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L 1004.3

TESTING LABORATORY No. 1004.3
accredited by the Czech Institute for Accreditation, o. p. s

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TEST REPORT

ABOUT THE ELECTROMAGNETIC COMPATIBILITY TEST of the ENA175

AKREDITOVANÁ ZKUŠEBNÍ LABORATOŘ č.1004.3 Institut pro testování a certifikaci, a.s.

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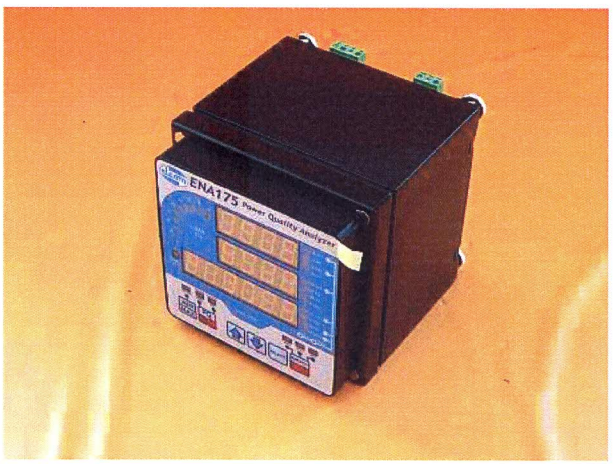
Distribution List:	Institute for testing and certification (Copy No 1)
	Applicant (Copy No 2)

1. General Specifications

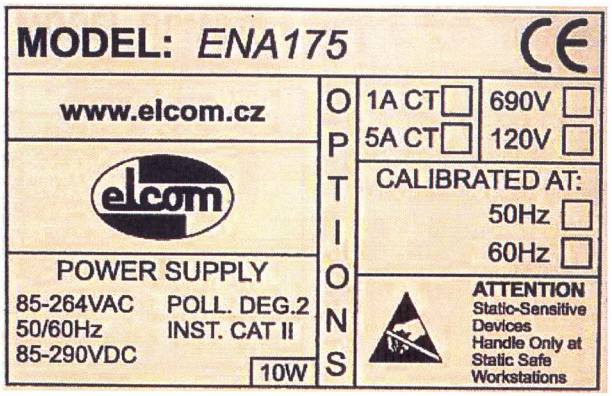
1.1. Equipment Under Test (EUT)

One sample the ENA175, labelled with serial number 1134604, was delivered to Institute for testing and certification on 2016-04-12. ATL 1004.3 started the requested tests under Job No 414103133.

Picture 1.1.A – EUT



Picture 1.1.B – EUT rating label



1.2. Applicant

ELCOM a.s.
Na Větrově 34
142 00 Praha 4
Czech Republic

Company ID: 25077155
Tax ID: CZ25077155

Order No.: ELC 161764
as of: 2016-03-18

1.3. Manufacturer

SATEC Ltd.
Har Hotzvim Industrial Park,POB 45022
Jerusalem 9145001
Israel

1.4. Test Period

Started on: 2016-04-12
Finished on: 2016-05-23

1.5. Test Conditions

Ambient temperature: (+15 up to +35) °C / (+59 up to +95) °F
Barometric pressure: (86 up to 106) kPa / (25.4 up to 31.3) inHg
Relative humidity: (25 – 75) %

1.6. Regulations used

i	*Regulation used*	*As Czech implementation of*
1	ČSN EN 61326-1 ed.2:2013	EN 61326-1:2013
2	ČSN EN 55011 ed.3:2010	EN 55011:2009
3	ČSN EN 61000-3-2 ed.4:2015	EN 61000-3-2:2014
4	ČSN EN 61000-3-3 ed.3:2014	EN 61000-3-3:2013
5	ČSN EN 61000-6-2 ed.3:2006	EN 61000-6-2:2005
6	ČSN EN 61000-4-2 ed.2:2009	EN 61000-4-2:2008
7	ČSN EN 61000-4-3 ed.3:2006+A1:2008+A2:2011	EN 61000-4-3:2006 +A1:2007+ A2:2010
8	ČSN EN 61000-4-4 ed.3:2013	EN 61000-4-4:2012
9	ČSN EN 61000-4-5 ed.2:2007	EN 61000-4-5:2006
10	ČSN EN 61000-4-6 ed.3:2009	EN 61000-4-6:2009
11	ČSN EN 61000-4-11 ed.2:2005	EN 61000-4-11:2004
12	* ČSN EN 61000-4-19:2015	EN 61000-4-19:2014

* Beyond the scope of accreditation

1.7. Test Instruments and Equipment

i	*Instrument / Equipment*	*Serial No*
1	Test Receiver Rohde & Schwarz ESIB 7	100318
2	Antenna Frankonia BTA-H	97061002
3	Antenna Rohde & Schwarz HF 906	359287/003
4	RF generator Rohde & Schwarz SMH	862490/007
5	RF generator Rohde & Schwarz SME 03	834617/007
6	RF Amplifier AR 10W1000B	21532
7	RF Amplifier MILMEGA AS0840-30-17	10140028
8	Generator Haefely PESD 3010	H805224
9	Generator Haefely PEFT-Junior	583333-82
10	Generator Haefely PSURGE 4010	080888/07
11	Coupling Network IP 6.2	145348
12	Coupling Network DEC1A	145312
13	Coupling Clamp KEMZ 801	14299
14	Coupling Network MEB M3	14413
15	Test System TECTRA SYS61K – 1PL95	08950603/A0603070

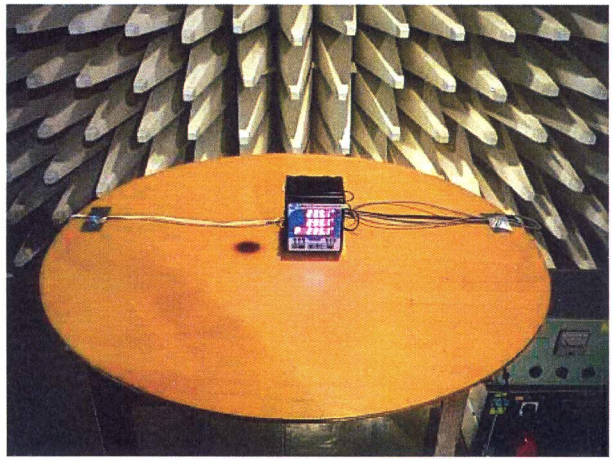
All listed equipment has been duly calibrated and they passed a regular metrological inspection.

1.8. EUT Installation

EUT was supplied from the AC mains of 230V / 50 Hz using non-shielded three-wire cable length of 1.5 m (4.9 ft.). A main voltage was connected to the measurement terminals, current terminals were connected to the 230 V 100W bulb. Non-shielded cable length of 3 m (9.8 ft.), without electrical termination, was connected to the EUT COM1 connector.

2. EMC TESTS OF RADIATED INTERFERENCE

Picture 2.A – EUT during radiated interferences measurement



2.1. Mains Terminal Spurious Voltage

Requirement in	**ČSN EN 61326-1, Clause 7**
Testing method	**ČSN EN 55011, Clause 8.2**
Test specification	Measuring of the levels of spurious terminal voltages, radiated by the EUT into the supply leads on frequencies 150 kHz up to 30 MHz. The spurious voltage levels were measured on the supply terminals of the L (phase) and N (neutral) supply conductors of the EUT using the Selective Micro-voltmeter with a quasi-peak and average detector. The EUT was placed on the wooden table 0.8 m (2.6 ft.) above ground reference plane in the shielded anechoic chamber. EUT was in the operation mode during the test.
Measurement uncertainty	U = ± 3.5 dB (specified for the coverage coefficient k = 2 and the confidence probability of 95 %)
Results	**PASSED, Class A**

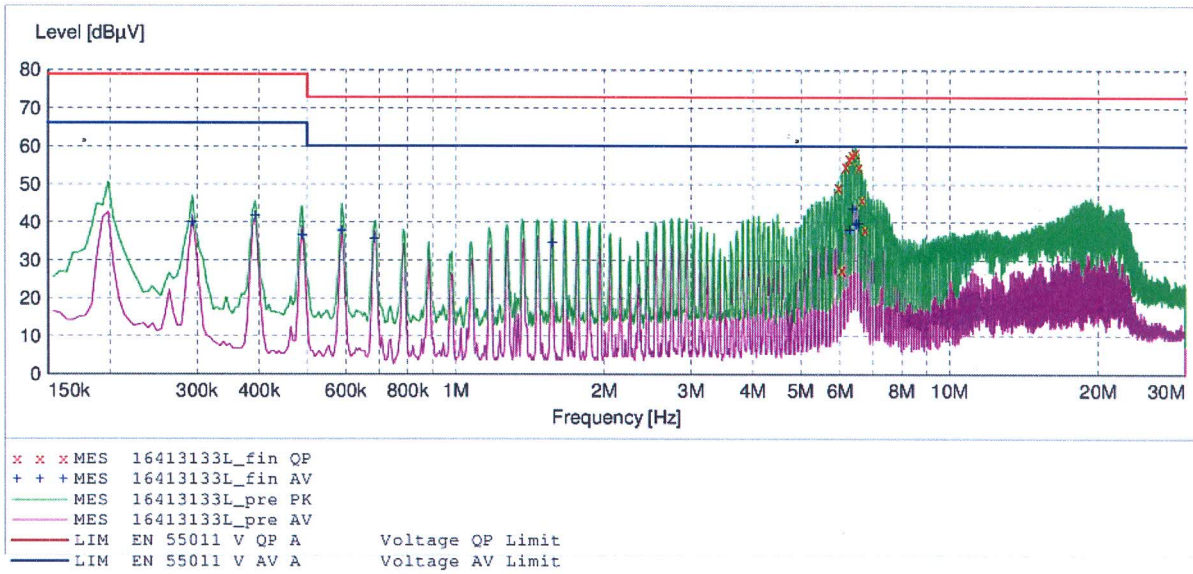
Limits of the conducted spurious voltage on the mains terminals according to ČSN EN 55011, 6.2.1.3 Table 2

Frequency band (MHz)	Quasi-peak limits dB (μV)	Average limits dB (μV)
0,15 up to 0,5	79	66
0,5 up to 30	73	60

Graph 2.1.A

Voltage on Mains

```
EUT:                ENA175/75
Manufacturer:       ELCOM a.s.
Operating Condition:
Test Site:
Operator:           J.Prochazka
Test Specification: L
Comment:
Start of Test:      12.4.2016 / 16:55:43
```




```
x x x MES  16413133L_fin QP
+ + + MES  16413133L_fin AV
       MES  16413133L_pre PK
       MES  16413133L_pre AV
       LIM  EN 55011 V QP A      Voltage QP Limit
       LIM  EN 55011 V AV A      Voltage AV Limit
```

Graph 2.1.B

Voltage on Mains

```
EUT:                ENA175/75
Manufacturer:       ELCOM a.s.
Operating Condition:
Test Site:
Operator:           J.Prochazka
Test Specification: N
Comment:
Start of Test:      12.4.2016 / 17:00:06
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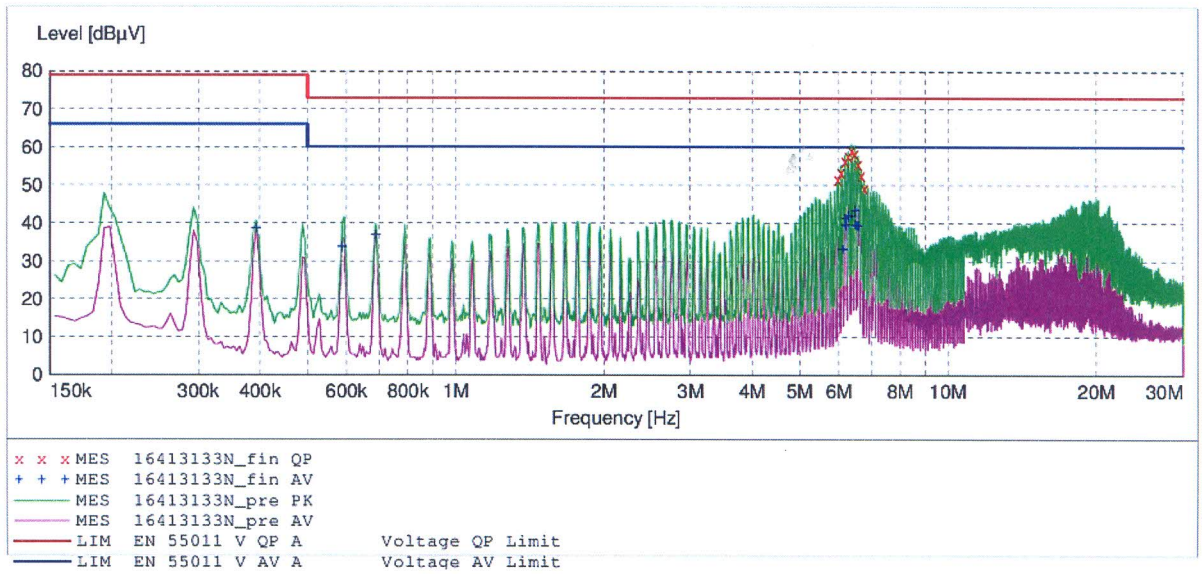



```
x x x MES  16413133N_fin QP
+ + + MES  16413133N_fin AV
       MES  16413133N_pre PK
       MES  16413133N_pre AV
       LIM  EN 55011 V QP A      Voltage QP Limit
       LIM  EN 55011 V AV A      Voltage AV Limit
```

2.2. Radiated Field

Requirement in	**ČSN EN 61326-1, Clause 7**
Testing method	**ČSN EN 55011, Clause 8.3**
Test specification	The field strength levels, radiated by the EUT into environment on frequencies of 30 MHz up to 1 GHz. The measurement was carried out in the anechoic chamber at the distance of 3 m (9.8 ft.) and recalculated for the distance of 10 m (32.8 ft.) The Selective Microvoltmeter with a quasi-peak type detector was connected to the measuring antenna. The values of radiated electromagnetic field were subsequently measured at horizontal as well as vertical polarization of the measuring antenna. The maximum of emission was searched for horizontal and for vertical polarization by rotation of device and by turning the high of antenna. The EUT was placed on the wooden table 0.8 m (2.6 ft.) above ground reference plane in the shielded anechoic chamber. EUT was in the operation mode during the test.
Measurement uncertainty	U = ± 5.2 dB (specified for the coverage coefficient k = 2 and the confidence probability of 95 %)
Results	**PASSED, Class A**

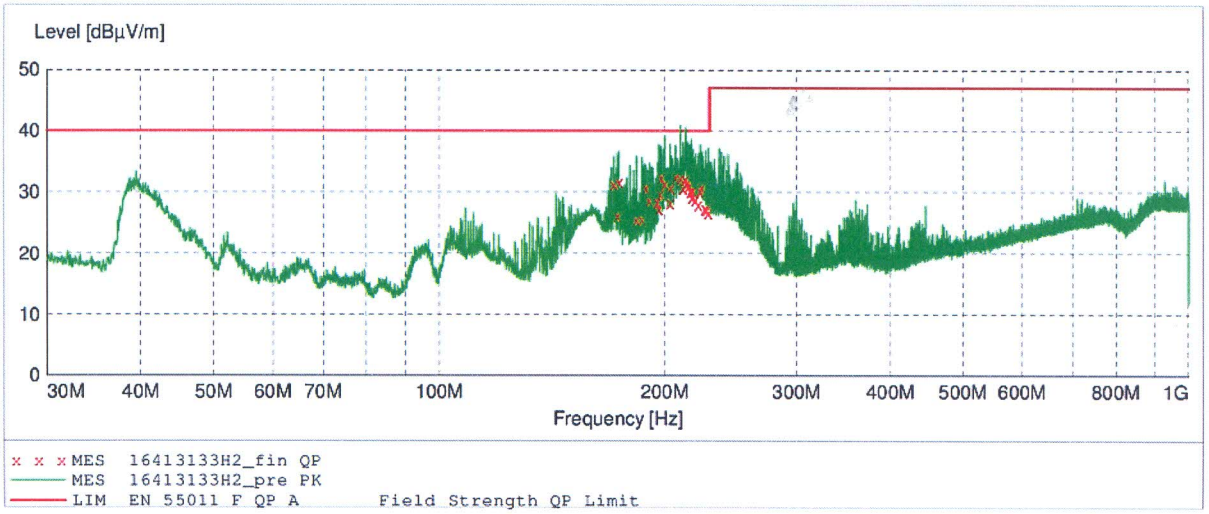
Limits of the radiated emissions (measuring distance 10 m) of the class A according to ČSN EN 55011, Table 4

Frequency Range (MHz)	*Quasi-Peak Limits dB (μV/m)*
30 up to 230	40
230 up to 1,000	47

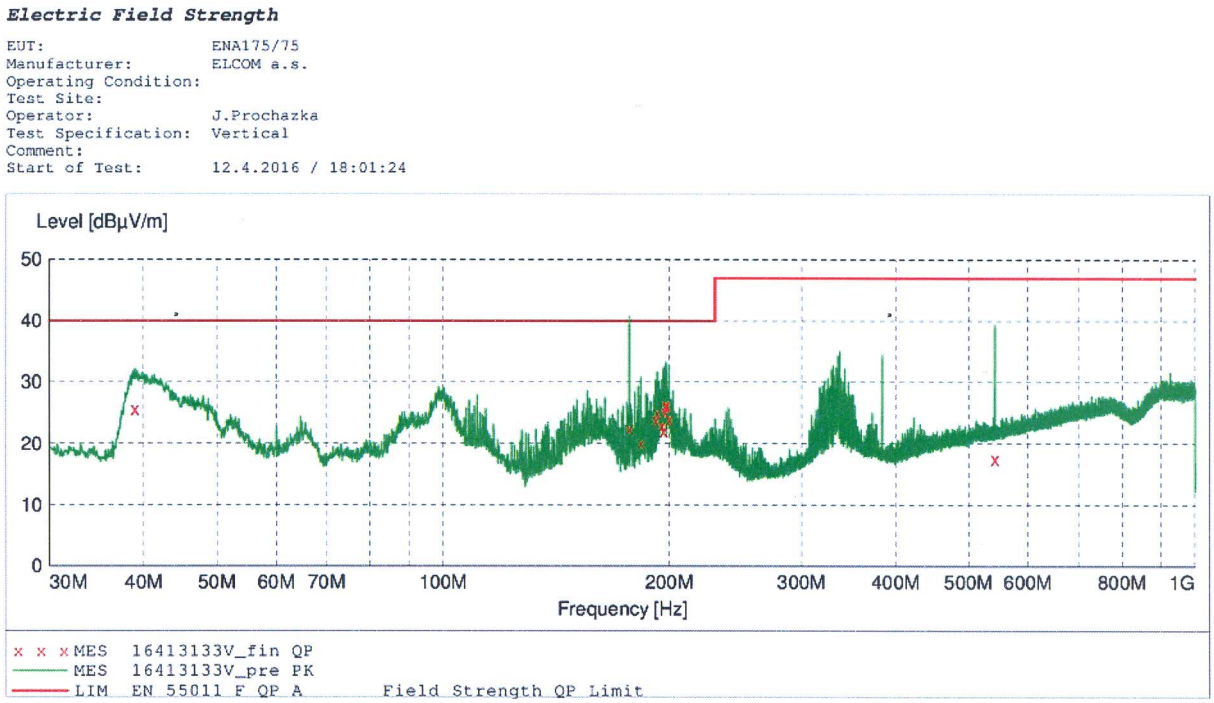
Graph 2.2.A

Electric Field Strength

```
EUT:                ENA175/75
Manufacturer:       ELCOM a.s.
Operating Condition:
Test Site:
Operator:           J.Prochazka
Test Specification: Horizontal
Comment:
Start of Test:      12.4.2016 / 17:52:52
```



Graph 2.2.B



2.3. Harmonic Current Emissions

Requirement in	**ČSN EN 61326-1, Clause 7**
Testing method	**ČSN EN 61000-3-2**
Test specification	Rated power consumption is lower than 75 W, EUT meet the requirements of the standard without testing
Results	**PASSED**

2.4. Voltage Variation Reduction and Flickering Reduction in the Mains

Requirement in	**ČSN EN 61326-1, Clause 7**
Testing method	**ČSN EN 61000-3-3**
Test specification	EUT meet the requirements of the standard without testing
Results	**PASSED**

3. EMC IMMUNITY

EUT was placed on a table for required test. EUT was in the operating mode, connected according to clause 1.8, during the test.

If the regulations mentioned below require performance Criterion A, change of measurement value, error message, or reset of the EUT is not allowed during the test.

3.1. Electrostatic Discharge Immunity

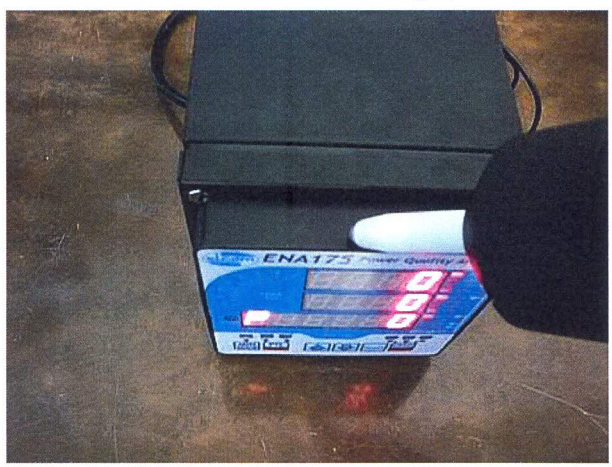
Requirement in	**ČSN EN 61326-1, table 2**
Testing method	**ČSN EN 61000-4-2**
Test specification	The air method was applied for non-conductive surfaces while contact discharges were used for conductive parts. 20 discharges were applied to each place (10 discharges with positive polarity a 10 discharges with negative polarity). Discharge points are shown on the pictures. EUT was placed on an insulating pad on a table 0.8 m (2.6 ft.) above the ground reference plane. EUT was in the operating mode during the test.
Results	**PASSED, Performance Criterion A**

Table 3.1.A – ESD immunity test parameters and performance

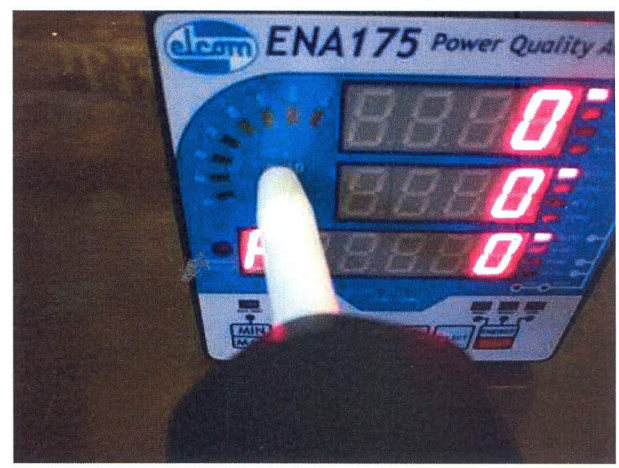
Level	+ 4 kV	- 4 kV	+ 6 kV	- 6 kV	+ 8 kV	- 8 kV
Air Discharge	-	-	-	-	A	A

A ... Performance Criterion A (no function of the EUT was affected)

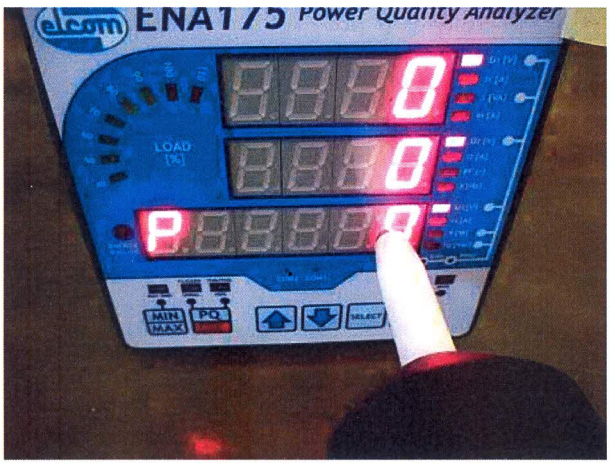
Picture 3.1.A – Air discharge point



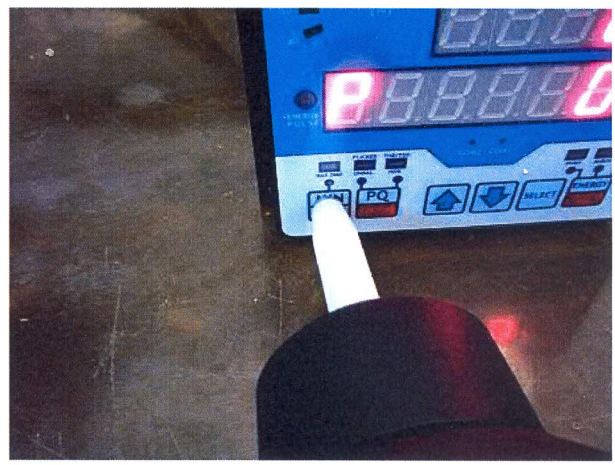
Picture 3.1.B – Air discharge point



Picture 3.1.C – Air discharge point

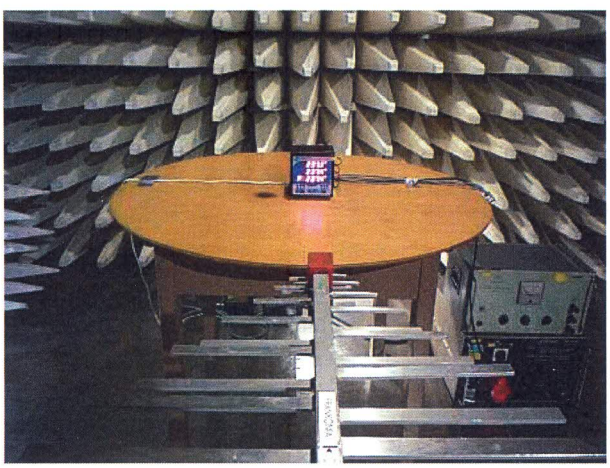


Picture 3.1.D – Air discharge point

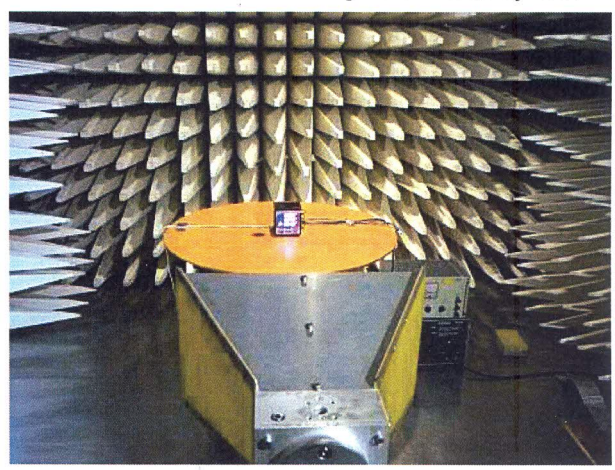


3.2. Field Immunity

Picture 3.2.A – EUT during field immunity test



Picture 3.2.B – EUT during field immunity test



Requirement in	**ČSN EN 61326-1, Clause 6.2. table 2**
Testing method	**ČSN EN 61000-4-3**
Test specification	EUT was placed in a shielded anechoic chamber, on a wooden table, 80 cm (2.6 ft.) above the grounding surface. EUT was in operation mode during the test.
Results	**PASSED, Performance Criterion A**

Table 3.2.A – Field immunity test parameters and performance

Frequencies	*AM*	*Mod. Frequency*	*Polarisation*	*Field intensity [V]*	*Performance*
80 MHz – 1 GHz	80%	1 kHz	Horizontal	10	A
1,4 GHz – 2 GHz	80%	1 kHz	Horizontal	3	A
2 MHz – 2,7 GHz	80%	1 kHz	Horizontal	1	A
80 MHz – 1 GHz	80%	1 kHz	Vertical	10	A
1,4 GHz – 2 GHz	80%	1 kHz	Vertical	3	A
2 MHz – 2,7 GHz	80%	1 kHz	Vertical	1	A

A ... Performance Criterion A (no function of the EUT under was affected)

3.3. Electrical Fast Transients/Burst Immunity

Requirement in	**ČSN EN 61326-1, table 2**
Testing method	**ČSN EN 61000-4-4**
Test specification	The pulse groups were injected directly into the individual supply leads L, N and PE, measuring terminals L, N and to the COM cable using capacitive way. The EUT was placed 0.1 m (0.3 ft.) above the reference grounding surface on a table with the height of 0.8 m (2.6 ft.). The minimum distance from any metallic objects was more than 0.6 m (1.9 ft.) from the EUT. The distance between the pulse generator and the EUT was 1.0 m (3.3 ft.). EUT was in the operating mode during the test.
Results	**PASSED, Performance Criterion B**

Table 3.3.A – fast transients/burst immunity test parameters

Pulse group width	15 ms
Pulse group period	300 ms
Repeating frequency of the pulse groups	5 kHz
Duration positive / negative pulses:	1 minute for each conductor

Table 3.3.B – fast transients/burst immunity tests parameters and performance

Level	+1 kV	-1 kV	+ 2 kV	- 2 kV
Conductor L	A	A	-	-
Conductor N	A	A	-	-
Conductor PE	B	A	-	-
Measuring terminal L	-	-	A	A
Measuring terminal N	-	-	A	A
Cable COM	A	A	-	-

A ... Performance Criterion A (no function of the EUT was affected)

B ... Performance Criterion B (Reset of the EUT, function of the EUT was restored after the test)

3.4. Surge Immunity

Requirement in	**ČSN EN 61326-1, table 2**
Testing method	**ČSN EN 61000-4-5**
Test specification	The surges were applied directly between the: • L and N mains terminals • L mains terminal and PE • N mains terminal and PE • measuring terminals L and N • measuring terminal L and PE • measuring terminal N and PE The EUT was placed 0.1 m (0.33 ft.) above the ground reference plane on a table with the height of 0.8 m (2.63 ft.). EUT was in operation mode during the test
Results	**PASSED, Performance Criterion A**

Table 3.4.A – surge immunity test parameters

Shape of pulses	1.2/50 μs open-circuit voltage, 8/20 μs short-circuit current
Phase of injected signal with reference to the mains	0°, 90°, 180°, 270°
Number of surges	5
Interval between surges	10 s

Table 3.4.B –surge immunity tests parameters and performance

Level	+0.5 kV	- 0.5 kV	+1 kV	- 1 kV	+ 2 kV	- 2 kV
L and N mains terminals	-	-	A	A	-	-
L and PE mains terminals	-	-	-	-	A	A
N and PE mains terminals	-	-	-	-	A	A
L and N measuring terminals	-	-	A	A	-	-
L and PE measuring terminals	-	-	-	-	A	A
N and PE measuring terminals	-	-	-	-	A	A

A ... Performance Criterion A (no function of the EUT was affected)

3.5. Immunity to Conducted Disturbances Induced by RF Fields

Requirement in	**ČSN EN 61326-1, table 2, ČSN EN 61000-6-2, table 3, point 3.1**
Testing method	**ČSN EN 61000-4-6**
Test specification	The conducted spurious signals were injected into main and measuring conductors using M3 CDN and to the COM cable using EM clamp. EUT was placed 0.1 m (0,33 ft.) above ground reference plane on the wooden table height of 0.8 m (2.63 ft.). EUT was in the operating mode during the test.
Results	**PASSED, Performance Criterion A**

Table 3.5.A – Field immunity test parameters and performance

	Frequencies	*AM*	*Mod. frequency*	*Severity level [V]*	*Performance*
Mains conductors	150 kHz – 80 MHz	80%	1 kHz	3	A
Measuring conductors	150 kHz – 80 MHz	80%	1 kHz	3	A
Cable COM	150 kHz – 80 MHz	80%	1 kHz	3	A

A ... Performance Criterion A (no function of the EUT was affected)

3.6. Short-time Breaks and Drop-outs of Supply Voltage

Requirement in	**ČSN EN 61326-1, Clause 6.2. table 2**
Testing method	**ČSN EN 61000-4-11**
Test specification	3 drops for each test level 10 s delay between drops EUT was in the operating mode during the test.
Results	**PASSED: Performance Criterion B**

Table 3.6.A – Supply voltage drop-out test parameters and performances

Environmental Effect	*Test Level*	*Time of Duration*	*Performance*
Short-time drop-out to	0 % U_{supply}	0.5 of period	A
Short-time drop-out to	0 % U_{supply}	1 periods	A
Short-time drop-out to	70 % U_{supply}	25 periods	A
Short-time break	0 % U_{supply}	250 periods	B

A ... Performance Criterion A (no function of the EUT was affected)

B ... Performance Criterion B (Reset of the EUT, function of the EUT was restored after the test)

3.7. Immunity to conducted differential mode disturbances and signalling

Testing method	**ČSN EN 61000-4-19, Clause 5.1.2, table 1**
Test specification	The conducted spurious signals were injected into main conductors using M3 CDN. EUT was placed on the wooden table height of 0.8 m (2.6 ft.). EUT was in the operating mode during the test.
Results	**PASSED, Performance Criterion A**

Table 3.7.A –conducted differential mode disturbance and signalling test parameters and performances

	Frequency band	*T_{pulse} [ms]*	*T_{pause} [ms]*	*Test level [V]*	*Performance*
Mains conductors	2 kHz up to 9 kHz	3000	300	12	A

4. CONCLUSIONS

ENA175 complies with requirements of the following regulations in the range of performed tests:

- EN 61326-1:2013
- EN 55011:2009 class A
- EN 61000-3-2:2014
- EN 61000-3-3:2013
- EN 61000-6-2:2005
- EN 61000-4-2:2008 criterion A
- EN 61000-4-3:2006 criterion A
- EN 61000-4-4:2012 criterion B
- EN 61000-4-5:2006 criterion A
- EN 61000-4-6:2009 criterion A
- EN 61000-4-11:20014 criterion B
- EN 61000-4-19:2014 criterion A

END OF THE REPORT