



**TEST REPORT CONCERNING THE COMPLIANCE  
OF AN INDUCTIVE PROXIMITY CARD READER  
OPERATING ON 125 KHZ,  
BRAND INTEGRATED ENGINEERING,  
MODEL SMARTREADER/125 WITH 47 CFR PART 15  
(2004-10-01).**

FCC listed : 90828  
Industry Canada : IC3501  
VCCI registered : R-1518, C-1598

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Test specification(s): 47 CFR Part 15 (2004-10-01)  
Description of EUT: 125 kHz Inductive Card Reader  
Manufacturer: Integrated Engineering  
Brand mark: Integrated Engineering  
Model: Smartreader/125  
FCC ID: P4E-SMARTPIN-2

## MEASUREMENT/TECHNICAL REPORT

**Integrated Engineering B.V.**

**Model : Smartreader/125**

**FCC ID: P4E-SMARTPIN-2**

January 13, 2006

This report concerns:	Original grant/certification	<del>Class 2 change</del>	Verification
Equipment type:	Inductive proximity card reader		
Deferred grant requested per 47 CFR 0.457(d)(1)(ii) ?	Yes	No	n.a.
Report prepared by:	<p>Name : J. Schuurmans, B.Sc.E.E. Company name : TNO Electronic Products &amp; Services (EPS) B.V. Address : Smidshornerweg 18 Postal code/city : 9822 ZG Niekerk Mailing address : P.O. Box 15 Postal code/city : 9822 TL Niekerk Country : The Netherlands Telephone number : + 31 594 505 005 Telefax number : + 31 594 504 804 E-mail : info@eps.tno.nl</p>		

The data taken for this test and report herein was done in accordance with 47 CFR Part 15 and the measurement procedures of ANSI C63.4-1992. TNO Electronic Products & Services (EPS) B.V. at Niekerk, The Netherlands, certifies that the data is accurate and contains a true representation of the emission profile of the Equipment Under Test (EUT) on the date of the test as noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: January 13, 2006

Signature:

P.A.J.M. Robben, B.Sc.E.E.  
TNO Electronic Products & Services (EPS) B.V.



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### Description of test item

Test item : 125 kHz Inductive Proximity Card Reader  
Manufacturer : Integrated Engineering B.V.  
Brand : Integrated Engineering  
Model : Smartreader/125  
Serial number(s) : 2005.40.005  
Revision : Not applicable  
Receipt date : October 24, 2005

### Applicant information

Applicant's representative : Ir. R. Holslag  
Company : Integrated Engineering B.V.  
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Country : The Netherlands  
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### Test(s) performed

Location : Niekerk  
Test(s) started : September 2, 2005  
Test(s) completed : December 22, 2005  
Purpose of test(s) : Equipment Authorisation (Certification).

Test specification(s) : 47 CFR Part 15 (2004-10-01)

Test engineers : J. Schuurmans, B.Sc.E.E.

Report written by : J. Schuurmans, B.Sc.E.E.

Report date : January 13, 2006

This report is in conformity with NEN-EN-ISO/IEC 17025: 2000.

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The test results relate only to the item(s) tested.



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## 1 General information.

### 1.1 Product description.

#### 1.1.1 Introduction.

The EUT is an inductive proximity card reader intended to be used in access control systems, parking systems and other applications using RF ID readers.

### 1.2 Related submittal(s) and/or Grant(s).

Not applicable.

### 1.3 Tested system details.

Details and an overview of the system and all of its components, as it has been tested, may be found below.

EUT	:	125 kHz Inductive Card Reader
Manufacturer	:	Integrated Engineering
Brand	:	Integrated Engineering
Model	:	Smartreader/125
Serial number	:	2005.40.005
Voltage input rating	:	+5 - +12 VDC
Current input rating	:	700 mAmps
Remarks	:	-
Auxiliary equipment 1	:	AC/DC power adapter
Manufacturer	:	Integrated Engineering.
Brand	:	Integrated Engineering
Model	:	FW7238/05
Serial number	:	n.a.
Voltage input rating	:	100-240 VAC, 50-60 Hz
Current input rating	:	160 mAmps max.
Voltage output rating	:	+5 VDC
Current output rating	:	1.3 Amps
Remarks	:	-
Auxiliary equipment 3	:	Laptop
Manufacturer	:	Dell Computer Corporation
Brand	:	Dell
Model	:	C600
Serial number	:	TW-0791UH-12800-155-4387
Voltage input rating	:	100-240 VAC, 50-60 Hz
Current input rating	:	3.5 Amps max.
Remarks	:	used on control port.



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### 1.3.1 Description of input and output ports.

Number	Ports	From	To	Shielding	Remarks
1	AC mains	AC mains	AE1	yes / no	None
2	DC power input port	AE1	EUT	yes / no	None
3	Serial port	EUT	AE3	yes / no	None

AE = Auxiliary equipment

### 1.4 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (2004-10-01), sections 15.207 and 15.209.

The test methods, which have been used, are based on ANSI C63.4: 2003.

Radiated emission tests above 30 MHz were performed at a measurement distance of 3 meters.

Radiated emission tests below 30 MHz were performed at a measurement distance of 3 meters and 10 meters. To calculate the field strength level from these results to the appropriate distance at which the limit is specified, the calculation in appendix 1 has been applied.

The receivers are switching automatically to the right bandwidth in accordance with CISPR 16. This is implemented in the receiver. The antenna factors are programmed in the test receiver. The receiver automatically calculates the appropriate correction factor for the utilized antenna and also the appropriate antenna factor for the cable loss. The total correction is automatically added to the measured value.

### 1.5 Test facility.

The Federal Communications Commission has reviewed the technical characteristics of the test facilities at TNO Electronic Products & Services (EPS) B.V., located in Niekerk, 9822 TL Smidshornerweg 18, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948, per October 23, 2000.

The description of the test facilities has been filed at the Office of the Federal Communications Commission under registration number 90828. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The list of all public test facilities is available on the Internet at <http://www.fcc.gov>.

### 1.6 Product labeling.

In accordance with 47 CFR Part 15.19 (a)(3) the following text shall be placed on a label, which is attached to the EUT:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

A label, in accordance with 47 CFR Part 15.19 (b)(1)(i), shall be attached to the EUT.

For further details about the labeling requirements (size, legibility, etc.) as set by the Federal Communications Commission see 47 CFR Part 15.19 (a)(3), 47 CFR Part 15.19 (b)(1), 47 CFR Part 15.19 (b)(2) and 47 CFR Part 15.19 (b)(4).



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## 2 System test configuration.

### 2.1 Justification.

The system was configured for testing in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.4: 2003.

### 2.2 EUT mode of operation.

The EUT has been tested in active mode, i.e. the EUT is ready to detect a card. To assess the behaviour of the EUT while reading the card, the EUT is tested with a card presented such that it continuously reads the card, and continuously sends data to the serial port of the EUT, connected to AE3.

The EUT can be integrated in the following housing. The product contains only the EUT and a plastic housing. Refer to external photo's exhibit for explanatory pictures.

Model name	Model Number	Specification
CLASSIC	800-9261	Contains only the EUT but without the keypad
SMARTID	800-8000	Contains only the EUT but without the keypad
SMARTID PIN	800-8001	Contains only the EUT

The intentional radiator tests (15.207, 15.209) have been performed with the EUT which contains a keypad and interconnect (see internal pictures exhibit).

### 2.3 Special accessories.

No special accessories are used and/or needed to achieve compliance with the appropriate sections of 47 CFR Part 15.

### 2.4 Equipment modifications.

No modifications have been made to the equipment in order to achieve compliance with the appropriate sections of 47 CFR Part 15.

### 2.5 Block diagram of the EUT.

The block diagram is available in the technical documentation package which will be submitted to the Commission.

### 2.6 Schematics of the EUT.

The schematics are available in the technical documentation package which will be submitted to the Commission.

### 2.7 Part list of the EUT.

The part list is available in the technical documentation package which will be submitted to the Commission.



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### 3 Radiated emission data.

#### 3.1 Radiated field strength measurements (30 MHz – 1 GHz, H-field).

Frequency (MHz)	Measurement results dB( $\mu$ V)/m @ 3 metres Quasi-peak		Limits dB( $\mu$ V)/m @ 3 metres Quasi-peak	Margin (dB) Quasi-peak		Result
	Vertical	Horizontal		Vertical	Horizontal	
37.56	18.0	12.7	40.0	-22.0	-27.3	PASS
40.00	28.4	12.8	40.0	-11.6	-27.2	PASS
44.75	19.2	9.7	40.0	-20.9	-30.4	PASS
50.00	26.8	8.7	40.0	-13.2	-31.3	PASS
43.18	29.4	17.5	40.0	-10.6	-22.5	PASS
60.00	26.1	7.8	40.0	-13.9	-32.2	PASS
80.00	24.5	16.6	40.0	-15.5	-23.4	PASS
100.00	22.1	17.9	43.5	-21.4	-25.6	PASS
160.00	17.1	16.1	43.5	-26.4	-27.4	PASS
200.00	15.7	17.2	43.5	-27.8	-26.3	PASS
220.00	13.0	18.1	46.0	-33.0	-27.9	PASS
280.00	22.0	21.9	46.0	-24.0	-24.1	PASS
300.00	21.0	22.1	46.0	-25.0	-23.9	PASS
340.00	22.1	21.4	46.0	-23.9	-24.6	PASS
380.00	23.8	21.2	46.0	-22.2	-24.8	PASS

**Table 1: Radiated emissions of the EUT.**

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15, section 15.209, with the EUT tested in active mode and while detecting a card are depicted in table 1.

**Notes:**

1. Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.

Test engineer

signature :

Name : J. Schuurmans

Date : December 19, 2005



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### 3.2 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field).

Frequency (MHz)	Measurement results dB $\mu$ V Quasi-peak		Antenna factor	Cable loss	Measurement results dB( $\mu$ V)/m Quasi-peak (calculated)	Limits Part 15.209 dB( $\mu$ V)/m
	3 meters	10 meters				
0.009 - 0.490	<10.0	n.a.	20.5	1	-	48.5 – 13.8 (300 m)
0.125	58.5	30.7	20.5	1	-26.3	25.7 (300 m)
0.250	< 10.0	n.a.	20.5	1	-	19.6 (300 m)
0.375	< 10.0	n.a.	20.0	1	-	16.1 (300 m)
0.490 - 1.705	<10.0	n.a.	19.5	1	-	33.8 - 22.9 (30 m)
1.705 – 30.0	< 10.0	n.a.	19.5	1	-	29.5 (30 m)

**Table 2 Radiated emissions of the EUT.**

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15, sections 15.205 and 15.209, with the EUT operating in continuous transmit mode on 125 kHz, are depicted in table 2.

**Notes:**

- A example of a calculated measurement result can be found in Appendix 1.
- Frequency range: 9-90 kHz Average detector used during measurements  
110-490 kHz Average detector used during measurements
- n.a. indicates that no field strength values could be measured on the listed frequencies or in the listed frequency range
- Field strength values of radiated emissions at frequencies not listed in table 3 are more than 20 dB below the applicable limit

The EUT was varied in three positions, the loop antenna was varied in two orientations. The reported value is the worst case found at the reported frequency.

The EUT was tested in both normal mode (i.e. without a label in its proximity) and in activated mode (i.e. with a label in its proximity).

Test engineer

Signature

Name : J. Schuurmans

Date : December 19, 2005



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## 4 Conducted emission data.

### 4.1 Conducted emission data of the EUT.

Frequency (MHz)	Measurement results dB(µV) Neutral		Measurement results dB(µV) Line 1		Limits dB(µV)		Margin (dB) Neutral		Margin (dB) Line 1		Result
	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	
0.25	17.7	14.6	14.8	9.6	61.8	51.8	-44.1	-37.2	-47.0	-42.2	PASS
0.38	27.0	26.6	22.1	20.4	58.4	48.4	-31.4	-21.8	-36.3	-28.0	PASS
0.63	26.0	24.6	24.2	23.3	56.0	46.0	-30.0	-21.4	-31.8	-22.7	PASS
0.88	25.1	24.6	24.2	23.5	56.0	46.0	-30.9	-21.4	-31.8	-22.5	PASS
1.13	32.0	30.8	32.1	31.9	56.0	46.0	-24.0	-15.2	-23.9	-14.1	PASS
2.28	34.4	33.9	32.3	31.0	56.0	46.0	-21.6	-12.1	-23.7	-15.0	PASS
3.42	35.0	34.5	32.3	31.0	56.0	46.0	-21.0	-11.5	-23.7	-15.0	PASS
6.69	33.3	30.1	31.9	28.1	60.0	50.0	-26.7	-19.9	-28.1	-21.9	PASS

**Table 3: Conducted emission measurements.**

The results of the conducted emission tests, carried out in accordance with 47 CFR Part 15, section 15.207, at the 110 Volts AC mains connection terminals of the AC/DC power supply which was connected to the EUT, are depicted in table 3. The EUT was tested in both active mode, and while detecting a card.

**Notes:**

1. The conducted emissions on frequencies which are not listed in the table above were found to be below 25 dB $\mu$ V on both line 1 and line 2.

**Test engineer**

Signature :

Name : J. Schuurmans, B.Sc.E.E.

Date : December 13, 2005



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## 5 List of utilized test equipment.

Inventory number	Description	Brand	Model
12476	Antenna mast	EMCO	TR3
12477	Antenna mast 1-4 mtr	Poelstra	--
12491	Measuring receiver	R&S	ESH3
12493	Spectrum monitor ESH3	R&S	EZM
12512	LISN FCC	Emco	3725/2
12605	calibrated dipole 28MHz-1GHz	Emco	3121c
12636	Polyester chamber	Polyforce	--
13313	Pulse limiter	R&S	ESH3-Z2
13886	Open Area testsite	Comtest	--
14051	Anechoic room	Comtest	--
15633	Biconilog Testantenna	Chase	CBL 6111B
15667	Measuring receiver	R&S	ESCS 30
99055	Non-conducting support	NMi	--
99061	Non-conducting support 150cm	NMi	--
99077	Regulating trafo	RFT	LTS006
99112	Tripod	Chase	--



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## Appendix 1

### Calculated measurements results radiated field strength, H-Field

#### General Formula:

$d_1$  = short distance

$d_2$  = long distance

So:  $(d_1/d_2))^n = H_{d2}/H_{d1}$

$$n \log(d_1/d_2) = \log(H_{d2}/H_{d1})$$

#### Measured field strength at 125 kHz:

$H_{3m} = 80.0 \text{ dB}\mu\text{V/m} = 1000 \mu\text{V/m}$

$H_{10m} = 52.2 \text{ dB}\mu\text{V/m} = 407.3 \mu\text{V/m}$

$$n = \log(H_{d2}/H_{d1}) / \log(d_1/d_2)$$

$$n = \log(407.3/10000) / \log(3/10)$$

$$n = 2.65$$

#### Calculated field strength at 125 kHz (10m --> 300m):

$H_{300m} = H_{d2}, H_{10m} = H_{d1}$

$$n \log(d_1/d_2) = \log(H_{d2}/H_{d1}) \Rightarrow H_{d2} = H_{d1} (d_1/d_2)^n$$

$$H_{300} = 0.048 \mu\text{V/m} = -26.3 \text{ dB}\mu\text{V/m}$$