

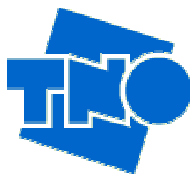


**TESTREPORT CONCERNING THE COMPLIANCE OF
A VOTING MACHINE FOR USE AT ELECTIONS IN
IRELAND, BRAND NEDAP, MODEL P.R.U., IN
ACCORDANCE WITH THE STANDARDS EN 50082-2:
1995 AND EN 55022: 1998 (EMISSION AND IMMUNITY)**

**TNO Electronic Products and Services (EPS) B.V.
P.O. Box 15
9822 ZG Niekerk (NL)
Smidshornerweg 18
9822 TL Niekerk (NL)**

Telephone: +31 594 505005
Telefax: +31 594 504804

E-mail: info@eps.tno.nl



Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

Description of test item





Test item : Voting Machine for use at elections in Ireland
Manufacturer : N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark : NEDAP
Model : P.R.U.
Serial number(s) : --
Receipt number : 1
Receipt date : May 08, 2003

Applicant information

Applicant's representative : Mr. Peter Greene
Company : Department of the Environment and Local Government
Address : Customhouse
Postal code : --
City : Dublin 1
PO-box : --
Postal code : --
City : --
Country : Ireland
Telephone number : + 353 18882483
Telefax number : + 353 18882690
Order number : n.a.

Test performed

Location : Niekerk
Test(s) started : May 08, 2003
Test(s) completed : May 22, 2003
Purpose of test(s) : Compliance with relevant Standards
Test specification(s) : EN 50082-1: 1997, EN 55022: 1998

Test engineer : A.W. Kars 
Projectleader : A.W. Kars 
Report written by : A.W. Kars 
Report approved by : P. de Beer 
Report date : Aug. 06, 2003

This report is in conformity with NEN-EN-ISO/IEC 17025.
This report shall not be reproduced, except in full, without the written permission of TNO Electronic Products and Services (EPS) B.V.
The test results relate only to the item(s) tested.



Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

Table of contents

1	General	4
1.1	Applied standards	4
1.2	Detailed description of test configuration, input and output ports	4
1.2.1	Description of test configuration	4
1.2.2	Description of input and output ports	4
1.3	Test conditions	4
1.3.1	Environmental conditions	4
1.3.2	Operation mode(s)	4
2	Emission	5
2.1	Enclosure	6
2.1.1	Radiated electric field strength measurements	6
2.1.2	Conductive disturbances Power Supply Line	8
3	Immunity	10
3.1	Performance criteria	10
3.1.1	Performance criterion A	10
3.1.2	Performance criterion B	10
3.1.3	Performance criterion C	10
3.1.4	Performance criterion D	10
3.2	Enclosure port	11
3.2.1	Radio-frequency electromagnetic field. Amplitude modulated	11
3.2.2	Electrostatic discharge	12
3.3	DC input and DC output ports	13
3.3.1	Radio-frequency (common mode). Amplitude modulated	13
3.3.2	Surges	14
3.3.3	Fast transients (common mode)	15
3.4	AC input and AC output power ports	16
3.4.1	Radio-frequency (common mode). Amplitude modulated	16
3.4.2	Surges	17
3.4.3	Fast transients (common mode)	18
4	Conclusion	19



Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

1 General.

1.1 Applied standards.

The Voting Machine for use at elections in Ireland, brand NEDAP, type P.R.U., has been tested for emission and immunity in accordance with the standards EN 50082-1: 1997 and EN 55022: 1998.

1.2 Detailed description of test configuration, input and output ports.

The Voting Machine for use at elections in Ireland, brand NEDAP, type P.R.U., in the configuration as described below, will be referred to as EUT for the purpose of this testreport.

1.2.1 Description of test configuration.

Test item : Voting Machine for use at elections in Ireland
Manufacturer : N.V. Nederlandsche Apparatenfabriek NEDAP
Brand : NEDAP
Type : P.R.U.
Serial number : --
Voltage input rating : 230 V AC
Remarks : --

1.2.2 Description of input and output ports.

Number	Terminal	From	To	Remarks
1	Mains power supply	Mains terminal	EUT	None
2	Polling Staff control unit	Polling Staff Control box	EUT	< 2 m

Table 1

1.3 Test conditions.

1.3.1 Environmental conditions.

During all tests the environmental conditions were the following:

- Temperature : 20 - 22 °C
- Relative humidity : 37 - 58 %

1.3.2 Operation mode(s).

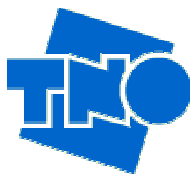
During testing the following operation mode has been applied:



Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

2 Emission.

The EUT has been tested in conformity with the standard EN 55022: 1998 (conducted and radiated fieldstrength measurements concerning the emission of radiated and conducted electromagnetic disturbances).



Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --


2.1 Enclosure.

2.1.1 Radiated electric fieldstrength measurements.

The radiated field strength levels (electric component) have been measured in conformity with- and according to the criteria as stated below. Maximum levels recorded

Basic standard : EN 55022, CISPR 16
Test set-up : EN 55022, CISPR 16
Measuring distance : 10 metres
Frequency range 1 : 30 MHz - 230 MHz
Limits : 30 dB(μ V/m)
Frequency range 2 : 230 MHz - 1000 MHz
Limits : 37 dB(μ V/m)

Detailed results of the measurements concerning radiated field strength levels (electric component), emitted by the EUT, are depicted in table 1 on the next page of this testreport.

Result of the measurements concerning radiated electromagnetic fields (electric component) emitted by the EUT (enclosure)	PASS / FAIL / NOT APPLICABLE
Name of test engineer:	A.W. Kars
Signature:	
Date:	May 28, 2003
REMARKS:	NONE

Utilized test equipment:

Inventory number	Description	Brand	Type
12636	Plastic measurement room	Polyforce	-
13886	Open Area Test Site	Comtest	-
14277	Antennamast 4m	Heinrich Deisel	MA240
14278	Controller OATS	Heinrich Deisel	HD100
15633	Biconilog antenna 30MHz – 1000MHz	Chase	CBL6111B
15667	EMI test receiver	Rohde & Schwarz	ESCS 30
99108	Turntable OATS	Heinrich Deisel	HD050

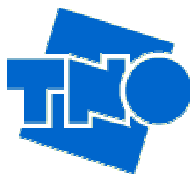


Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

Frequency (MHz)	Measurement results dB(μ V)/m @ 10 metres Quasi-peak		Limits dB(μ V)/m @ 10 metres Quasi-peak	Result
	Vertical	Horizontal		
30.0 – 230.0	< 15.0	< 15.0	30.0	PASS
230.0 – 1000.0	< 15.0	< 15.0	37.0	PASS

Table 1

The results of the measurements, carried out in conformity with the standard EN 55022:1998, concerning radiated field strength levels (electric component), emitted by the EUT in the configuration and operation mode(s) as stated in this testreport, are depicted in table 2.




Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

2.1.2 Conductive disturbances Power Supply Line.

The disturbance voltage levels at the power supply lines of the EUT's power supply to be measured in conformity with- and according to the criteria as stated below.

Basic standard	:	EN 55022 and CISPR 16
Test set-up	:	EN 55022 and CISPR 16
Frequency range 1	:	0.15 MHz – 0.5 MHz
Limit	:	66.0 – 56.0 dB(μV) quasi peak, 56.0 - 46.0 dB(μV) average
Frequency range 2	:	0.5 – 5.0 MHz
Limit	:	56.0 dB(μV) quasi peak, 46.0 dB(μV) average
Frequency range 2	:	5.0 - 30 MHz
Limit	:	60.0 dB(μV) quasi peak, 50.0 dB(μV) average

Detailed results of the measurements concerning conducted disturbances, emitted by the EUT, are depicted in table 2 and 3 on the next page of this testreport.

Result of the measurements concerning the emission of disturbance voltage levels at the ab in/output ports of the EUT	PASS / FAIL / NOT APPLICABLE
Name of test engineer:	A.W. Kars
Signature:	
Date:	May 28, 2003
REMARKS:	NONE

Utilized test equipment:

Inventory number	Description	Brand	Type
12507	Artificial mains network 3-phase	Rohde & Schwarz	ESH2-Z5
13313	Impulse limiter	Rohde & Schwarz	ESH3Z2.357...
15667	EMI test receiver	Rohde & Schwarz	ESCS 30



Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

Frequency (MHz)	Measured values Quasi Peak		Limits
	Line (dBµV)	Neutral (dBµV)	Quasi Peak (dBµV)
0.161	28.3	26.6	65.0
0.195	25.2	25.2	64.0
0.195 – 3.76	< 20.0	< 20.0	64.0 – 57.0
3.76	26.9	27.0	57.0
7.17	32.0	33.0	60.0
12.00	40.4	41.0	60.0

Table 2

The results of the disturbance voltage level measurements, carried out in conformity with the standards EN 55022: 1998, at the mains power supply line of the EUT, in the configuration and operation mode(s) as stated in this testreport, are depicted in table 2.

Frequency (MHz)	Measured values Average		Limits
	Line (dBµV)	Neutral (dBµV)	Quasi Peak (dBµV)
0.161	21.6	19.4	55.0
0.195	23.0	23.3	54.0
0.195 – 3.76	< 10.0	< 10.0	54.0 – 47.0
3.76	27.1	27.3	47.0
7.17	28.9	30.1	50.0
12.00	40.6	41.2	50.0

Table 3

The results of the disturbance voltage level measurements, carried out in conformity with the standards EN 55022: 1998, at the mains power supply line of the EUT, in the configuration and operation mode(s) as stated in this testreport, are depicted in table 3.



Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

3 Immunity.

The EUT has been tested in conformity with the immunity standards EN 50082-1: 1997 concerning the susceptibility to continuous and transient, conducted and radiated disturbances including electrostatic discharges.

3.1 Performance criteria.

The general principles (performance criteria) for the evaluation of the immunity test results are the following.

3.1.1 Performance criterion A.

During testing, normal performance within the specification limits

3.1.2 Performance criterion B.

During testing, temporary degradation, or loss of function or performance which is self recovering

3.1.3 Performance criterion C

During testing, temporary degradation, or loss of function or performance which requires operator intervention or system reset occurs

3.1.4 Performance criterion D

Degradation or loss of function which is not recoverable due to damage to equipment, components, software, or to loss of data

For performance criteria B and C, the EUT has passed the tests if it has shown its specified immunity throughout the period of application of the test signal and, at the end of the tests, the EUT fulfils the functional requirements established in the technical product specification. The performance. criteria D is normally not acceptable.

Because it is not possible to state only one performance criteria for each phenomenon, the following guidance is given:

- check the function normally fulfilled by certain equipment;
- the function of the device in relation to the phenomenon determines the performance criteria.




Description of EUT: Voting Machine for use at elections in Ireland
 Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
 Brand mark: NEDAP
 Model: P.R.U.
 Serial number(s): --

3.2 Enclosure port.

3.2.1 Radio-frequency electromagnetic field. Amplitude modulated

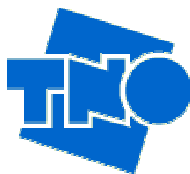
The susceptibility of the EUT to radio-frequency electromagnetic fields has been tested in conformity with-and according to the criteria as stated below.

Basic standard : IEC 61000-4-3
 Test set-up : IEC 61000-4-3
 Frequency range : 80 MHz - 1000 MHz
 Field strength level : 3 V_{rms}/m (selected without modulation, applied with modulation)
 Modulation : 1 kHz, modulation depth 80%
 Performance criterion : A

Result of the tests concerning the susceptibility of the EUT to radio-frequency electromagnetic fields (amplitude modulated, enclosure port)	PASS / FAIL / NOT APPLICABLE
Name of test engineer:	A.W. Kars
Signature:	
Date:	May 28, 2003
REMARKS:	
NONE	

Utilized test equipment:

Inventory number	Description	Brand	Type
12441	Tripod	EMCO	TR3
12520	Function generator	Tabor Electronics	8241
14051	Compact anechoic room	Euroshield/ Comtest	RFSD-F-100
14298	Amplifier 0.01 MHz-220 MHz	SPS/Comtech	SPS7010
14307	Amplifier 200 MHz-1000 MHz	SPS/Comtech	SPS8030
14351	Biconilog antenna 20 MHz-1100 MHz	EMCO	3143
15392	Signalgenerator 0.1 MHz-2048 MHz	Rohde & Schwarz	SMY02
99107	Turntable anechoic room + controller	Heinrich Deisel	HD050




Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

3.2.2 Electrostatic discharge.

The susceptibility of the EUT to electrostatic discharges has been tested in conformity with- and according to the criteria as stated below.

Basic standard : IEC 61000-4-2
Test set-up : IEC 61000-4-2
Test levels : ± 4 kV, ± 8 kV and 16 kV air discharge
 ± 2 kV, ± 4 kV, ± 6 kV and ± 8 kV contact discharge
Performance criterion : B

Result of the tests concerning the susceptibility of the EUT to electrostatic discharges (enclosure port)	PASS / FAIL / NOT APPLICABLE
Name of test engineer:	A.W. Kars
Signature:	
Date:	May 28, 2003
REMARKS:	None

Utilized test equipment:

Inventory number	Description	Brand	Type
99002	ESD simulator system	Schaffner	NSG 435-01



Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --


3.3 DC input and DC output ports.

3.3.1 Radio-frequency (common mode). Amplitude modulated.

The susceptibility of the EUT to radio-frequency (common mode)¹⁾, amplitude modulated, to be tested in conformity with- and according to the criteria as stated below.

Basic standard : IEC 61000-4-6
Test set-up : IEC 61000-4-6
Frequency range : 0.15 MHz - 80 MHz
Test level : 3 V_{rms} (selected without modulation, applied with modulation)
Modulation : 1 kHz, modulation depth 80%
Source impedance : 150 Ohms
Performance criterion : not applicable

Note¹⁾ : Conducted only on ports interfacing with cables whose total length, according to the manufacturer's functional specification, may exceed 3 metres

Result of the tests concerning the susceptibility of the EUT to radio-frequency (common mode, amplitude modulated, DC input and DC output ports)	PASS/ FAIL/ NOT TESTED
Name of test engineer:	A.W. Kars
Signature:	
Date:	May 28, 2003
REMARKS:	NONE




Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

3.3.2 Surges.

The susceptibility of the EUT to surges¹⁾ to be tested in conformity with- and according to the criteria as stated below.

Basic standard : IEC 61000-4-5
Test set-up : IEC 61000-4-5
Test level 1 : ± 0.5 kV, ± 1.0 kV and ± 2.0 kV (line to earth)
Test level 2 : ± 0.5 kV and ± 1.0 kV (line to line)
Tr/Th : 1.2/50 (8/20) μ s
Number of pulses : 5
Performance criterion : not applicable

Note¹⁾ : Applicable only to input ports

Result of the tests concerning the susceptibility of the EUT to surges (DC input and DC output power ports)	PASS / FAIL / NOT TESTED
Name of test engineer:	A.W. Kars
Signature:	
Date:	May 28, 2003
REMARKS:	
NONE	




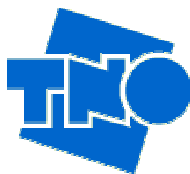
Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

3.3.3 Fast transients (common mode).

The susceptibility of the EUT to fast transients (common mode) to be tested in conformity with-and according to the criteria as stated below.

Basic standard : IEC 61000-4-4
Test set-up : IEC 61000-4-4
Test level : ± 1 kV and ± 2 kV
Tr/Th : 5/50 ns
Repetition frequency : 5 kHz
Performance criterion : not applicable

Result of the tests concerning the susceptibility of the EUT to fast transients (common mode, DC input and DC output power ports)	PASS / FAIL / NOT TESTED
Name of test engineer:	A.W. Kars
Signature:	
Date:	May 28, 2003
REMARKS:	NONE




Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

3.4 AC input and AC output power ports.

3.4.1 Radio-frequency (common mode). Amplitude modulated.

The susceptibility of the EUT to radio-frequency (common mode), amplitude modulated, has been tested in conformity with and according to the criteria as stated below.

Basic standard : IEC 61000-4-6
 Test set-up : IEC 61000-4-6
 Frequency range : 0.15 MHz - 80 MHz
 Test level : 3 V_{rms} (selected without modulation, applied with modulation)
 Modulation : 1 kHz, modulation depth 80%
 Source impedance : 150 Ohms
 Performance criterion : A

Result of the tests concerning the susceptibility of the EUT to radio-frequency (common mode, amplitude modulated, AC input and AC output power ports)	PASS / FAIL / NOT APPLICABLE
Name of test engineer:	A.W. Kars
Signature:	
Date:	May 28, 2003
REMARKS:	
NONE	

Utilized test equipment:

Inventory number	Description	Brand	Type
12527	Signal generator 0.1 MHz-1000 MHz	Rohde & Schwarz	SMG
14298	Amplifier 0.01 MHz-220 MHz	SPS/Comtech	SPS7010
14307	Amplifier 200 MHz-1000 MHz	SPS/Comtech	SPS8030
39420	RF current injection clamp	Lüthi	EM101
59601/x	CDN coupling devices	Air Parts	Mx
99039	Attenuator 25W/6 dB, DC-8 GHz	Lucas Weinschel	33-6-34




Description of EUT: Voting Machine for use at elections in Ireland
 Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
 Brand mark: NEDAP
 Model: P.R.U.
 Serial number(s): --

3.4.2 Surges.

The susceptibility of the EUT to surges¹⁾ has been tested in conformity with- and according to the criteria as stated below.

Basic standard : IEC 61000-4-5
 Test set-up : IEC 61000-4-5
 Test level 1 : ±1 kV, ±2.0 kV and ±4.0 kV (line to earth)
 Test level 2 : ±1 kV and ±2.0 kV (line to line)
 Tr/Th : 1.2/50 (8/20) µs
 Number of pulses : 5
 Performance criterion : B

Note¹⁾ : Applicable only to input ports

Result of the tests concerning the susceptibility of the EUT to surges (AC input and AC output power ports)	PASS / FAIL / NOT APPLICABLE
Name of test engineer:	A.W. Kars
Signature:	
Date:	May 28, 2003
REMARKS: NONE	

Utilized test equipment:

Inventory number	Description	Brand	Type
15108	Surge simulator syst. mainframe 25A	Schaffner	NSG 2050
15111	Pulse network 1.2/50 µs 6.6 kV 3.3 kA	Schaffner	PNW 2050
99004	3-phase coupling network 25A	Schaffner	CDN 133
99006	1-phase Schuko coupling adapter 16A	Schaffner	INA 252
99008	Blind cover	Schaffner	-
99010	3-phase IEC 309 coupling adapter 32A	Schaffner	INA 250
99029	Software control package	Schaffner	WIN 2050




Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

3.4.3 Fast transients (common mode).

The susceptibility of the EUT to fast transients (common mode) has been tested in conformity with- and according to the criteria as stated below.

Basic standard : IEC 61000-4-4
 Test set-up : IEC 61000-4-4
 Test level : ± 1 kV and ± 2 kV
 Tr/Th : 5/50 ns
 Repetition frequency : 5 kHz
 Performance criterion : B

Result of the tests concerning the susceptibility of the EUT to fast transients (common mode, AC input and AC output power ports)	PASS / FAIL / NOT APPLICABLE
Name of test engineer:	A.W. Kars
Signature:	
Date:	May 28, 2003
REMARKS:	
NONE	

Utilized test equipment:

Inventory number	Description	Brand	Type
15110	Three phase burst simulator system	Schaffner	NSG 2025-4
99001	IEC 1000-4-4 capacitive coupling clamp	Schaffner	CDN 126
99005	3-phase IEC 309 coupling adapter 32A	Schaffner	INA 250
99006	1-phase Schuko coupling adapter 16A	Schaffner	INA 252
99007	Blind cover	Schaffner	-
99014	Attenuator 30 dB for burst verification	Schaffner	INA 265
99015	Software control package	Schaffner	WIN 2025



Description of EUT: Voting Machine for use at elections in Ireland
Manufacturer: N.V. Nederlandsche Apparatenfabriek NEDAP
Brand mark: NEDAP
Model: P.R.U.
Serial number(s): --

4 Conclusion.

The Voting Machine for use at elections in Ireland, brand NEDAP, type P.R.U., complies with the requirements of the standards EN 50082-1: 1997 and EN 55022: 1998 in the configuration and operation mode(s) as stated in this testreport.