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EMC TEST REPORT – 393950-2TRFEMC

Applicant:
Nanoptix

Product:
Thermal Printer

Models:
Orizon NextGen: 950054
Presenter: 920800

Specification:
EN 55035:2017

Date of issue: October 29, 2020

Daniel Hynes, EMC/RF Lab Manager	
Tested by	Signature
Yong Huang, EMC/RF Specialist	
Tested by	Signature
David Duchesne, EMC/RF Lab Manager	
Reviewed by	Signature

Lab and test locations

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Website	www.nemko.com			

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contained in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Copyright notification

Table of Contents

Section 1 Report summary

1.1 Test specifications

EN 55035:2017	Electromagnetic compatibility of multimedia equipment Immunity requirements

1.2 Exclusions

None

1.3 Statement of compliance

In the configuration tested, the EUT was found compliant.

Unless noted in section 1.2, all testing was performed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.4 Test report revision history

Table 1.4-1: *Test report revision history*

Revision #	Date of issue	Details of changes made to test report
TRF	October 29, 2020	Original report issued

Section 2 Engineering considerations

2.1 Modifications incorporated in the EUT for compliance

There were no modifications performed to the EUT during this assessment.

2.2 Technical judgment

The printer is available with, or without, the presenter option. Testing has been performed on the printer and presenter combined into a single system as the worst-case configuration.

2.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 3 Test conditions

3.1 Atmospheric conditions

Temperature	15 °C – 35 °C
Relative humidity	30 % – 60 %
Air pressure	86 kPa (860 mbar) – 106 kPa (1060 mbar)

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

3.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 4 Measurement uncertainty

4.1 Uncertainty of measurement

Nemko Canada Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 “Uncertainty in EMC measurements.” Measurement uncertainty was calculated using the methods described in CISPR 16-4-2 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Measurement instrumentation uncertainty. The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

Section 5 Information provided by the applicant

5.1 Disclaimer

This section contains information provided by the applicant and has been utilized to support the test plan. Inaccurate information provided by the applicant can affect the validity of the results contained within this test report. Nemko accepts no responsibility for the information contained within this section and the impact it may have on the test plan and resulting measurements.

5.2 Applicant/Manufacture

Applicant name	Nanoptix Inc.
Applicant address	699 Champlain Street, Dieppe, NB, E1A 1P6
Manufacture name	Same as applicant
Manufacture address	Same as applicant

5.3 EUT information

Product	Thermal Printer
Model	Orizon NextGen: 950054 Presenter: 920800
Serial number	ON00052
Part number	Orizon NextGen: 950054 Presenter: 920800
Power requirements	24 V_{DC} (via external 100–240 V_{AC}, 50/60 Hz power adapter)
Description/theory of operation	The EUT is a thermal printer. This printer can be used is a ticket dispensing terminal to print tickets or receipts. It can receive print jobs from either USB full speed or RS-232.
Operational frequencies	Orizon NextGen (950054): Operational frequencies: 1 GHz internal processor, 400 MHz for memory access Crystal is 24 MHz and then boosted inside the processor. Presenter (920800) The Presenter is running a 16 MHz MSP430 microcontroller (no crystal, just an internal oscillator).
Software details	Orizon NextGen firmware is ONG-2.11B. PC software to send print jobs to the printer for testing is "Nanoptix Printer Status", revision 5.4.1.9.

5.4 EUT setup details

5.4.1 EUT Exercise and monitoring

Methods used to exercise the EUT and all relevant ports:

- A print ticket job can be sent to the printer every 10 seconds using the "Nanoptix Printer Status" application on the host PC.

Configuration details:

- The EUT setup in a configuration that was expected to produce the highest amplitude emissions relative to the limit and that satisfy normal operation/installation practice by the end user.
- The type and construction of cables used in the measurement set-up were consistent with normal or typical use. Cables with mitigation features (for example, screening, tighter/more twists per length, ferrite beads) have been noted below:
  - None
- The EUT was setup in a manner that was consistent with its typical arrangement and use. The measurement arrangement of the EUT, local AE and associated cabling was representative of normal practice. Any deviations from typical arrangements have been noted below:
  - None

Monitoring details:

- The printer prints a ticket every 10 seconds. If an error is detected by the printer, it will sound a buzzer.

5.4.2 EUT test configuration

Table 5.4-1: *EUT sub assemblies*

Description	Brand name	Serial number, Part number, Model, Revision level
Thermal Printer with Presenter	Nanoptix	SN: ON00052, PN: 950054/920800, MN: 950054/920800
Switching Power Adapter	FSP Group Inc.	SN: H0241003379, PN: 9NA0605220, MN: FSP060-RTAAN2

Table 5.4-2: *EUT interface ports*

Description	Qty.
24 VDC Input	1
HDMI	1
Ethernet	1
USB (Maintenance)	2
Mini-USB	1
RS-232	1

Table 5.4-3: *Support equipment*

Description	Brand name	Serial number, Part number, Model, Revision level
Laptop Computer	Dell	FA002700

Table 5.4-4: *Inter-connection cables*

Cable description	From	To	Length (m)
2 conductor DC power cable	24 VDC Input	Switching Power Adapter	2
6 conductor, custom DIN to DB9, RS232 cable + DB9 to DB9, RS232 cable, male to female + RS232 to USB adapter	RS-232	Laptop Computer	5
Standard HDMI cable	HDMI	Not terminated	5
Mini USB to USB + USB extension	Mini-USB	Laptop Computer	7
RJ45 to RJ45 network cable, STP	Ethernet	Laptop Computer	5

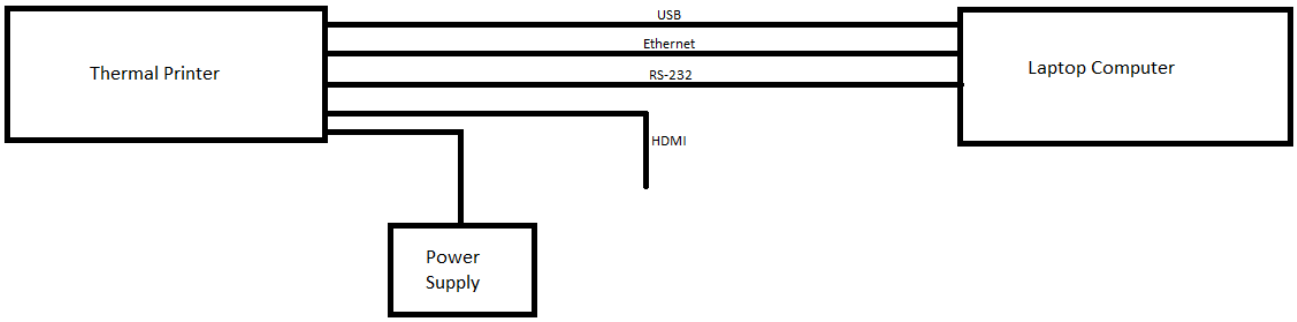

Figure 5.4-1: *block diagram*

Section 6 Summary of test results

6.1 Testing location

Test location (s)	Montreal

6.2 Testing period

Test start date	October 26, 2020	Test end date	October 27, 2020

6.3 Sample information

Receipt date	October 22, 2020	Nemko sample ID number	Item # 1

6.4 Test results

Table 6.4-1: *Result summary*

Test description	Verdict
Enclosure ports	
Power frequency magnetic field	Not applicable
Continuous RF electromagnetic field disturbances, swept test	Pass
Continuous RF electromagnetic field disturbances, spot test	Pass
ESD	Pass
Analogue/digital data ports	
Continuous induced RF disturbances	Pass
Broadband impulse noise disturbances, repetitive	Not applicable
Broadband impulse noise disturbances, isolated	Not applicable
Surges	Not applicable
Electrical fast transients/burst	Pass
DC network power ports	
Continuous induced RF disturbances	Not applicable
Surges	Not applicable
Electrical fast transients/burst	Not applicable
AC mains power ports	
Continuous induced RF disturbances	Pass
Voltage dips	Pass
Voltage interruptions	Pass
Surges	Pass
Electrical fast transients/burst	Pass

Notes: None

Section 7 Terms and definitions

7.1 Performance terms and definitions

General performance criteria, Reference Clause 8.1 of EN 55035:2017	General performance criteria are defined in 8.2, 8.3 and 8.4. These criteria shall be used during the testing of primary functions where no relevant annex is applicable. When assessing the impact of a disturbance on a function, the assessment should take into consideration the function's performance prior to the application of the disturbance and only identify as failures those changes in performance that are a result of the disturbance.
Performance criterion A, Reference Clause 8.2 of EN 55035:2017	The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Performance criterion B, Reference Clause 8.3 of EN 55035:2017	During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test. After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Performance criterion C, Reference Clause 8.4 of EN 55035:2017	Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

7.2 General definitions

7.2.1 EN 61000-4-2 (Electrostatic discharge)

Electrostatic discharge; ESD	A transfer of electric charge between bodies of different electrostatic potential in proximity or through direct contact.
Contact discharge method	A method of testing, in which the electrode of the test generator is held in contact with the EUT, and the discharge actuated by the discharge switch within the generator.
Air discharge method	A method of testing, in which the charged electrode of the test generator is brought close to the EUT, and the discharge actuated by a spark to the EUT.
Direct application	Application of the discharge directly to the EUT.
Indirect application	Application of the discharge to a coupling plane in the vicinity of the EUT, and simulation of personnel discharge to objects, which are adjacent to the EUT.
Coupling plane	A metal sheet or plate, to which discharges are applied to simulate electrostatic discharge to objects adjacent to the EUT. HCP: Horizontal Coupling Plane; VCP: Vertical Coupling Plane.

7.2.2 EN 61000-4-3: (Radiated, radio-frequency, electromagnetic field)

Continuous waves (CW)	Electromagnetic waves, the successive oscillations of which are identical under steady-state conditions, which can be interrupted or modulated to convey information.
Electromagnetic (EM) wave	Radiant energy produced by the oscillation of an electric charge characterized by oscillation of the electric and magnetic fields.
Field strength	The term “field strength” is applied only to measurements made in the far field. The measurement may be of either the electric or the magnetic component of the field and may be expressed as V/m, A/m or W/m2; any one of these may be converted into the others.
Sweep	Continuous or incremental traverse over a range of frequencies.

7.2.3 EN 61000-4-4 (Electrical fast transient/burst)

Burst	Sequence of a limited number of distinct pulses or an oscillation of limited duration.
Common mode (coupling)	Simultaneous coupling to all lines versus the ground reference plane.
Ground reference plane	Flat conductive surface whose potential is used as a common reference.
Coupling clamp	Device of defined dimensions and characteristics for common mode coupling of the disturbance signal to the circuit under test without any galvanic connection to it.
Transient	Pertaining to or designating a phenomenon or a quantity which varies between two consecutive steady states during a time interval which is short compared with the time-scale of interest.

General definitions, continued

7.2.4 EN 61000-4-5 (Surge)

Surge	Transient wave of electrical current, voltage, or power propagating along a line or a circuit and characterized by a rapid increase followed by a slower decrease.
Ground (reference)	Part of the Earth considered as conductive, the electrical potential of which is conventionally taken as zero, being outside the zone of influence of any earthing (grounding) arrangement.

7.2.5 EN 61000-4-6 (Immunity to conducted disturbances, induced by radio-frequency fields)

Clamp injection	Clamp injection is obtained by means of a clamp-on “current” injecting device on the cable.
Coupling/decoupling network CDN	Electrical circuit incorporating the functions of both the coupling and decoupling networks.
Sweep	Continuous or incremental traverse over a range of frequencies.

7.2.6 EN 61000-4-8 (Power frequency magnetic field)

Induction coil	Conductor loop of defined shape and dimensions, in which flows a current, generating a magnetic field of defined constancy in its plane and in the enclosed volume.
Immersion method	Method of application of the magnetic field to the EUT, which is placed in the centre of an induction coil.
Proximity method	Method of application of the magnetic field to the EUT, where a small induction coil is moved along the side of the EUT in order to detect particularly sensitive areas.
Ground	A flat conductive surface whose potential is used as a common reference for the magnetic field generator and the auxiliary equipment (the ground plane can be used to close the loop of the induction coil.

7.2.7 EN 61000-4-11 (Voltage dips, short interruptions and voltage variations)

Voltage dip	A sudden reduction of the voltage at a particular point of an electricity supply system below a specified dip threshold followed by its recovery after a brief interval.
Short interruption	A sudden reduction of the voltage on all phases at a particular point of an electric supply system below a specified interruption threshold followed by its restoration after a brief interval.

Section 8 Testing data

8.1 ESD

8.1.1 References and limits

- EN 55035:2017
- EN 61000-4-2:2009

Table 8.1-1: *ESD specification*

Test specification	Performance criterion
4 (Contact discharge), 8 (Air discharge)	B

Notes: Electrostatic discharges shall be applied only to points and surfaces of the EUT which are expected to be touched during normal operation, including user access operations specified in the user manual, for example cleaning or adding consumables when the EUT is powered. The application of discharges to the contacts of open connectors is not required.

8.1.2 Test summary

Verdict	Pass		
Tested by	Yong Huang	Test date	October 27, 2020

8.1.3 Notes

None

8.1.4 Setup details

Table 8.1-2: *ESD equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
ESD gun	EMC-Partner	ESD3000	FA002712	1 year	March 11, 2021

Notes: None

8.1.5 Test data

Table 8.1-3: *ESD results*

EUT setup configuration	Table top	
EUT power input during test	230 V_{AC}, 50 Hz	
ESD repetition rate	1 pulse per second	
Discharges	10 contact discharges and 10 air discharges at each polarity	
Contact discharge	**Test voltage (±kV)**	**Comments**
Please refer to "ESD test location points" photos of this section	4	No degradation
Indirect discharge	**Test voltage (±kV)**	**Comments**
HCP (all sides)	4	No degradation
VCP (all sides)	4	No degradation
Air discharge	**Test voltage (±kV)**	**Comments**
Please refer to "ESD test location points" photos of this section	2, 4, 8	No degradation

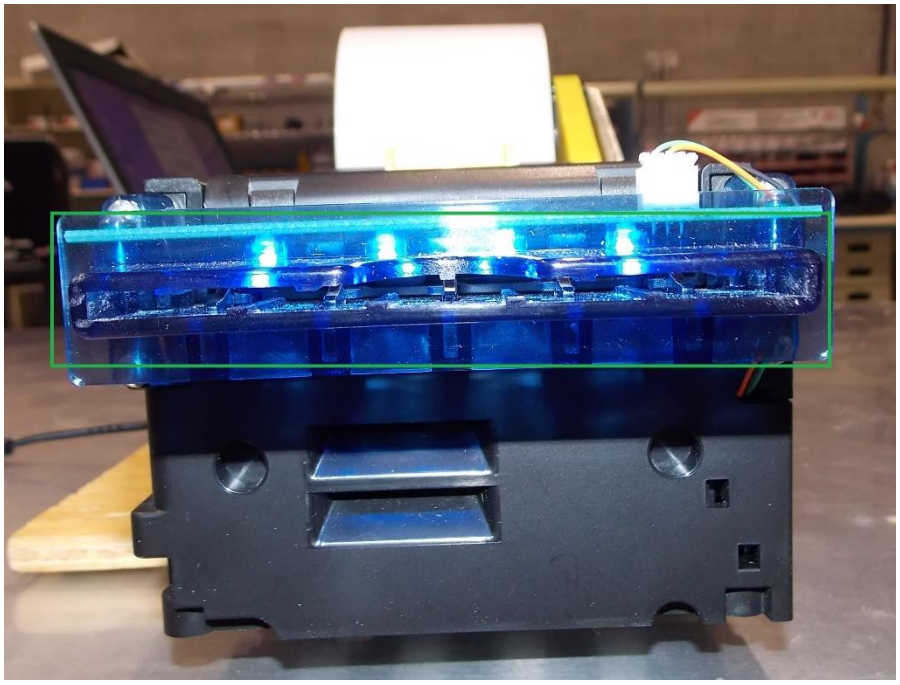

Figure 8.1-1: *ESD test location point's photo*

Red points = contact discharge
Green points = air discharge

8.1.6 Setup photos

Figure 8.1-2: *ESD setup photo*

8.2 Continuous RF electromagnetic field disturbances

8.2.1 References and limits

- EN 55035:2017
- EN 61000-4-3:2006 + A1:2008 + A2:2010

Table 8.2-1: *Continuous RF electromagnetic field disturbances, specification*

Test specification	Performance criterion
Swept test	
80–1000 MHz, 3 V/m (unmodulated), 80 % AM (1 kHz)	A
Spot test	
1800, 2600, 3500, 5000 MHz, 3 V/m (unmodulated), 80 % AM (1 kHz)	A

Notes: None

8.2.2 Test summary

Verdict	Pass		
Tested by	Yong Huang	Test date	October 26, 2020

8.2.3 Notes

None

8.2.4 Setup details

Table 8.2-2: *Continuous RF electromagnetic field disturbances, equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Horn antenna (1–18 GHz)	EMCO	3115	FA001452	1 year	December 16, 2020
Directional coupler (80–1000 MHz)	AR	DC6180	FA001659	1 year	January 21, 2021
Starprobe (0.1–6000 MHz)	AR	Fl7006	FA002054	1 year	December 13, 2020
Laser probe interface	AR	FI7000	FA002054	—	NCR
Amplifier (80–1000 MHz, 250 W)	AR	250W1000A	FA002088	—	NCR
Power meter	Rohde & Schwarz	NRP	FA002486	1 year	April 25, 2021
Power sensor	Rohde & Schwarz	NRP-Z91	FA002489	1 year	April 25, 2021
3 m EMI test chamber (Immunity)	TDK	SAC-3	FA002532	1 year	January 17, 2021
Biconilog antenna (26–3000 MHz)	ETS Lindgren	3140B	FA002546	—	NCR
Amplifier (2–8 GHz, 300 W)	AR	300T2G8	FA002565	—	NCR
3 Phase AC Power Source	apc AC Power	45 kVA	FA002677	—	VOU
Power Meter	HIOKI	PW3337	FA002727	1 year	February 21, 2021
Signal generator	Rohde & Schwarz	SMB100B	FA003063	1 year	November 26, 2020

Notes: VOU - verify on use
NCR - no calibration required

Table 8.2-3: *Continuous RF electromagnetic field disturbances, software details*

Manufacturer of Software	Details
Rohde & Schwarz	EMC32, Software for EMC Measurements, Version 10.60.10

8.2.5 Test data

Table 8.2-4: *Swept frequency – Continuous RF electromagnetic field disturbances, results*

Step size increment[1]	1 %
Dwell time[2]	5 s
Antenna polarization	Vertical and Horizontal
Modulation	CW signal amplitude modulated (AM) with 80 % depth with a 1 kHz sine wave
EUT setup configuration	Table top
EUT power input during test	230 V_{AC}, 50 Hz
EUT position facing antenna	Front side, back side, left side and right side

Frequency range, MHz		Test level, V/m[1]	Comments
80	1000	3	No degradation

Notes: [1]Recognizing that a 1% step size is preferred, the frequency range can be swept incrementally with a step size not exceeding 4% of the previous frequency with a test level of twice the value of the specified test level in order to reduce the testing time for equipment requiring testing in multiple configurations and/or long cycle times.
[2]The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to be able to respond. However, the dwell time shall not exceed 5 seconds at each of the frequencies during the scan. The time to exercise the EUT is not interpreted as a total time of a program or a cycle but related to the reaction time in case of failure of the EUT.

Table 8.2-5: *Spot frequencies – Continuous RF electromagnetic field disturbances, results*

Dwell time[1]	5 s
Antenna polarization	Vertical and Horizontal
Modulation	CW signal amplitude modulated (AM) with 80 % depth with a 1 kHz sine wave
EUT setup configuration	Table top
EUT power input during test	230 V_{AC}, 50 Hz
EUT position facing antenna	Front side, back side, left side and right side

Frequency, MHz	Test level, V/m	Comments
1800	3	No degradation
2600	3	No degradation
3500	3	No degradation
5000	3	No degradation

Notes: [1]The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to be able to respond. However, the dwell time shall not exceed 5 seconds at each of the frequencies during the scan. The time to exercise the EUT is not interpreted as a total time of a program or a cycle but related to the reaction time in case of failure of the EUT.
[2] When applicable, within the frequency sweep, a more comprehensive functional test was performed as specified in Annex H of EN 55035:2017

8.2.6 Setup photos

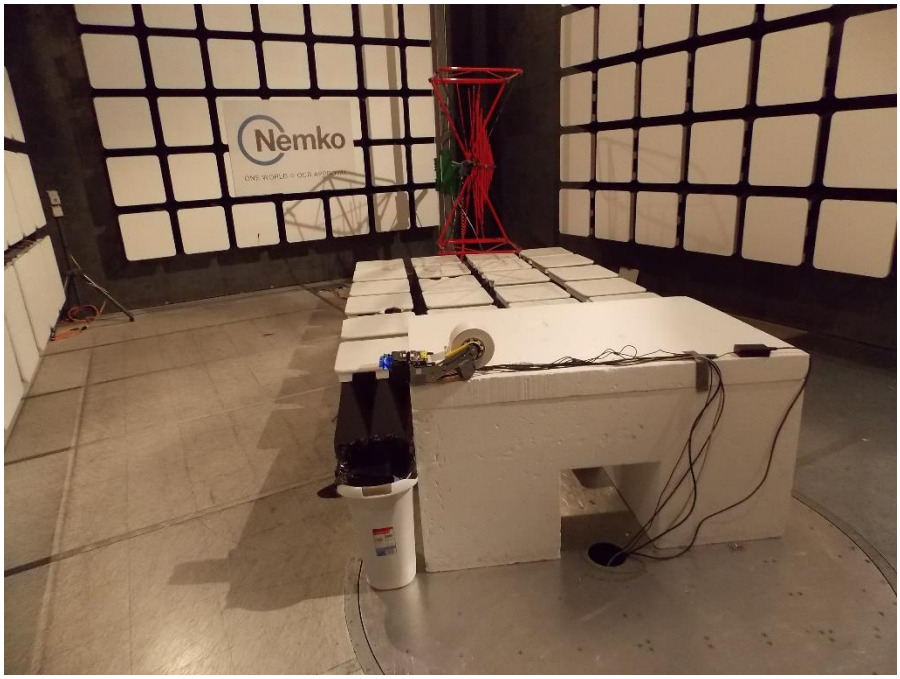

Figure 8.2-1: *Continuous RF electromagnetic field disturbances, setup photo (swept test)*

Figure 8.2-2: *Continuous RF electromagnetic field disturbances, setup photo (swept test)*

Setup photos, continued

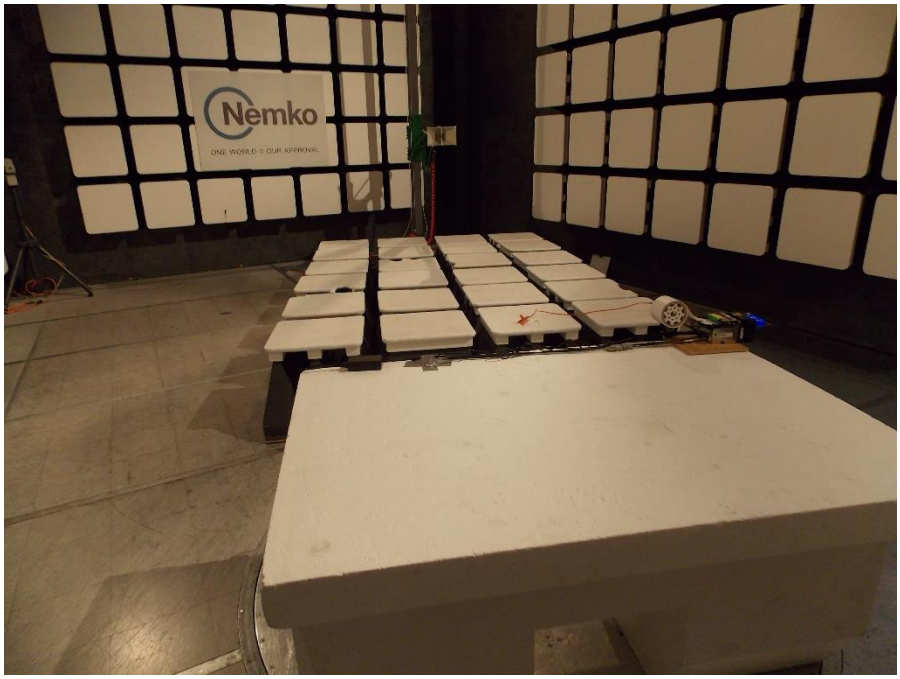

Figure 8.2-3: *Continuous RF electromagnetic field disturbances, setup photo (spot test)*

Figure 8.2-4: *Continuous RF electromagnetic field disturbances, setup photo (spot test)*

8.3 Electrical fast transients/burst

8.3.1 References and limits

- EN 55035:2017
- EN 61000-4-4:2012

Table 8.3-1: *Electrical fast transients/burst specification*

Test specification	Performance criterion
Analogue/digital data ports [1 and 2]	
0.5 kV (peak), 5/50 Tr/Th ns, 5 kHz (repetition rate)	B
DC network power ports [1]	
0.5 kV (peak), 5/50 Tr/Th ns, 5 kHz (repetition rate)	B
AC mains power ports	
1 kV (peak), 5/50 Tr/Th ns, 5 kHz (repetition rate)	B

Notes: [1] Applicable only to ports which, according to the manufacturer's specification, supports cable lengths greater than 3 m.
[2] For CPE xDSL ports repetition frequency is 100 kHz

- If the EUT contained several ports with the same particular interface, only one was tested
- Multi-conductor cables shall be tested as a single cable. Cables shall not be split or divided into groups of conductors for this test.

8.3.2 Test summary

Verdict	Pass		
Tested by	Yong Huang	Test date	October 27, 2020

8.3.3 Notes

None

8.3.4 Setup details

Table 8.3-2: *Electrical fast transients/burst equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Surge/EFT generator	TESEQ	NSG 3060	FA002495	1 year	April 21, 2021
Surge/EFT coupler/decoupler	TESEQ	NSG 3063	FA002497	1 year	April 22, 2021
Capacitive coupling clamp	TESEQ	CDN 3425	FA002498	—	NCR

Notes: None

Table 8.3-3: *Fast transients test software details*

Manufacturer of Software	Details
TESEQ	WIN 3000, Version 1.3.2

8.3.5 Test data

Table 8.3-4: *Electrical fast transients/burst results*

Wave shape (Tr / Td)	5/50 ns (Tr = rise time, Td= duration time)
Repetition frequency	5 kHz
Burst duration	15 ms
Burst period	300 ms
Test duration	60 s
EUT power input during test	230 V_{AC}, 50 Hz

Test port	Test voltage (±kV)	Comments
AC input[1 and 2]	0.5, 1	No degradation
USB port[3]	0.5	No degradation
Ethernet port[3]	0.5	No degradation
HDMI port[3]	0.5	No degradation
RS-232 port[3]	0.5	No degradation

Notes: [1]Transient applied asynchronous (relation to power supply)
[2]The test voltage was applied simultaneously between a ground reference plane and all of the power supply terminals and the protective or functional earth port on the EUT cabinet
[3]The test voltage was applied via capacitive coupling clamp

8.3.6 Setup photos

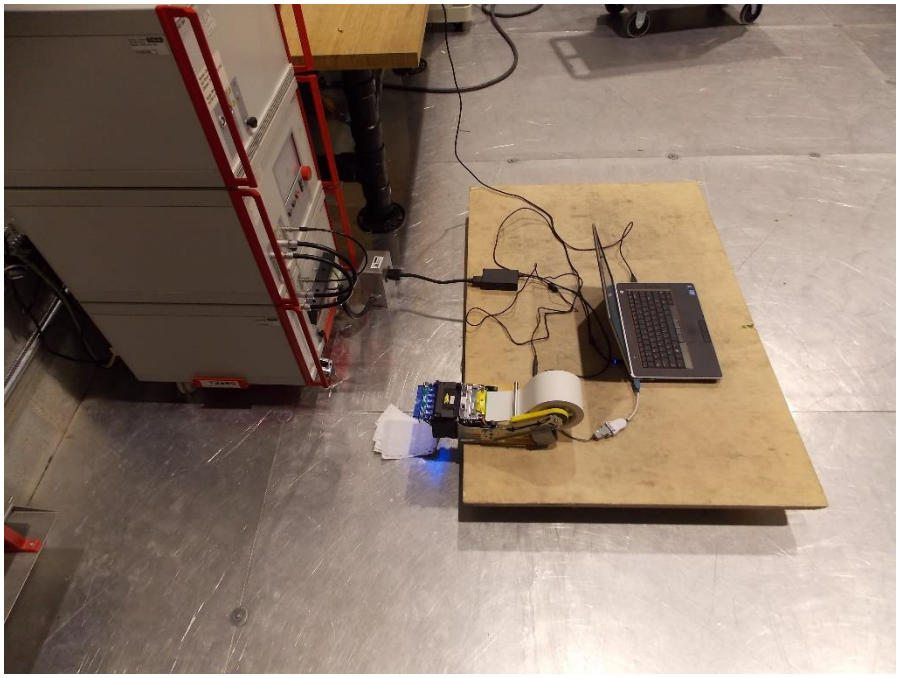

Figure 8.3-1: *Electrical fast transients/burst setup photo (Mains)*

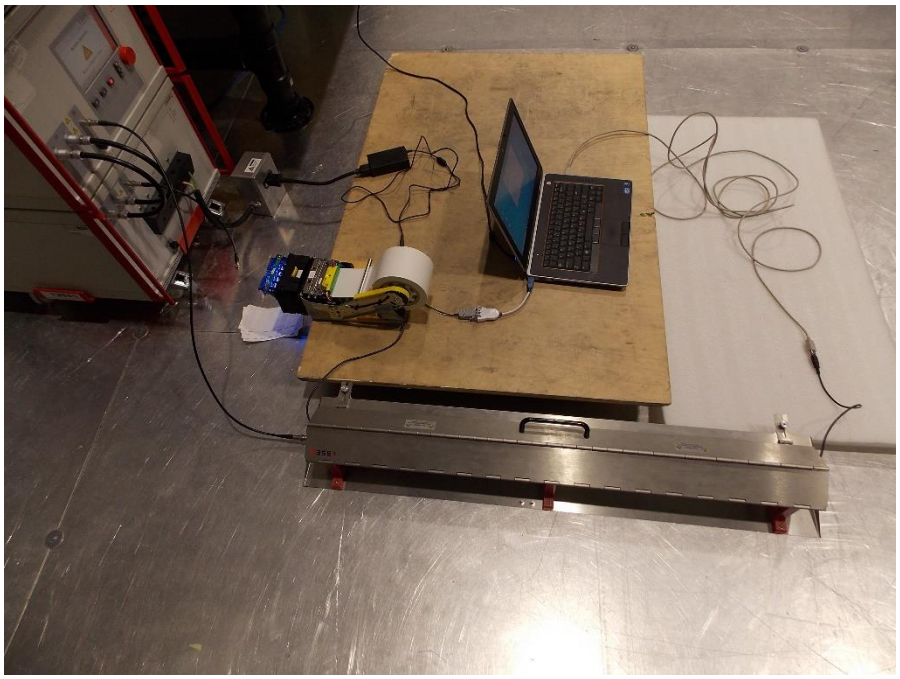

Figure 8.3-2: *Electrical fast transients/burst setup photo (I/O)*

8.4 Surges

8.4.1 References and limits

- EN 55035:2017
- EN 61000-4-5:2006

Table 8.4-1: *Surges specification*

Test specification	Performance criterion
Analogue/digital data ports [1, 2, 3, and 4]	
Unshielded symmetrical with primary protection: 1 and 4 kV (line to ground), 10/700 Tr/Th µs	C
Unshielded symmetrical without primary protection: 1 kV (line to ground), 10/700 Tr/Th µs	C
Coaxial or shielded: 0.5 kV (shield to ground), 1.2/50 Tr/Th µs	B
DC network power ports [5]	
0.5 kV (line to ground), 1.2/50 (8/20) Tr/Th µs	B
AC mains power ports [6]	
1 kV (line to line), 1.2/50 (8/20) Tr/Th µs 2 kV (line to ground), 1.2/50 (8/20) Tr/Th µs	B

Notes:
[1] Applicable only to ports which, according to the manufacturer's specification, supports cable lengths greater than 3 m.
[2] Surges are applied with primary protection fitted. Where possible, use the actual primary protector intended to be used in the installation.
[3] Where the surge coupling network for the 10/700 (5/320) µs waveform affects the functioning of high speed data ports, the test shall be carried out using a 1.2/50 (8/20) µs waveform and appropriate coupling network.
[4] Surges are applicable to ports which satisfy all of the following conditions:
- May connect directly to cables that leave the building structure
- Defined as an antenna port, a wired network port, or a broadcast receiver tuner port

Typical ports covered include xDSL, PSTN, CATV, antenna and similar. Excluded ports are LAN and similar.
[5] Applicable only to ports which, according to the manufacturer's specification, may connect directly to outdoor cables.
[6]. The number of pulses applied shall be as follows:
- Five positive pulses line-to-neutral at 90˚ phase
- Five negative pulses line-to-neutral at 270˚ phase

The following additional pulses are required only if the EUT has an earth connection or if the EUT is earthed via any AE:
- Five positive pulses line-to-earth at 90˚ phase
- Five negative pulses line-to-earth at 270˚ phase
- Five negative pulses neutral-to-earth at 90˚ phase
- Five positive pulses neutral-to-earth at 270˚ phase

For multiple-phase systems, where a neutral conductor is present, the test applied (as defined above) to a single phase unless the other phases are connected to significantly different circuit arrangements
For multiple-phase systems, where a neutral conductor is not present, the test is applied as defined in the basic standard.

8.4.2 Test summary

Verdict	Pass		
Tested by	Yong Huang	Test date	October 27, 2020

8.4.3 Notes

None

8.4.4 Setup details

Table 8.4-2: *Surges equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Surge/EFT generator	TESEQ	NSG 3060	FA002495	1 year	April 21, 2021
Surge/EFT coupler/decoupler	TESEQ	NSG 3063	FA002497	1 year	April 22, 2021

Notes: None

Table 8.4-3: *Surges test software details*

Manufacturer of Software	Details
TESEQ	WIN 3000, Version 1.3.2

8.4.5 Test data

Table 8.4-4: *Surges at AC mains power ports/ DC network power ports results*

Open circuit voltage (T_1 / T_2)	1.2/50 µs (T_1 = front time, T_2= time to half value)
Short circuit curent (T_1 / T_2)	8/20 µs (T_1 = front time, T_2= time to half value)
Surge pulse interval	20 s
Number of pulses	5 positive and 5 negative
EUT power input during test	230 V_{AC}, 50 Hz

Test port	Coupling	Test voltage (±kV)	Comments
AC mains power ports			
AC Mains Input	Phase to Neutral[1 and 3]	0.5, 1	No degradation
	Phase to ground[2 and 3]	0.5, 1, 2	No degradation
	Neutral to ground[2 and 3]	0.5, 1, 2	No degradation

Notes: [1]Surge applied with generator output impedance set to 2 Ω
[2]Surge applied with generator output impedance set to 12 Ω
[3]Surge applied synchronous (relation to power supply): 90 and 270°

8.4.6 Setup photos

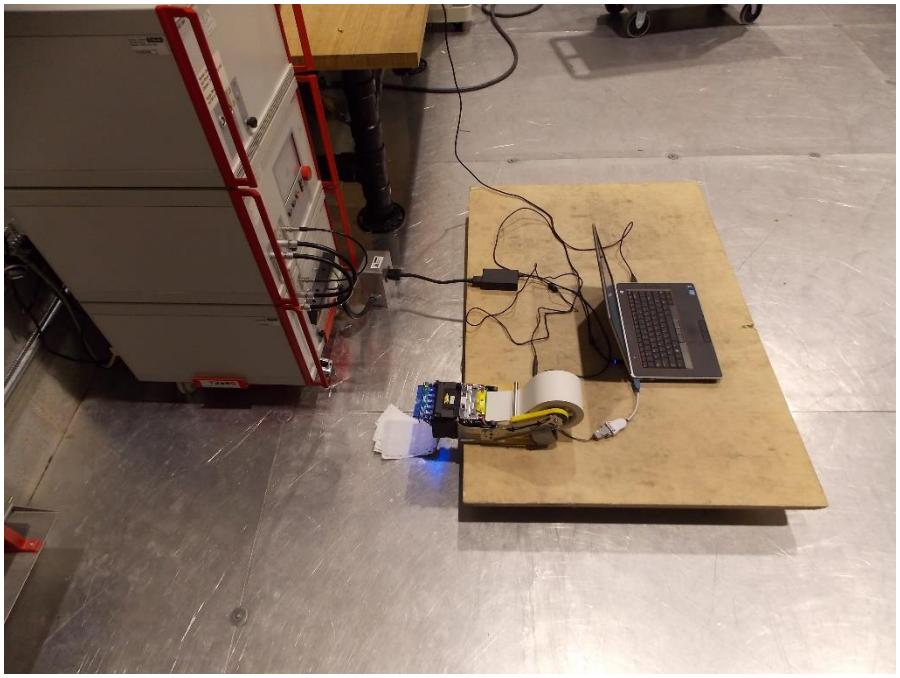

Figure 8.4-1: *Surges setup photo (Mains)*

8.5 Continuous induced RF disturbances

8.5.1 References and limits

- EN 55035:2017
- EN 61000-4-6:2009

Table 8.5-1: *Continuous induced RF disturbances specification*

Test specification	Performance criterion
Analogue/digital data ports [1]	
0.15–10 MHz, 3 V_{RMS} (unmodulated), 80 % AM (1 kHz)	
10–30 MHz, 3 to 1 V_{RMS} (unmodulated), 80 % AM (1 kHz)	A
30–80 MHz, 1 V_{RMS} (unmodulated), 80 % AM (1 kHz)	
DC network power ports [1]	
0.15–10 MHz, 3 V_{RMS} (unmodulated), 80 % AM (1 kHz)	
10–30 MHz, 3 to 1 V_{RMS} (unmodulated), 80 % AM (1 kHz)	A
30–80 MHz, 1 V_{RMS} (unmodulated), 80 % AM (1 kHz)	
AC mains power ports	
0.15–10 MHz, 3 V_{RMS} (unmodulated), 80 % AM (1 kHz)	
10–30 MHz, 3 to 1 V_{RMS} (unmodulated), 80 % AM (1 kHz)	A
30–80 MHz, 1 V_{RMS} (unmodulated), 80 % AM (1 kHz)	

Notes: [1] Applicable only to ports which, according to the manufacturer's specification, supports cable lengths greater than 3 m.

- If d.c. power is fed on conductors included in a signal cable, then the requirements of Signal ports and telecommunication ports only apply to this cable.
- Multi-conductor cables shall be tested as a single cable. Cables shall not be split or divided into groups of conductors for this test.

8.5.2 Test summary

Verdict	Pass		
Tested by	Daniel Hynes	Test date	October 27, 2020

8.5.3 Notes

None

8.5.4 Setup details

Table 8.5-2: *Continuous induced RF disturbances equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Amplifier	AR	150A220	FA001744	—	NCR
Directional coupler (0.01–250 MHz)	AR	DC2600A	FA001856	1 year	January 14, 2021
CDN-M3	FCC	FCC-801-M3-16A	FA002065	1 year	November 26, 2020
CDN-M3	FCC	FCC-801-M3-16A	FA002066	1 year	April 25, 2021
6 dB attenuator	Inmet	2N200W-06	FA002482	1 year	January 14, 2021
Signal generator	Rohde & Schwarz	SMC100A	FA002484	1 year	April 28, 2021
EM injection clamp	FCC	F-2031-23mm	FA002491	1 year	March 1, 2021
CDN-T8	FCC	F-090407-1004-1	FA002493	1 year	April 3, 2021
CDN-USB	FCC	FCC-801-S-USB-3.0	FA002741	1 year	April 2, 2021
CDN-HDMI	FCC	FCC-801-S19-HDMI	FA002743	1 year	April 29, 2021
Power sensor	Rohde & Schwarz	NRP6A	FA003073	1 year	February 3, 2021

Notes: NCR - no calibration required

Table 8.5-3: *Continuous induced RF disturbances test software details*

Manufacturer of Software	Details
Rohde & Schwarz	EMC32, Software for EMC Measurements, Version 10.60.10

8.5.5 Test data

Table 8.5-4: *Continuous induced RF disturbances results*

Frequency range[4 and 5]	0.15–10 MHz	10–30 MHz	30–80 MHz
Signal level[1]	3 V_{RMS}	3–1 V_{RMS} [3]	1 V_{RMS}
Step size increment[1]	1 %		
Dwell time[2]	5 s		
EUT power input during test	230 V_{AC}, 50 Hz		
Modulation	CW signal amplitude modulated (AM) with 80 % depth with a 1 kHz sine wave		

Ports investigated	Coupling method	50 Ω termination point	Comments
AC input	CDN-M3	CDN-M3 (Support Equipment)	No degradation
USB port	CDN-USB	CDN-M3	No degradation
Ethernet port	CDN-T8	CDN-M3	No degradation
HDMI port	CDN-HDMI	CDN-M3	No degradation
RS-232 port	EM Clamp	CDN-M3	No degradation

Notes:
[1]Recognizing that a 1% step size is preferred, the frequency range can be swept incrementally with a step size not exceeding 4% of the previous frequency with a test level of twice the value of the specified test level in order to reduce the testing time for equipment requiring testing in multiple configurations and/or long cycle times.
[2]The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to be able to respond. However, the dwell time shall not exceed 5 seconds at each of the frequencies during the scan. The time to exercise the EUT is not interpreted as a total time of a program or a cycle but related to the reaction time in case of failure of the EUT.
[3]The test levels decrease linearly with the logarithm of the frequency in the range 10 MHz to 30 MHz
[4] Within the frequency sweep the following spot frequencies were additionally assessed.
[5] When applicable, within the frequency sweep, a more comprehensive functional test was performed as specified in Annex H of EN 55035:2017 at the following spot frequencies: 0.2 1, 7.1, 13.56, 21.0, 27.12, 40.68 MHz

8.5.6 Setup photo

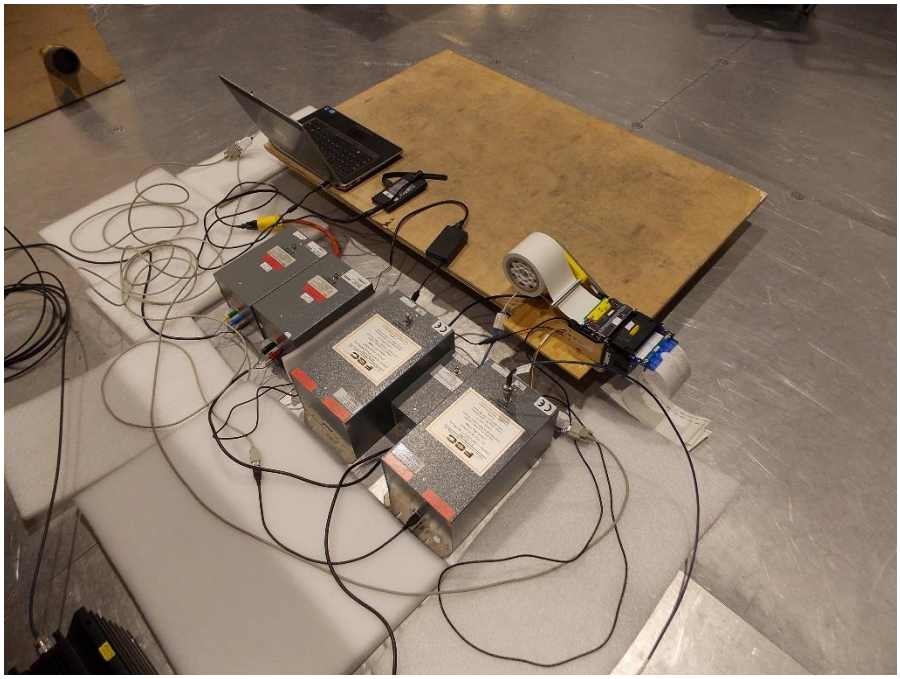

Figure 8.5-1: *Continuous induced RF disturbances setup photo*

8.6 Voltage dips and voltage interruptions

8.6.1 References and limits

- EN 55035:2017
- EN 61000-4-11:2004

Table 8.6-1: *Voltage dips and voltage interruptions specification*

Test specification	Performance criterion
Input AC power ports (including equipment marketed with a separate a.c./d.c power converter)	
< 5 % residual voltage, 0.5 cycles (Voltage dip) 70 % residual voltage, 25 cycles (Voltage dip)	B
< 5 % residual voltage, 250 cycles (Voltage interruption)	C

Notes: Changes to occur at 0 degree crossover point of the voltage waveform. If the EUT does not demonstrate compliance when tested with 0 degree switching, the test shall be repeated with the switching occurring at both 90 degrees and 270 degrees. If the EUT satisfies these alternative requirements, then it fulfils the requirements.

8.6.2 Test summary

Verdict	Pass		
Tested by	Daniel Hynes	Test date	October 27, 2020

8.6.3 Notes

None

8.6.4 Setup details

Table 8.6-2: *Voltage dips and voltage interruptions equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 Phase 15 kVA, Harmonics, Flicker and Dips system	TESEQ	ProfLine 2115-400	FA002516	1 year	November 20, 2020

Notes: None

Table 8.6-3: *Voltage dips and voltage interruptions test software details*

Manufacturer of Software	Details
TESEQ	WIN2110SII (P/N CIC605), Version 3.2.0

8.6.5 Test data

Table 8.6-4: *Voltage dips results*

Variation/dip repetition	Sequence of three dips/interruptions with an interval of 10 seconds between each test		
Voltage change degree of the voltage waveform	0 and 180		
EUT power input during test	230 V_{AC}, 50 Hz		
Test port	**Residual voltage (%)**	**Cycles**	**Comments**
AC Mains Input	< 5	0.5	No degradation
	70	25	No degradation

Notes: None

Table 8.6-5: *Voltage interruptions results*

Variation/dip repetition	Sequence of three dips/interruptions with an interval of 10 seconds between each test		
Voltage change degree of the voltage waveform	0 and 180		
EUT power input during test	230 V_{AC}, 50 Hz		
Test port	**Residual voltage (%)**	**Cycles**	**Comments**
AC Mains Input	< 5	250	EUT power cycled

Notes: None

8.6.6 Setup photo

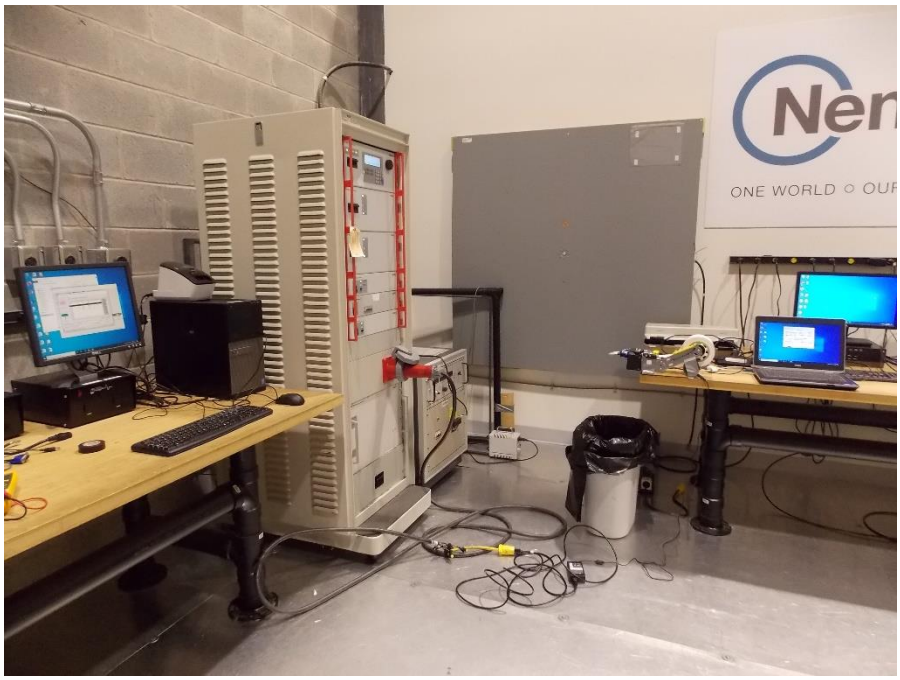

Figure 8.6-1: *Voltage dips and voltage interruptions setup photo*

Section 9 EUT photos

9.1 External photos

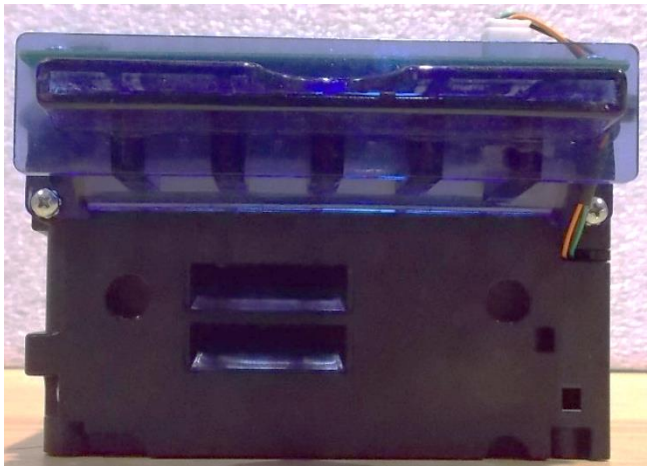

Figure 9.1-1: *Front view photo*

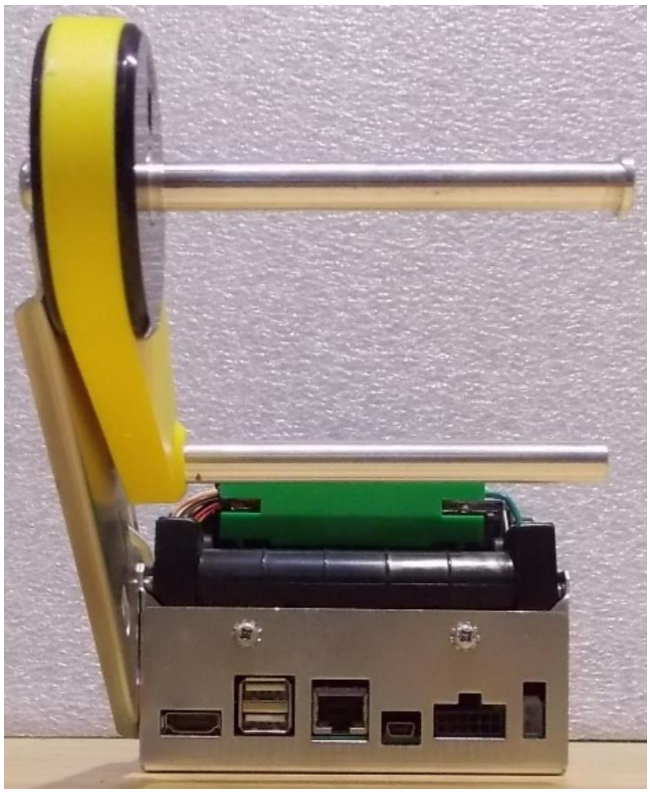

Figure 9.1-2: *Rear view photo*

External photos, continued

Figure 9.1-3: *Side view photo*

Figure 9.1-4: *Side view photo*

External photos, continued

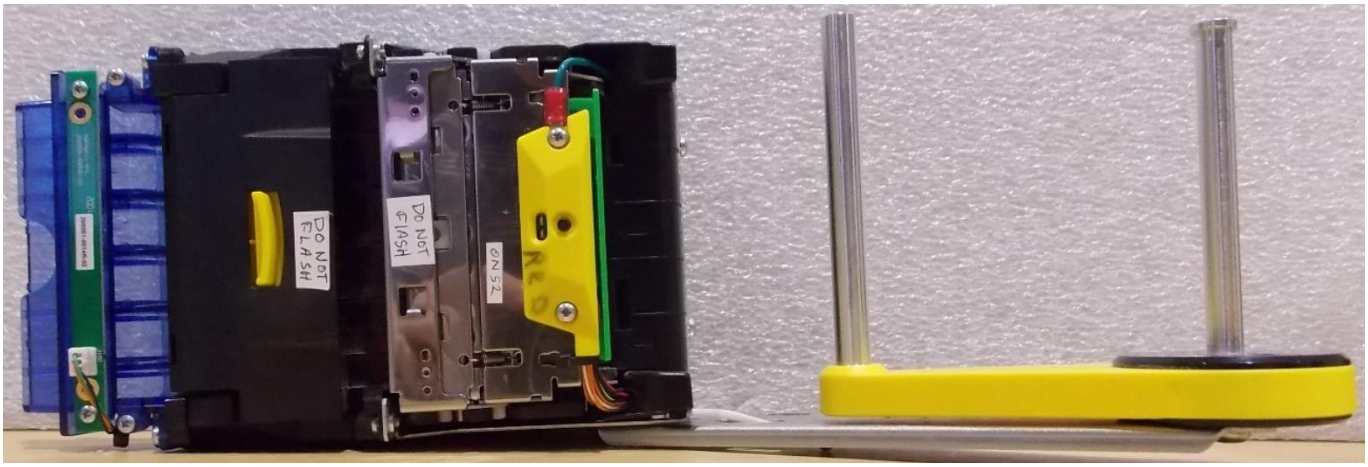

Figure 9.1-5: *Top view photo*

Figure 9.1-6: *Bottom view photo*

End of the test report