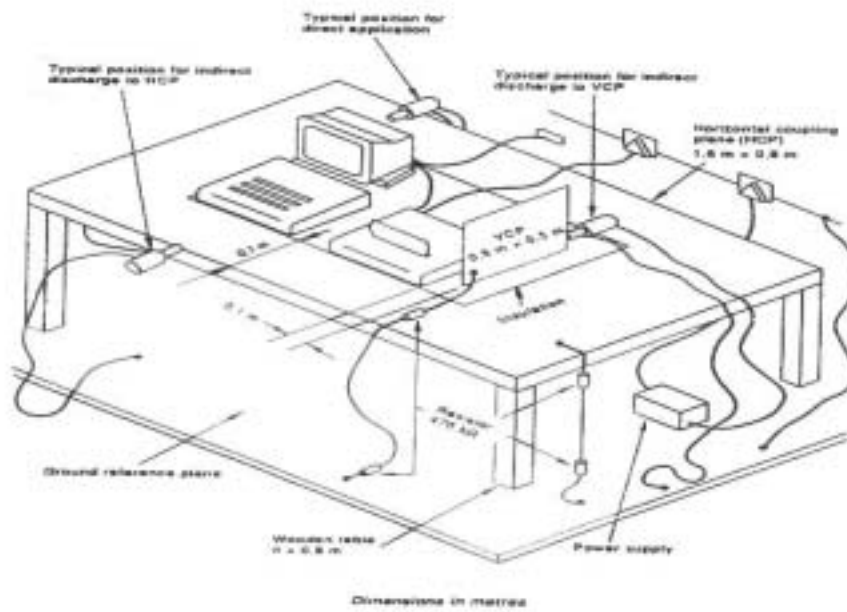
- ambient temperature: 15 °C to 35°C;
- relative humidity: 30 % to 60%
- atmospheric pressure: 86 KPa (860 mbar) to 106 KPa (1 060 mbar).

NOTE – Any other values are specified in the product specification.

### Electromagnetic conditions

The electromagnetic environment of the laboratory shall not influence the test results.

## 9.2 Electrostatic Discharge Test Setup



- Example of test set-up for table-top equipment, laboratory tests



### 9.3 Electrostatic Discharge Test Limits

#### Test levels

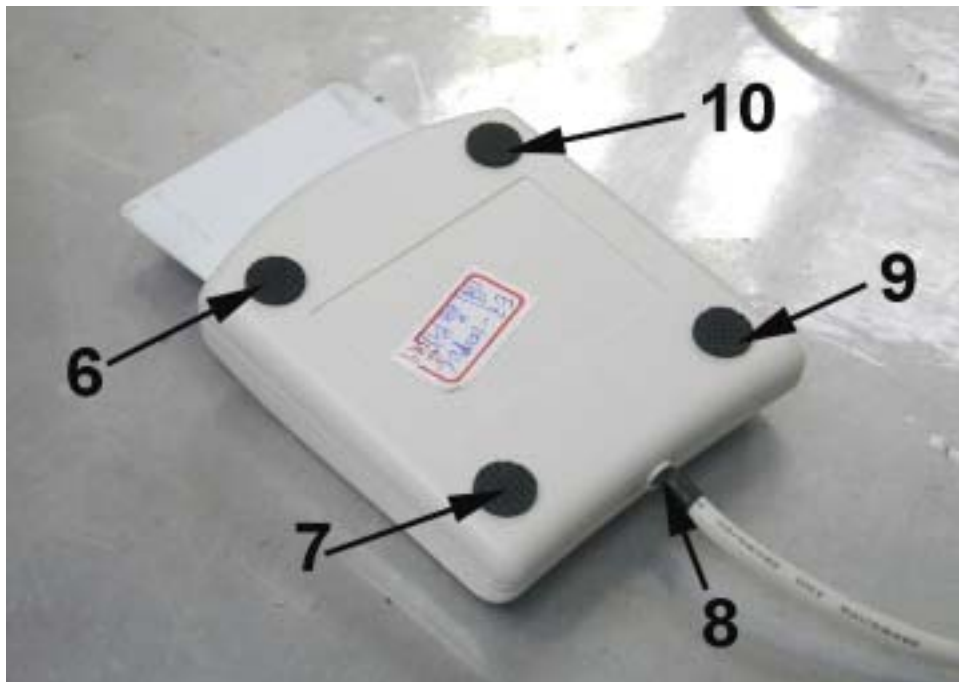
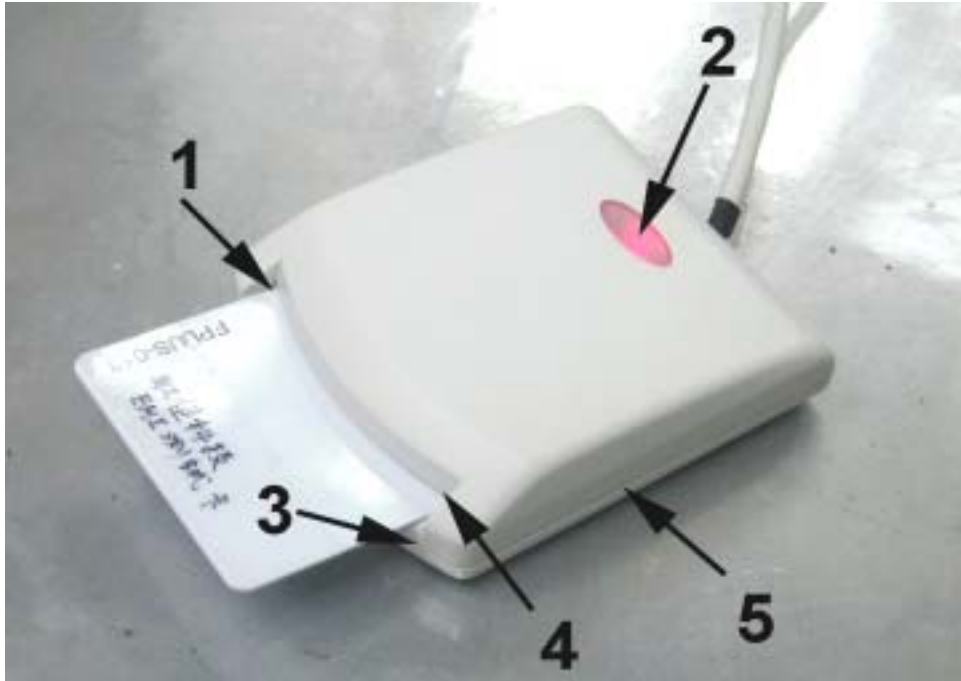
Contact discharge		Air discharge	
Level	Test voltage kv	Level	Test voltage
1	2	1	2
2	4	2	4
3	6	3	8
4	8	4	15
x <sup>1)</sup>	Special	x <sup>1)</sup>	Special

<sup>1)</sup> "x" is an open level . The level has to be specified in the dedicated equipment specification .

If higher voltages than those shown are specified , special test equipment may be needed .

### 9.4 Direct Discharge Test Drawing

Model No. : EZ-100PU-C

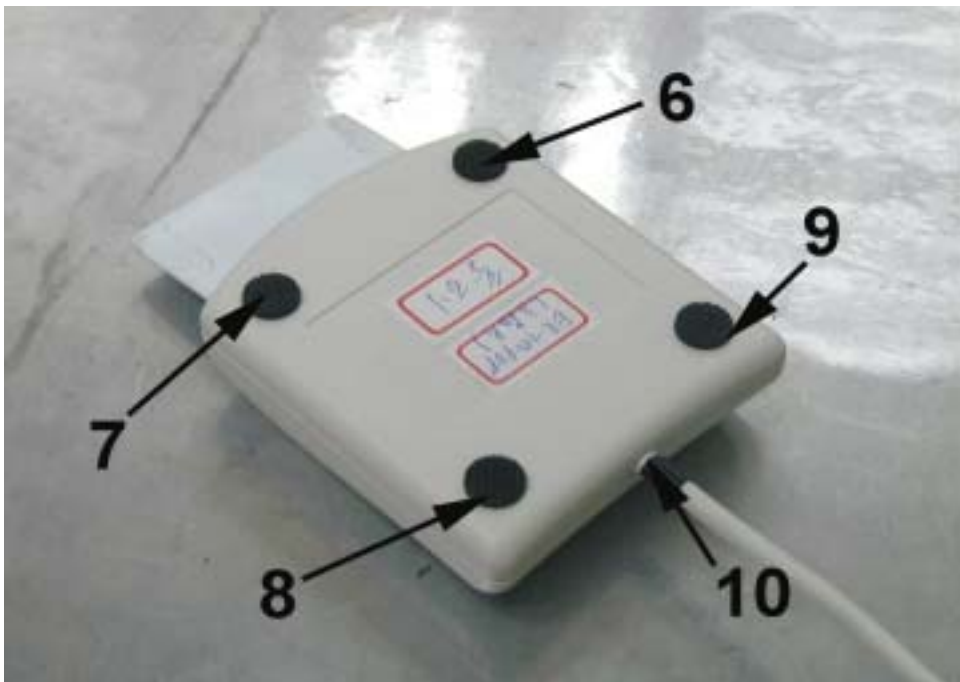
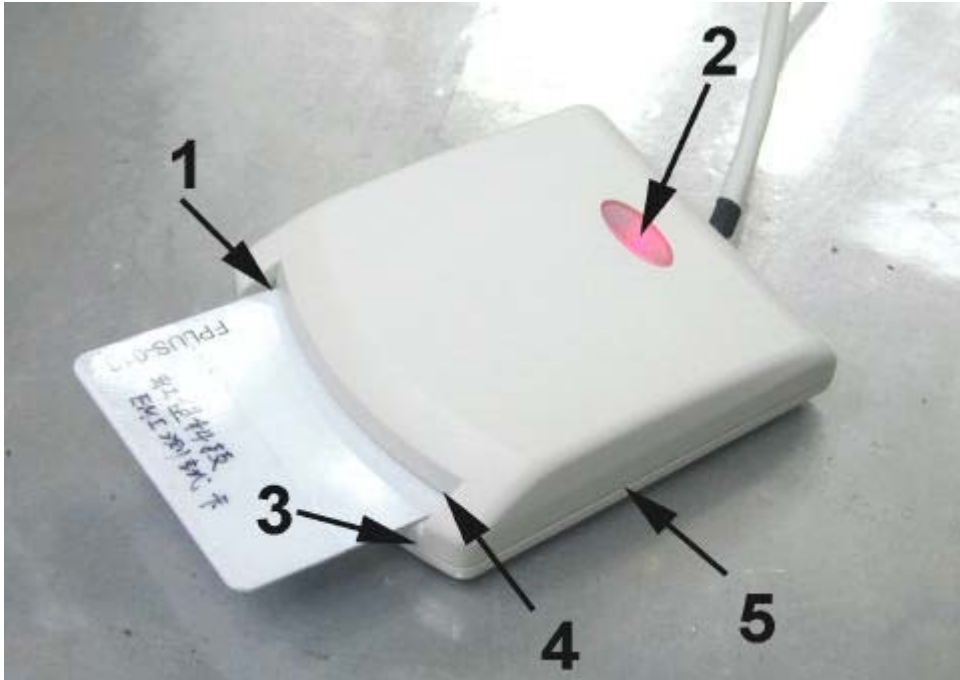


## Indirect Discharge Test Drawing

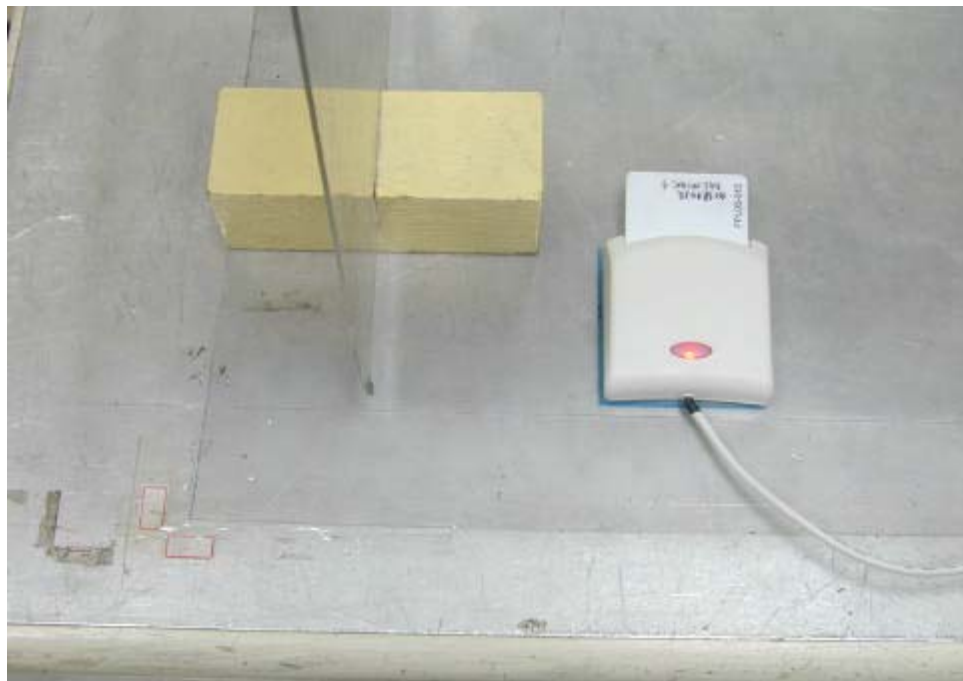


## Direct Discharge Test Drawing

Model No. : EZ-100PU-P



## Indirect Discharge Test Drawing



## 9.5 Electrostatic Discharge Test Data (Direct Discharge)

Model No. : EZ-100PU-C, EZ-100PU-P

Test Item : <b>Direct Discharge</b>		Instrument : NoiseKen ESS-100L															
Temperature : <u>24</u> °C		Relative Humidity : <u>47</u> %RH															
Storage Capacitor : 150 pf		Discharge Resistor : 330 Ohm															
Discharge Rate : < 1 / Sec																	
	<b>Contact Discharge</b>								<b>Air Discharge</b>								
	2 KV		4 KV		6 KV		8 KV		2 KV		4 KV		6 KV		8 KV		
	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1	/	/	/	/	/	/	/	/	/	P	P	P	P	P	P	P	P
2	/	/	/	/	/	/	/	/	/	P	P	P	P	P	P	P	P
3	/	/	/	/	/	/	/	/	/	P	P	P	P	P	P	P	P
4	/	/	/	/	/	/	/	/	/	P	P	P	P	P	P	P	P
5	/	/	/	/	/	/	/	/	/	P	P	P	P	P	P	P	P
6	/	/	/	/	/	/	/	/	/	P	P	P	P	P	P	P	P
7	/	/	/	/	/	/	/	/	/	P	P	P	P	P	P	P	P
8	/	/	/	/	/	/	/	/	/	P	P	P	P	P	P	P	P
9	/	/	/	/	/	/	/	/	/	P	P	P	P	P	P	P	P
10	/	/	/	/	/	/	/	/	/	P	P	P	P	P	P	P	P

1. " P " ---- means the EUT function is correct during the test.
2. " / " ---- no test.



## 10. EN 61000-4-3 Radio-Frequency Electromagnetic Field Test

Test standard	Model No.	Result
EN 61000-4-3	EZ-100PU-C, EZ-100PU-P	A

Field Strength : 3 V/M , Level 2 .

Modulation : AM 80 % , 1KHz . ON (YES) . OFF (\_\_\_)

Start : 80 MHz , Stop : 1000 MHz . AC Power : 230 Vac

DC Power : N/A Vdc

**The test results shall be classified on the basis of the operating conditions and the functional specifications of the equipment under test , as in the following , unless different specifications are given by product committees or product specifications :**

***Performance Criterion :***

***A) normal performance within the specification limits ;***

***B) temporary degradation or loss of function or performance which is self-recoverable ;***

***C) temporary degradation or loss of function or performance which requires operator intervention or system reset ;***



## **10.1 Radio-Frequency Electromagnetic Field Test Description**

Most electronic equipment is, in some manner, affected by electromagnetic radiation.

This radiation is frequently generated by such sources as the small hand-held radio transceivers that are used by operating, maintenance and security personnel, fixed-station radio and television transmitters, vehicle radio transmitters, and various industrial electromagnetic sources.

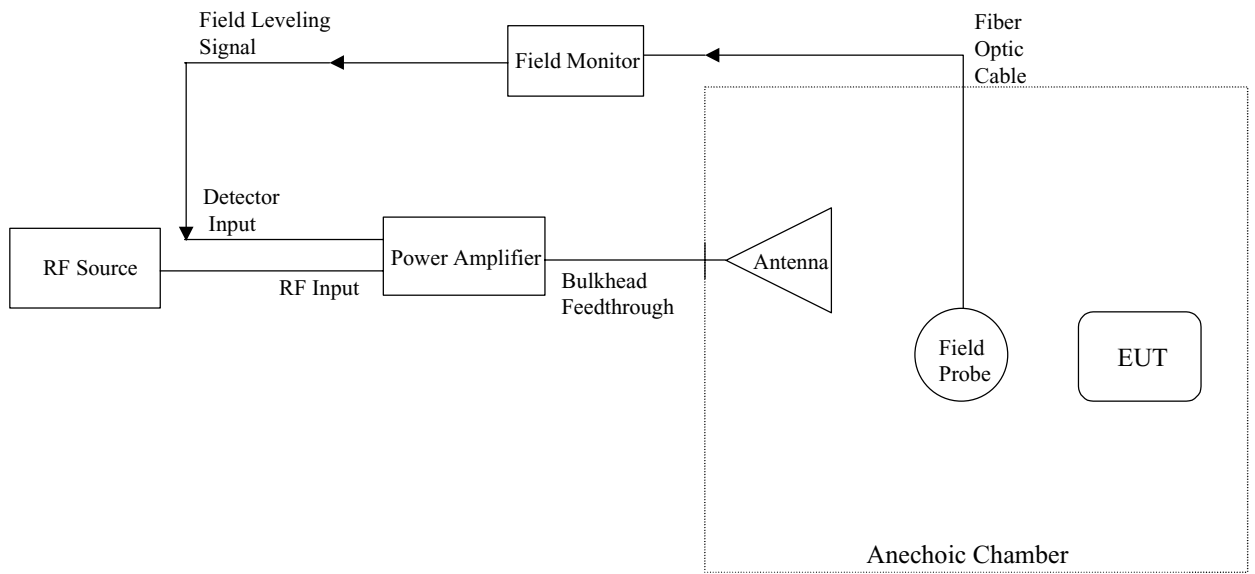
In addition to electromagnetic energy deliberately generated, there is also spurious radiation caused by devices such as welders, thyristors, fluorescent lights, switches operating inductive loads, etc. For the most part, this interference manifests itself as conducted electrical interference and, as such, is dealt with in other parts of this standard. Methods employed to prevent effects from electromagnetic fields will normally also reduce the effects from these sources.

The electromagnetic environment is determined by the strength of the electromagnetic field (field strength in volts per metre). The field strength is not easily measured without sophisticated instrumentation nor is it easily calculated by classical equations and formulae because of the effect of surrounding structures or the proximity of other equipment that will distort and/or reflect the electromagnetic waves.

All testing of equipment shall be performed in a configuration as close as possible to the installed case. Wiring shall be consistent with the manufacturer's recommended procedures, and the equipment shall be in its housing with all covers and access panels in place, unless otherwise stated.

If the equipment is designed to be mounted in a panel, rack or cabinet, it shall be tested in this configuration.

## 10.2 Radio-Frequency Electromagnetic Field Test Block Diagram



### 10.3 Radio-Frequency Electromagnetic Field Test Limits

Table 1 - Test levels

Level	Test field strength V/m
1	1
2	3
3	10
x	Special

NOTE – x is an open test level. This level may be given in the Product specification.

Table 1 gives details of the field strength of the unmodulated signal. For testing of equipment, this signal is 80 % amplitude modulate with a 1 KHz sinewave to simulate actual threats.

## 10.4 Radio-Frequency Electromagnetic Field Test Setup Photo

Model No. : EZ-100PU-C

< FRONT VIEW >



**Model No. : EZ-100PU-P**

**< FRONT VIEW >**



## 11. EN 61000-4-4 Fast Transient Burst Test

Test standard	Model No.	Result
EN 61000-4-4	EZ-100PU-C	B

**The test results shall be classified on the basis of the operating conditions and the functional specifications of the equipment under test , as in the following , unless different specifications are given by product committees or product specifications :**

***Performance Criterion :***

***A) normal performance within the specification limits ;***

***B) temporary degradation or loss of function or performance which is self-recoverable ;***

***C) temporary degradation or loss of function or performance which requires operator intervention or system reset ;***

## 11.1 Fast Transient Bursts Test Description

The repetitive fast transient test is a test with bursts consisting of a number of fast transients, coupled into power supply, control and signal ports of electrical and electronic equipment. Significant for the test are the short rise time, the repetition rate and the low energy of the transients.

The test shall be carried out on the basis of a test plan including verification of the performances of the EUT as defined in the technical specification.

### Climatic conditions

The tests shall be carried out in standard climatic conditions in accordance with IEC 68-1:

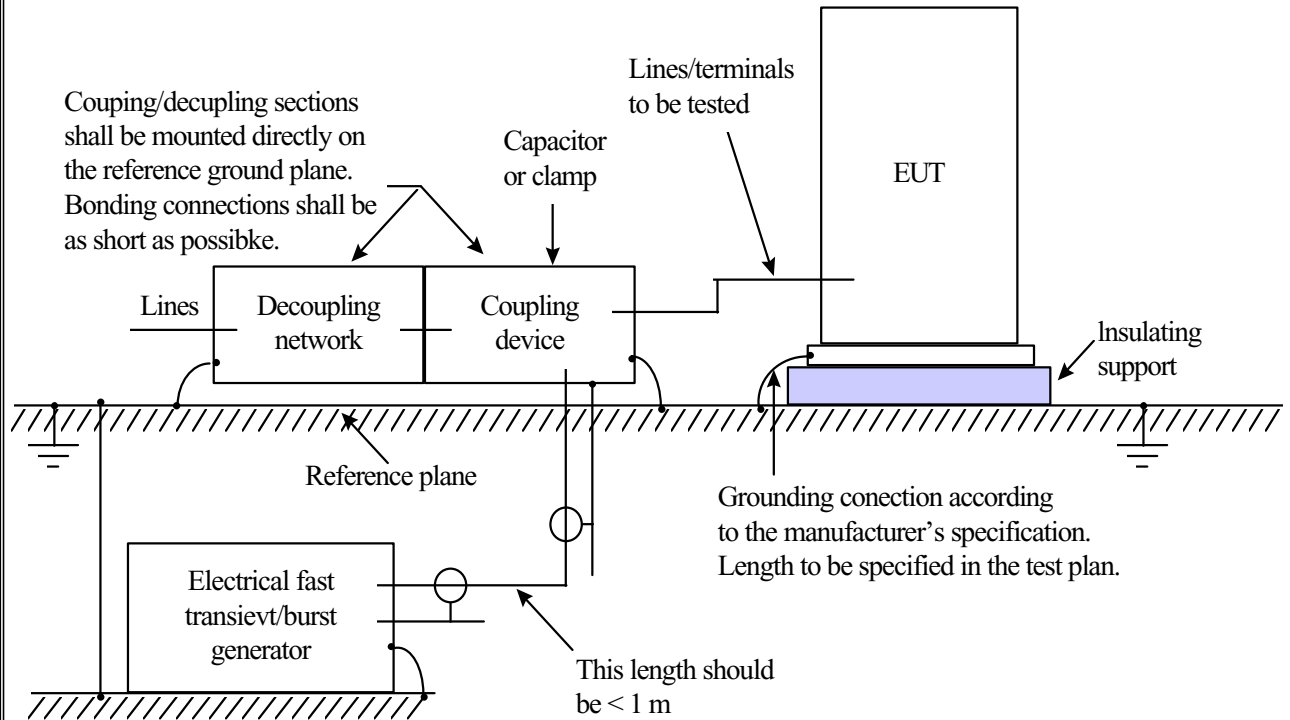
- ambient temperature: 15°C to 35°C
- relative humidity: 25% to 75%
- atmospheric pressure: 86kPa (860 mbar) to 106Kpa (1 060 mbar)

NOTE – Any other values are specified in the product specification.

### Electromagnetic conditions

The electromagnetic conditions of the laboratory shall be such to guarantee the correct operation of the EUT in order not to influence the test results.

## 11.2 Fast Transient Burst Test Setup



Block-diagram for electrical fast transient/burst immunity test



### 11.3 Fast Transient Burst Test Limits

Test levels

Open-circuit output test voltage ( $\pm 10\%$ ) and repetition rate of the impulses ( $\pm 20\%$ )				
Level	On power supply port, PE		On I/O (Input/Output) signal, data and control ports	
	Voltage peak kV	Repetition rate kHz	Voltage peak kV	Repetition rate kHz
1	0.5	5	0.25	5
2	1	5	0.5	5
3	2	5	1	5
4	4	2.5	2	5
x <sup>1)</sup>	Special	Special	Special	Special

<sup>1)</sup> "x" is an open level. The level has to be specified in the dedicated equipment specification.

## 11.4 Fast Transient Burst Test Setup Photo

< FRONT VIEW >





## 12. EN 61000-4-5 Surge Immunity Test

Test standard	Model No.	Result
EN 61000-4-5	EZ-100PU-C	A

**The test results shall be classified on the basis of the operating conditions and the functional specifications of the equipment under test , as in the following , unless different specifications are given by product committees or product specifications :**

***Performance Criterion :***

***A) normal performance within the specification limits ;***

***B) temporary degradation or loss of function or performance which is self-recoverable ;***

***C) temporary degradation or loss of function or performance which requires operator intervention or system reset ;***

## 12.1 Surge Immunity Test Description

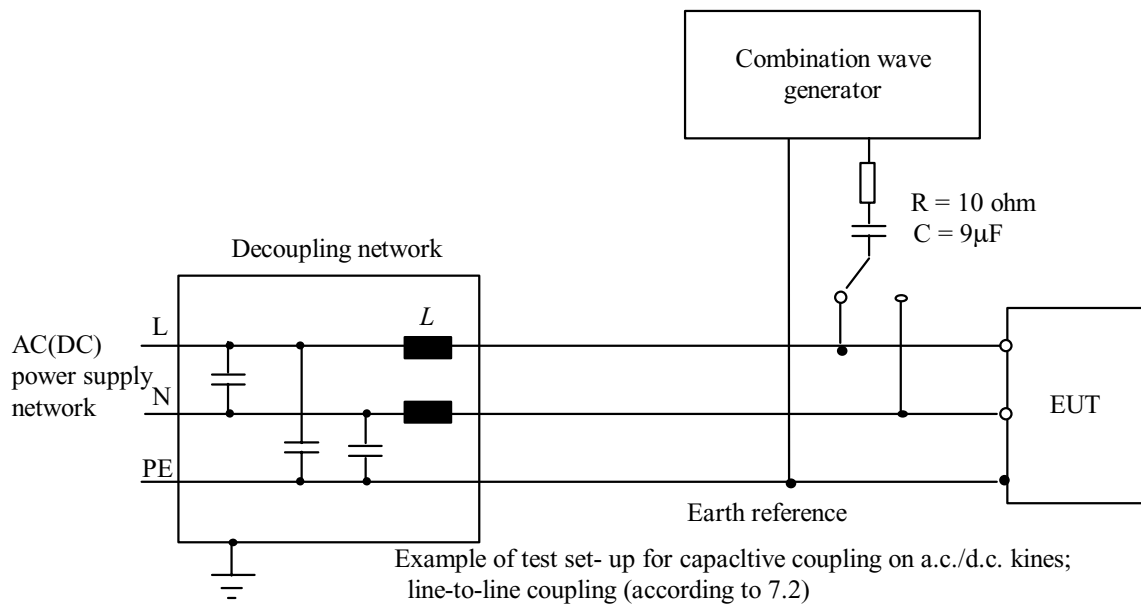
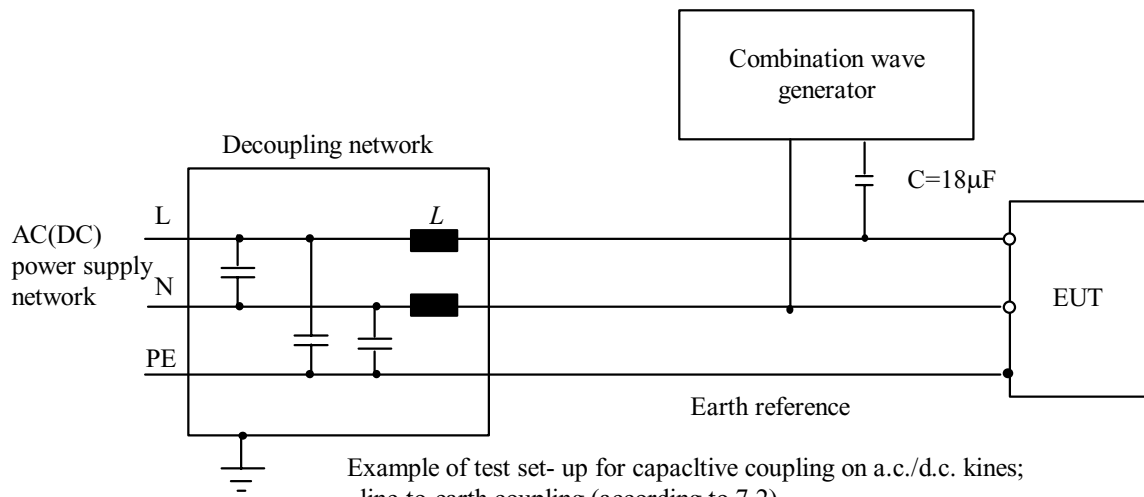
The task of the described laboratory test is to find the reaction of the EUT under specified operational conditions caused by surge voltages from switching and lightning effects at certain threat levels.

The following equipment is part of the test set-up :

- equipment under test (EUT);
- auxiliary equipment (AE);
- cables (of specified type and length);
- coupling device (capacitive or arrestors);
- test generator (combination wave generator, 1.2/50  $\mu$ s generator);
- decoupling network/protection devices;
- additional resistors, 10 ohm and 40 ohm

The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines and to provide sufficient decoupling impedance to the surge wave so that the specified wave may be developed on the lines under test .

## 12.2 Surge Immunity Test Setup



### 12.3 Surge Immunity Test Limits

The preferential range of test levels is given in table 1.

Table 1-Test levels

Level	Open-circuit test voltage $\pm 10\%$ kV
1	0.5
2	1.0
3	2.0
4	4.0
x	Special
NOTE - x is an open class . The level can be specified in the product specification .	

## 12.4 Surge Immunity Test Setup Photo

< FRONT VIEW >







### **13. EN 61000-4-6 Immunity To Conducted Disturbances, Induced By Radio-Frequency Fields**

Test standard	Model No.	Result
EN 61000-4-6	EZ-100PU-C, EZ-100PU-P	A

**The test results shall be classified on the basis of the operating conditions and the functional specifications of the equipment under test , as in the following , unless different specifications are given by product committees or product specifications :**

***Performance Criterion :***

***A) normal performance within the specification limits ;***

***B) temporary degradation or loss of function or performance which is self-recoverable ;***

***C) temporary degradation or loss of function or performance which requires operator intervention or system reset ;***

### **13.1 Immunity To Conducted Disturbances, Induced By Radio-Frequency Fields Description**

The EUT shall be placed on an insulating support, 0.1 m above the ground reference plane. For table-top equipment, the ground reference plane may be placed on a table (see figure) .

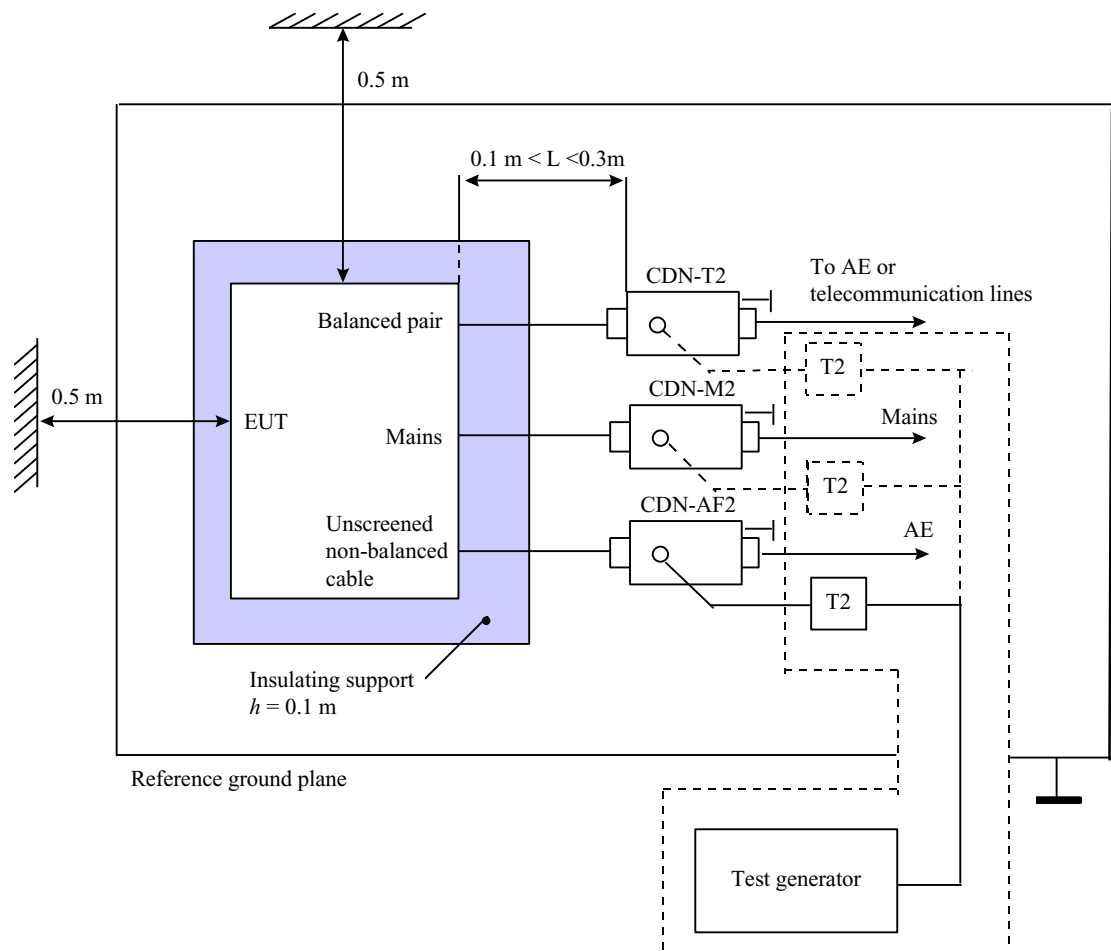
On all cables to be tested, coupling and decoupling devices shall be inserted. The coupling and decoupling devices shall be placed on the ground reference plane, making direct contact with it at about 0.1 m to 0.3 m from the EUT. The cables between the coupling and decoupling devices and the EUT shall be as short as possible and shall not be bundled nor wrapped. height above the ground reference plane shall be between 30 mm and 50 mm.

If the EUT is provided with other earth terminals, they shall, when allowed, be connected to the ground reference plane through the coupling and decoupling network CDN-M1, (i.e. the AE port of the CDN-M1 is then connected to the ground reference).

If the EUT is provided with a keyboard or hand-held accessory, then the artificial hand shall be placed on this keyboard or wrapped around the accessory and connected to the ground reference plane.

Auxiliary equipment (AE) required for the defined operation of the EUT according to the specifications of the product committee, e.g. communication equipment, modem, printer, sensor, etc., as well as auxiliary equipment necessary for ensuring any data transfer and assessment of the functions, shall be connected to the EUT through coupling and decoupling devices. However, as far as possible the number of cables to be tested should be limited by restricting attention to the representative functions.

### 13.2 Immunity To Conducted Disturbances, Induced By Radio-Frequency Fields Setup



NOTE - The EUT clearance from any metallic obstacles shall be at least  $0.5 \text{ m}$ .  
 All non-excited input ports of the CDNs shall be terminated by  $50 \text{ ohm}$  loads.

Example of test set-up with a single-unit system  
 for class II safety equipment (see IEC 536)

### 13.3 Immunity To Conducted Disturbances, Induced By Radio-Frequency Fields Test Limits

No tests are required for induced disturbances caused by electromagnetic fields coming from intentional RF transmitters in the frequency range 9 kHz to 150 kHz,

The open-circuit test levels (e.m.f.) of the unmodulated disturbing signal, expressed in r.m.s., are given in table 1. The test levels are set at the EUT port of the coupling and decoupling devices. For testing of equipment, this signal is 80% amplitude modulated with a 1 kHz sine wave to simulate actual threats.

Table1 – Test levels

Frequency range 150 kHz – 80MHz		
Level	Voltage level (e.m.t.)	
	Uo [dB( $\mu$ V)]	Uo[V]
1	120	1
2	130	3
X <sup>1)</sup>	140	10
	special	
<sup>1)</sup> X is an open level.		

## 13.4 Immunity To Conducted Disturbances, Induced By Radio-Frequency Fields Test Setup Photo

Model No. : EZ-100PU-C

< FRONT VIEW >



**Model No. : EZ-100PU-P**

**< FRONT VIEW >**



### 13.5 Immunity To Conducted Disturbances, Induced By Radio-Frequency Fields Test Data

MODEL NO. :                     EZ-100PU-C, EZ-100PU-P                    

REGULATION : EN 61000-4-6 (1995)

TEST RESULT

Temperature :   24   degree ,                      Relative Humidity :   47   % RH  
 Start :   0.15 MHz   ,              Stop :   80 MHz   ,              Power :   AC 230V    
 Modulation : AM 80 % ,              1kHz.              ON (YES) ,              OFF (    )  
 Output impedance : 50 ohm ,              Source impedance : 150 ohm  
 Performance criterion : A

Test Ports	Frequency(MHz) Range	EUT Condition	1V(rms) Field strength	3V(rms) Field strength
Input / Output a. c. power	0.15 - - - - - 80	NORMAL	/	P
Input / Output d. c.	0.15 - - - - - 80	NORMAL	/	/
Signal lines Control lines	0.15 - - - - - 80	NORMAL	/	/

- Note : 1. " P " mean the EUT function is correct during the test.  
 2. " / " no test.



## 14. EN 61000-4-8 Power Frequency Magnetic Field Immunity Test

Test standard	Model No.	Result
EN 61000-4-8	EZ-100PU-C	A

(A) Test instruments :

- HAEFELY&TRENCH magnetic field tester MAG100.1
- HAEFELY&TRENCH coil with clamp 1m x 1m
- HAEFELY&TRENCH support with castors height 2m

(B) Laboratory reference conditions :

- Temperature : 24°C
- relative humidity : 47 %
- atmospheric pressure : 95 kPa
- electromagnetic : 10 dB below the select test level

(C) Test level : level 1 A/m

**The test results shall be classified on the basis of the operating conditions and the functional specifications of the equipment under test , as in the following , unless different specifications are given by product committees or product specifications :**

***Performance Criterion :***

***A) normal performance within the specification limits ;***

***B) temporary degradation or loss of function or performance which is self-recoverable ;***

***C) temporary degradation or loss of function or performance which requires operator intervention or system reset ;***

## 14.1 Power Frequency Magnetic Field Immunity Test Description

The magnetic fields to which equipment is subjected may influence the reliable operation of equipment and systems.

The following tests are intended to demonstrate the immunity of equipment when subjected to power frequency magnetic fields related to the specific location and installation condition of the equipment (e.g. proximity of equipment to the disturbance source).

The power frequency magnetic field is generated by power frequency current in conductors or, more seldom, from other devices (e.g. leakage of transformers) in the proximity of equipment.

As for the influence of nearby conductors, one should differentiate between:

- the current under normal operating conditions, which produces a steady magnetic field, with a comparatively small magnitude;
- the current under fault conditions which can produce comparatively high magnetic fields but of short duration, until the protection devices operate (a few milliseconds with fuses, a few seconds for protection relays).

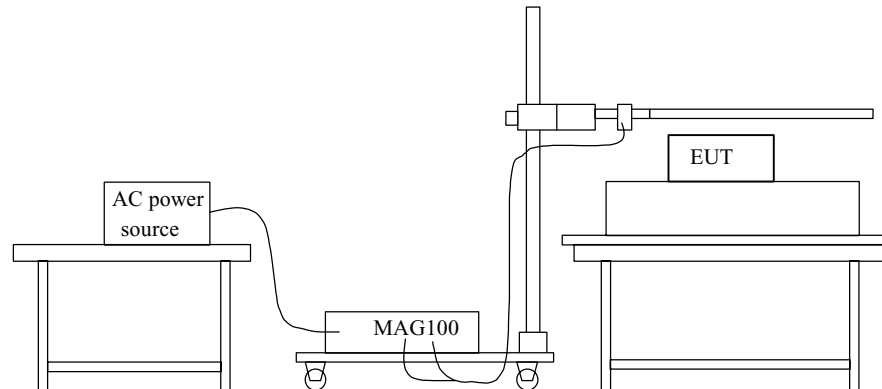
The test with a steady magnetic field may apply to all types of equipment intended for public or industrial low voltage distribution networks or for electrical plants.

The test with short duration magnetic field related to fault conditions, requires test levels that differ from those for steady state conditions; the highest values apply mainly to equipment to be installed in exposed places of electrical plants.

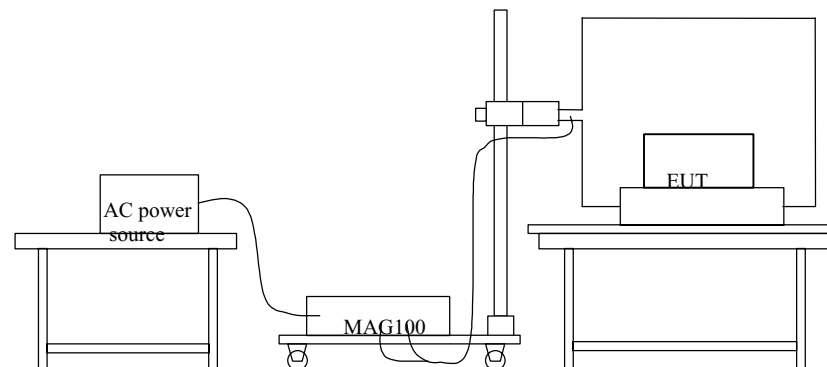
The test field waveform is that of power frequency.

In many cases (household areas, sub-stations and power plant under normal conditions), the magnetic field produced by harmonics is negligible. However, in very special cases like heavy industrial areas (large power converters, etc.) they occur, and will be considered in a future revision of this standard.

## 14.2 Power Frequency Magnetic Field Immunity Test Setup



- Vertical magnetic field drawing



- Horizontal magnetic field drawing

### 14.3 Power Frequency Magnetic Field Immunity Test Limits

Table 1-Test levels for continuous field

Level	Magnetic field strength A/m
1	1
2	3
3	10
4	30
5	100
x <sup>1)</sup>	special

NOTES  
1 – “x” is an open level. This level can be given in the product specification.

Table 2 – Test levels for short duration: 1 s to 3 s

Level	Magnetic field strength A/m
1	n.a. <sup>2)</sup>
2	n.a. <sup>2)</sup>
3	n.a. <sup>2)</sup>
4	300
5	1000
x <sup>1)</sup>	special

NOTES  
1 – “x” is an open level. This level, as well the duration of the test, can be given in the product specification.  
2 – “n.a.” = not applicable

## 14.4 Power Frequency Magnetic Field Immunity Test Setup Photos

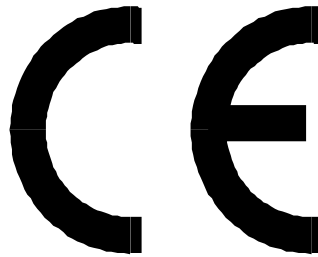
< VERTICAL VIEW >



< HORIZONTAL VIEW >



## 15. Labeling Requirement, WARNING



1. The vertical size is 5mm.
2. The mark will be placed in a visible spot on the outside of the equipment, but in cases where that is impractical, it may be included on the packaging and/or documentation.

ITE is subdivided into two categories denoted class A ITE and class B ITE.

### **Class A ITE**

Class A ITE is a category of all other ITE which satisfies the Class A ITE limits but not the Class B ITE limits. Such equipment should not be restricted in its sale but the following warning shall be included in the instructions for use :

#### **Warning**

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

### **Class B ITE**

Class B ITE is a category of apparatus which satisfies the class B ITE disturbance limits.

Class B ITE is intended primarily for use in the domestic environment and may include:

- equipment with no fixed place of use; for example, portable equipment powered by built-in batteries;
- telecommunication terminal equipment powered by a telecommunication network;
- personal computers and auxiliary connected equipment.

## 16. The List of Test Instruments

Test Mode	Instrument	Model No.	Serial No.	Next Cal. Date	Cal. Interval
<b>Conduction (No.1)</b>	R & S Receiver	ESHS10	830223/008	May 22, 2004	1Year
	Rolf Heine LISN	NNB-4/63TL	98008	May 01, 2004	1Year
	R & S LISN	ESH3-Z5	844982/039	Aug. 07, 2003	1Year
	Spectrum Analyzer	R3261A	91720076	Jun. 09, 2003	1Year
	RF Cable	Rg400	N/A	May 12, 2004	1Year
	Schaffner ISN	T411	N/A	Jun. 30, 2003	1Year
<b>Radiation (OP No.1)</b>	R & S Receiver	ESVS30	863342/012	May 20, 2004	1Year
	Schaffner Pre-amplifier	CPA9232	1028	May 12, 2004	1Year
	COM-Power Horn Ant.	AH-118 (1GHz~18GHz)	10095	May 21, 2004	2Year
	Schwarzbeck Precision Dipole Ant	VHAP (30MHz~1GHz)	970 + 971 953 + 954	Jun. 27, 2003	3Year
	R &S Signal Generator	SMY01	841104/037	Apr. 28, 2004	1Year
	RF Cable	No. 1	N/A	May 11, 2004	1Year
	EMCO Antenna	3142B (26MHz~2GHz)	9904-1370	Aug. 25, 2003	1Year

Test Mode	Test item	Instrument	Model No.	Serial No.	Next Cal. Date	Cal. Interval
EMS (NO.1)	4-2	ESD Test System	ESS-100L (A)TC-815D	4099C01970	July 15, 2003	1Year
	4-3	Comtest G-Strip	G-320	CC112-0008	Oct. 01, 2003	2Year
	4-4	KeyTek EFT Noise Generator	CE-40	9508266	Jan. 27, 2005	2Year
	4-5	HAEFELY Surge Tester	PSURGE 4	083665-17	Dec. 18, 2004	2Year
	4-8	HAEFELY Magnetic Field	MAG 100.1	083858-04	Dec. 26, 2004	2Year
	4-11	HAEFELY Line Interference Tester	PLINE 1610	083732-01	Dec. 19, 2004	2Year
	4-3 4-6	HP Signal Generator	8648A	3619U00426	Sep. 15, 2003	1Year
	3-2 3-3	HP Harmonic/ Flicker Test System	6842A	3531A-00141	Dec. 19, 2004	2Year

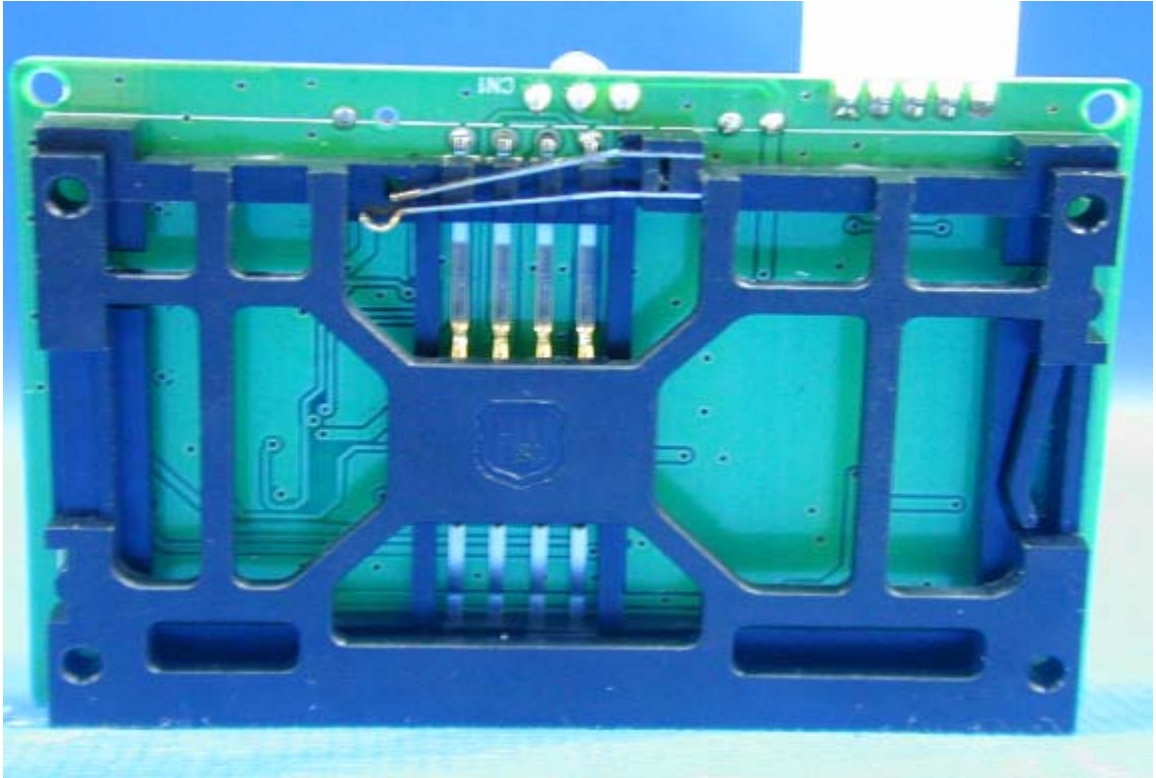


## 17. EUT Photos

MODEL NO. : EZ-100PU-C;









MODEL NO. : EZ-100PU-P;





# VERIFICATION

## of conformity with European EMC Directive

No. E920229

*Document holder:* CASTLES TECHNOLOGY CO., LTD.

*Type of equipment:* Smart Card Reader

*Type designation:* EZ-100PU-C, EZ-100PU-P

A sample of the equipment has been tested for CE-marking according to the EMC Directive, 89/336/EEC. & 92/31/EEC & 93/68/EEC *Standard(s) used for showing compliance with the essential requirements of the directive:*

<i>EMC Standard(s):</i>	<i>Performance Criterion</i>
EN 55022: 1998 + A1: 2000	Class B
EN 61000-3-2: 2000	
EN 61000-3-3: 1995	
EN 55024: 1998 + A1: 2001	
EN 61000-4-2: 1995 + A1: 1998	A
EN 61000-4-3: 1996 + A1: 1998	A
EN 61000-4-4: 1995	B
EN 61000-4-5: 1995	A
EN 61000-4-6: 1996	A
EN 61000-4-8: 1993	A
EN 61000-4-11: 1994	

The referred test report(s) show that the product fulfills the requirements in the EMC Directive for CE marking. On this basis, together with the manufacturer's own documented production control, the manufacturer (or his European authorized representative) can in his EC Declaration of Conformity verify compliance with the EMC Directive.

Signed for and on behalf of  
**PEP Testing Laboratory**



*M. Y. Tsui*

Date: JUN. 03, 2003

M. Y. Tsui / President

# Declaration of Conformity

The following

**Applicant** : **CASTLES TECHNOLOGY CO., LTD.**  
**Equipment** : **Smart Card Reader**  
**Model No.** : **EZ-100PU-C, EZ-100PU-P**  
**Report No.** : **E920229**

is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility(89/336/EEC) and the amendments in the Council Directive 92/31/EEC, 93/68/EEC.

For the evaluation of above mentioned Directives, the following standards were applied:

- 1) EN 55022: 1998+A1 : 2000 Class B
- 2) EN 61000-3-2 : 2000
- 3) EN 61000-3-3 : 1995
- 4) EN 55024 : 1998+A1 : 2001
  - EN 61000-4-2 : 1995+A1: 1998
  - EN 61000-4-3 : 1996+A1: 1998
  - EN 61000-4-4 : 1995
  - EN 61000-4-5 : 1995
  - EN 61000-4-6 : 1996
  - EN 61000-4-8 : 1993
  - EN 61000-4-11 : 1994

The following manufacturer is responsible for this declaration:

CASTLES TECHNOLOGY CO., LTD.  
6F-1, NO. 190, CHUNG-HSIN RD.,  
SEC. 2, HSIN-TIEN, TAIPEI HSIEN,  
TAIWAN, R. O. C.

Taiwan / Jun. 03, 2003

Place and Date

\_\_\_\_\_  
Signature of responsible Person