



## EMC Test Report

Reference number: EMC-190314/1

Customer: Piston Ltd.  
H 1033. Budapest, Szőlőkert út 4/B

Contact person: Tamas HANKO  
GSM: 36 30 9041329

Tested Product: Ergospirometer Type: PRE-201  
Prototype

Environmental conditions: Temperature: 20°C  
Humidity: 65%

Date of tests: 07/03/2014.

The tests were carried out by EMC Test Laboratory's engineers on behalf of T-Network Ltd Budapest, Hungary:

.....  
Geza RATKY

Laboratory Leader:

.....  
Sandor TATAR

The contact person participating in the tests considers the procedure convincing. The results verify the product's EMC compliance.

On behalf of Piston Limited Partnership:

.....  
Tamas HANKO

## Summary of the test results

| Description of the tests                                     | Limits and test levels of the related Standard                                   | Result   |
|--|--|--|
| <b>Disturbance emission tests</b>                            |  |  |
| Radiated RF emission test                                    | <b>EN 60601-1-2:2007</b><br><b>EN 55011:2009/A1:2010</b><br>30-1000MHz, Class A  | <b>Passed</b>  |
| Conducted disturbance voltage on AC lines                    | <b>EN 60601-1-2:2007</b><br><b>EN 55011:2009/A1:2010</b><br>0.15-30 MHz, Class A | <b>Passed</b>  |
| Mains frequency harmonics emission                           | <b>EN 60601-1-2:2007</b><br><b>EN 61000-3-2:2006/A1/A2:2009</b><br>100-2kHz      | <b>NA</b>  |
| Flicker  | <b>EN 60601-1-2:2007</b><br><b>EN 61000-3-3:2009</b>                             | <b>NA</b>  |
| <b>Immunity tests</b>  |  |  |
| Immunity against radiated RF disturbances                    | <b>EN 60601-1-2:2007</b><br>3V/m; 0.08-2.5GHz<br>Modulation: 1kHz, 80% AM        | <b>Passed</b><br><b>Evaluation:</b> operation in compliance with the specification |
| Immunity against conducted RF disturbances on AC power lines | <b>EN 60601-1-2:2007</b><br>3Veff; 0.15 – 80MHz<br>Modulation: 1kHz, 80% AM      | <b>Passed</b><br><b>Evaluation:</b> operation in compliance with the specification |
| Immunity against EFT signals                                 | <b>EN 60601-1-2:2007</b><br>±2kV between L, N, PE and ref. ground                | <b>Passed</b><br><b>Evaluation:</b> operation in compliance with the specification |
| Immunity against SURGE voltages                              | <b>EN 60601-1-2:2007</b><br>±1kV between L and N<br>±2kV between L-PE, N-PE      | <b>Passed</b><br><b>Evaluation:</b> operation in compliance with the specification |
| Immunity against voltage DIPS                                | <b>EN 60601-1-2:2007</b><br>100%,60%,30%<br>0.5, 5, 25 periods                   | <b>Passed</b><br><b>Evaluation:</b> operation in compliance with the specification |
| Immunity against short voltage interruptions                 | <b>EN 60601-1-2:2007</b><br>100% for 5 periods                                   | <b>Passed</b><br><b>Evaluation:</b> operation in compliance with the specification |
| Immunity against electrostatic discharges (ESD)              | <b>EN 60601-1-2:2007</b><br>±8kV air, ±6kV contact                               | <b>Passed</b><br><b>Evaluation:</b> operation in compliance with the specification |
| Immunity against mains frequency magnetic field              | <b>EN 60601-1-2:2007</b><br>50Hz, 3A/m   | <b>Passed</b><br><b>Evaluation:</b> operation in compliance with the specification |

Mains frequency harmonics emission measurement was not carried out because the consumption is less than 75W. Flicker measurement was omitted because no flicker was observed.

**The test results relate exclusively to the tested equipment, and are valid for equally manufactured products only!**

**Operational conditions during the tests:**

The equipment operated continuously during the tests in connection with a PC via 1,8 meter long USB cable. During the immunity tests the PC Service Program verified the right operation of the Ergospirometer.

**1. Radiated RF emission test**

The applied limit values are according to the related EN 55011:2009/A1:2010 Standard Class A.

**Test equipment**

| Device name       | Type                | S/N            | Calibration expires |
|-------------------|---------------------|----------------|---------------------|
| Spectrum Analyzer | Wayne Kerr SSA1000A | 000552         | 2016. March         |
| Receiver Antenna  | Sunol JB1           | A121307        | 2017. January       |
| Antenna MAST      | INN-CO, MA4000-EP   | 222/18061207/L | 2016. December      |
| MAST controller   | INN-CO, CO-2000     | 462/18061207/L | 2016. December      |
| Test Chamber      | T-Network Ltd. SAR  | -              | 2016. January       |

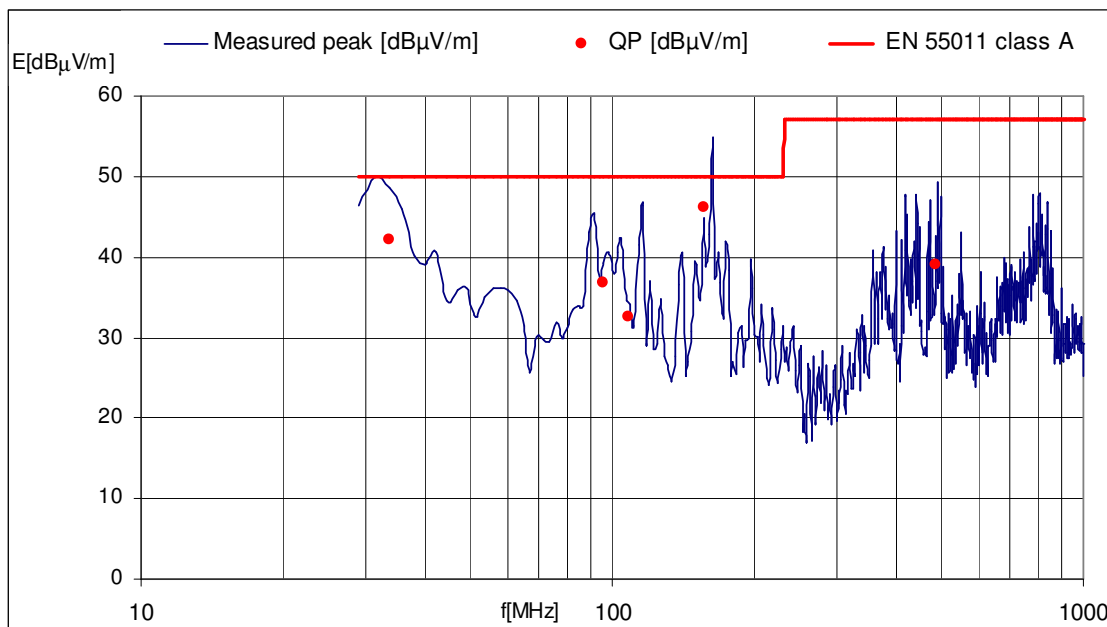
**Test setup and method:** as per EN 55022:2010, test distance 3m



The equipment's placement on the test site at 0° angle position

## 1.1 Radiated emission test results

The limit line relates to quasi peak measurement at 3m test distance and is calculated from values given for 10m in the EN 55011:2009/A1:2010 Standard.



| f [MHz] | QP [dBµV/m] | Polarization | Height [cm] | Angle [°] | Margin [dB] |
|---------|-------------|--------------|-------------|-----------|-------------|
| 96.02   | 36.8        | PV           | 152         | 0         | 13.2        |
| 156.01  | 46.2        | PV           | 104         | 0         | 3.8         |
| 33.55   | 42.3        | PV           | 144         | 180       | 7.7         |
| 107.99  | 32.5        | PH           | 210         | 180       | 17.5        |
| 485.99  | 39.0        | PH           | 104         | 180       | 18.0        |

### Evaluation of the test result:

The equipment fulfils the EN 55011:2009/A1:2010 Standard requirements.

## 2. Conducted disturbance emission measurement on AC power lines

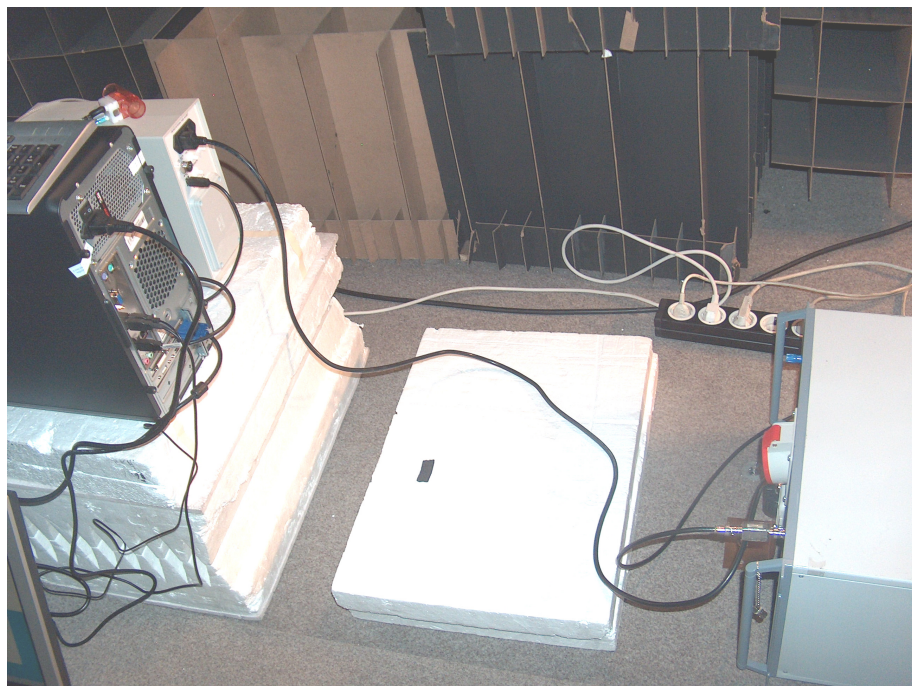
Test method is according to the related EN 55022:2010 Standard.

The applied limit values are according to the EN 55011:2009/A1:2010 Standard Class A.

### Test equipment

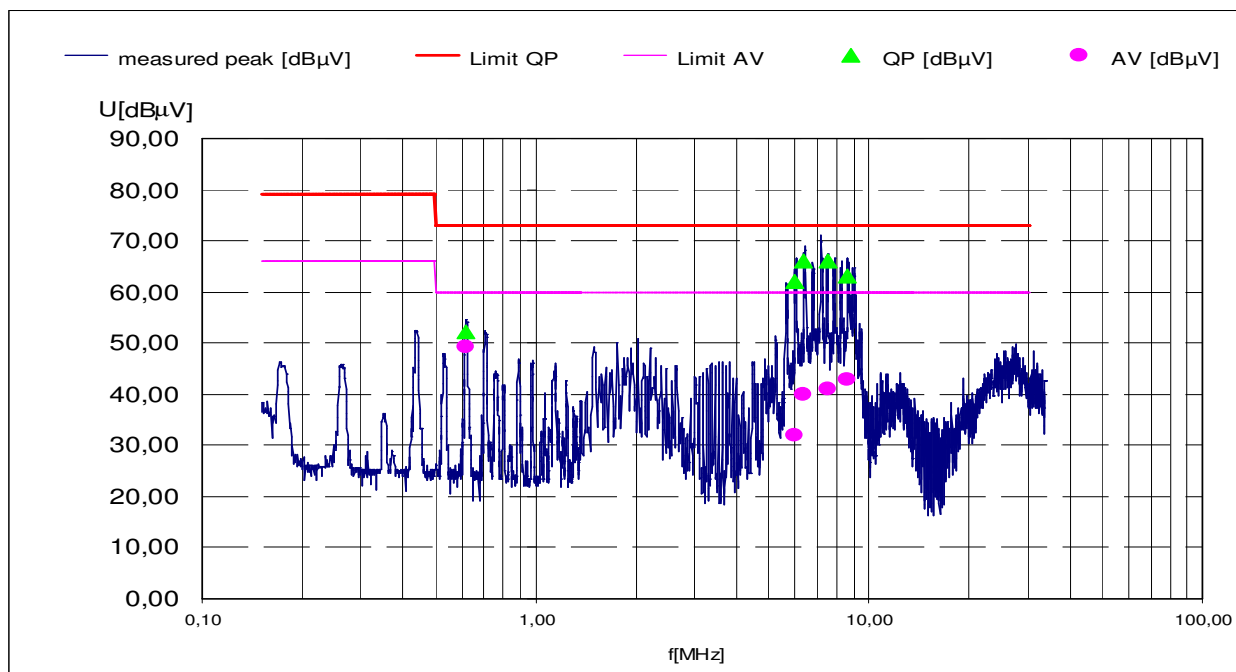
| Device name       | Type                | S/N         | Calibration expires |
|-------------------|---------------------|-------------|---------------------|
| Spectrum Analyzer | Wayne Kerr SSA1000A | 000552      | 2016. March         |
| LISN              | AFJ LT32            | 32030750159 | 2016. December      |
| Test Chamber      | T-Network Ltd. FAR  | -           | 2016. January       |

**Test setup:** Line Impedance Stabilizer Network (LISN) was applied as per EN 55022:2010 Standard, the disturbance voltages were measured on the internal test points of LISN.



The equipment's placement on the test site

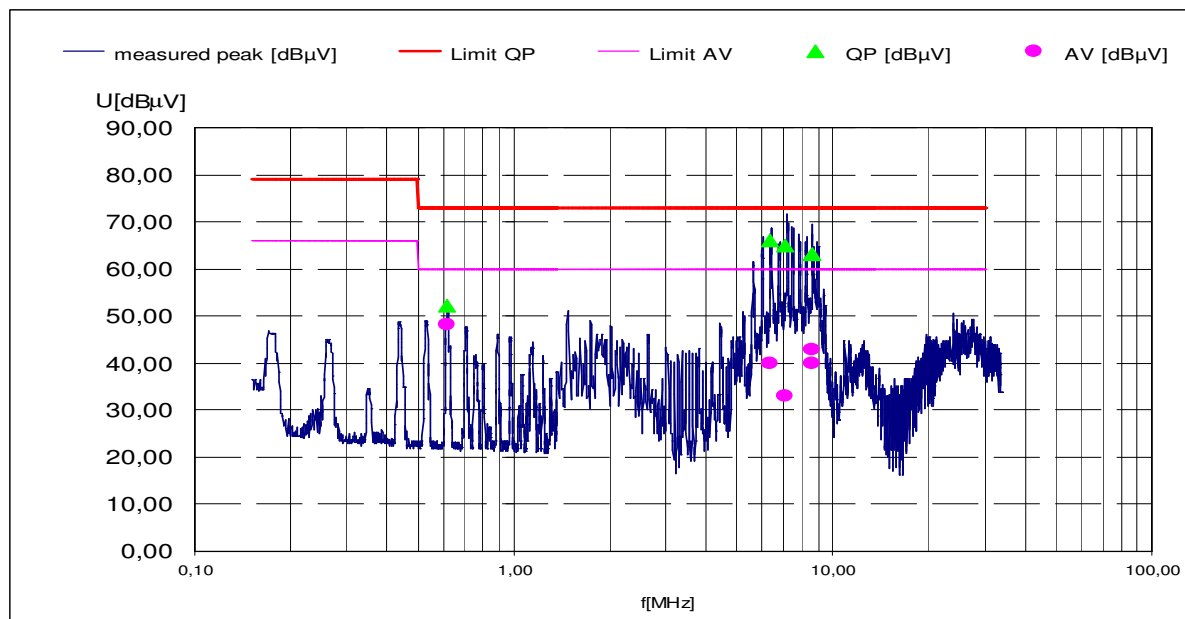
## 2.1 Result of conducted disturbance emission test on line N



| f [MHz] | QP [dBμV] | AV [dBμV] | QP [dBμV] | AV [dBμV] | QP [dB] | AV [dB] |
|---------|-----------|-----------|-----------|-----------|---------|---------|
| 0.62    | 52.2      | 49.2      | 73.0      | 60.0      | 20.8    | 10.8    |
| 6.00    | 62.0      | 32.0      | 73.0      | 60.0      | 11.0    | 28.0    |
| 6.39    | 66.0      | 40.0      | 73.0      | 60.0      | 7.0     | 20.0    |
| 7.51    | 66.0      | 41.0      | 73.0      | 60.0      | 7.0     | 19.0    |
| 8.65    | 63.0      | 43.0      | 73.0      | 60.0      | 10.0    | 17.0    |



## 2.2 Result of conducted disturbance emission test on line L



| f [MHz] | QP [dBµV] | AV [dBµV] | QP [dBµV] | AV [dBµV] | QP [dB] | AV [dB] |
|---------|-----------|-----------|-----------|-----------|---------|---------|
| 0.62    | 52.2      | 48.2      | 73.0      | 60.0      | 20.8    | 11.8    |
| 6.38    | 66.0      | 40.0      | 73.0      | 60.0      | 7.0     | 20.0    |
| 7.13    | 65.0      | 33.0      | 73.0      | 60.0      | 8.0     | 27.0    |
| 8.64    | 63.0      | 43.0      | 73.0      | 60.0      | 10.0    | 17.0    |
| 8.63    | 63.0      | 40.0      | 73.0      | 60.0      | 10.0    | 20.0    |

### Evaluation of the test result:

The equipment fulfils the EN 55011: 2009/A1:2010 Standard's requirements.

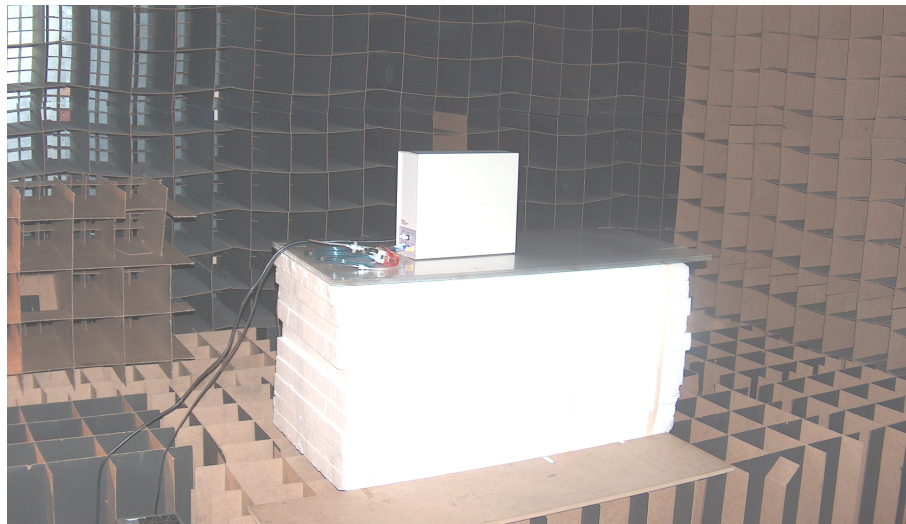
### 3. Immunity test against radiated RF disturbances

Test method is according to the related EN 61000-4-3:2006/A1:2008/A2:2010 Standard.

Test signal: 3 V/m, 0.08-2.5 GHz, modulation 1 kHz 80% AM as per EN 60601-1-2:2007 Standard.

#### Test equipment

| Device name           | Type                     | S/N         | Calibration expires |
|-----------------------|--------------------------|-------------|---------------------|
| Signal Generator      | R&S SMG 100 kHz-1000 MHz | 883 210/067 | 2016. September     |
| Power Amplifier       | AR PST 1-2 GHz           | 11747       | -                   |
| Power Amplifier       | HP 491C 2-4 GHz          | 1223-5286   | -                   |
| Power Amplifier       | Frankonia FLH20B         | 1084        | -                   |
| Test Chamber          | T-Network Ltd. FAR       | -           | 2016. January       |
| Sweep Generator       | HP8350A                  | 25209       | -                   |
| RF-Plug in            | HP 83592B 10 MHz-20 GHz  | 25562       | -                   |
| LF Generator          | HP3310A                  | 22513       | -                   |
| Antenna (1-18GHz)     | TN/DRH                   | 01/2005     | -                   |
| Antenna (80-1000 MHz) | TN/Logper                | 1/2008      | -                   |
| Electric Field Probe  | Narda EP300              | 000WJ70717  | 2016. December      |



The equipment's placement on the test site

**Evaluation of the test result:** The equipment operated perfectly during the test.

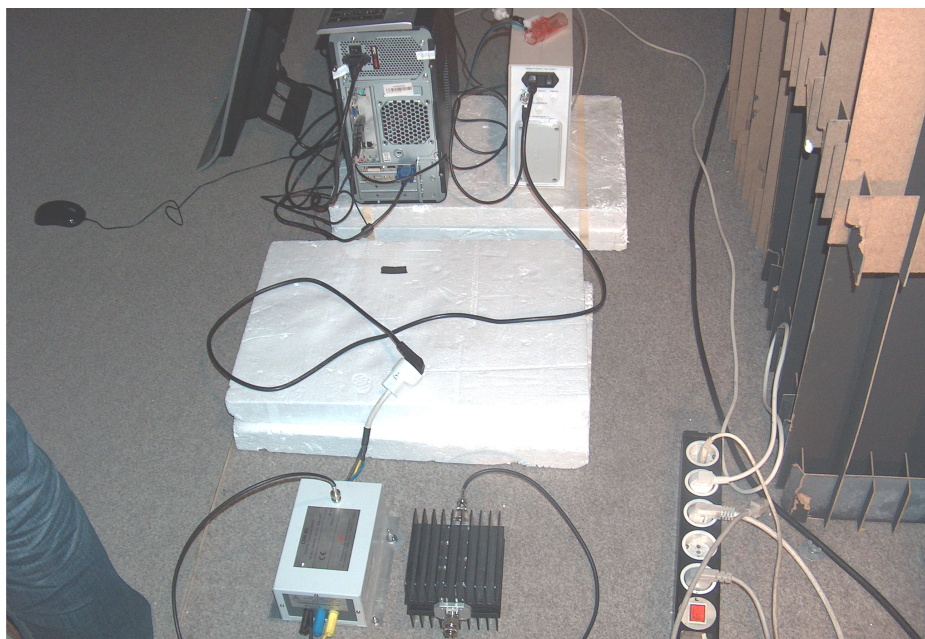
#### **4. Immunity test against conducted electromagnetic disturbances**

Test method is according to the related EN 61000-4-6:2009 Standard.

Test signal: 3 Veff, 0.15-80 MHz, modulation 1 kHz 80% AM as per EN 60601-1-2:2007 Standard.

#### **Test equipment**

| Device name    | Type                | S/N      | Calibration expires |
|----------------|---------------------|----------|---------------------|
| Test Generator | Frankonia CIT 10/75 | 102D1320 | 2016. December      |
| CDN            | Frankonia CDN-M3    | A3003063 | 2016. December      |
| Test Chamber   | T-Network Ltd. FAR  | -        | 2016. January       |



The equipment's placement on the test site

**Evaluation of the test result:** The equipment operated perfectly during the test.

## 5. Immunity against mains frequency magnetic field

Test method is according to the related EN 61000-4-8:2010 Standard.  
The applied test level: 3 A/m

### Test equipment

| Device name  | Type               | S/N | Calibration expires |
|--------------|--------------------|-----|---------------------|
| Test Coil    | Helmholtz          | 01  | 2014. May           |
| Test Chamber | T-Network Ltd. FAR | -   | 2016. January       |



The equipment's placement on the test site

**Evaluation of the test result:** The equipment operated perfectly during the test.

## 6. Immunity against mains frequency electric fast transients (EFT)

Test method is according to the related EN 61000-4-4:2005/A1:2010 Standard.  
The applied test level:  $\pm 2$  kV between L, N, PE and ground as per EN 60601-1-2:2007 Standard.

### Test equipment

| Device name    | Type                 | S/N | Calibration expires |
|----------------|----------------------|-----|---------------------|
| Test Generator | EMC Partner TRA-2000 | 969 | 2016. December      |
| Test Chamber   | T-Network Ltd. FAR   | -   | 2016. January       |

**Test setup:** As per EN 61000-4-4:2005/A1:2010 Standard the test signals were coupled to the power lines via the internal couplers of TRA-2000 test generator.

**Evaluation of the test result:** The equipment operated perfectly during the test.





## 7. Immunity test against over-voltage (SURGE)

Test method is according to the related EN 61000-4-5:2007 Standard.

The applied test level:  $\pm 1$  kV between L-N and  $\pm 2$  kV between L, N-PE as per EN 60601-1-2:2007 Standard.

### Test equipment

| Device name   | Type                 | S/N | Calibration expires |
|---------------|----------------------|-----|---------------------|
| CWG Generator | EMC Partner TRA-2000 | 969 | 2016. December      |
| Test Chamber  | T-Network Ltd. FAR   | -   | 2016. January       |

**Test setup:** As per EN 61000-4-5:2007 Standard, the test signals were coupled to the power lines via the internal couplers of TRA-2000 test generator.

**Evaluation of the test result:** The equipment operated perfectly during the test.

## 8. Immunity test against AC voltage DIPs and short interruptions

Test method is according to the related EN 61000-4-11: 2005 Standard.

The applied test levels are according to the related EN 60601-1-2:2007 Standard.

| Test level     | 30% DIP | 60% DIP | 100% DIP | Interruption |
|----------------|---------|---------|----------|--------------|
| Test time [s]  | 60      | 60      | 60       | 60           |
| Repetition [s] | 10      | 10      | 10       | 10           |
| Duration [ms]  | 500     | 100     | 10       | 100          |
| Start          | 0°      | 0°      | 0°       | 0°           |
| Stop           | 0°      | 0°      | 0°       | 0°           |

### Test equipment

| Device name   | Type                 | S/N | Calibration expires |
|---------------|----------------------|-----|---------------------|
| CWG Generator | EMC Partner TRA-2000 | 969 | 2016. December      |
| Test Chamber  | T-Network Ltd. FAR   | -   | 2016. January       |

**Evaluation of the test result:** The equipment operated perfectly during the test.

## 9. Electrostatic Discharge (ESD) Test

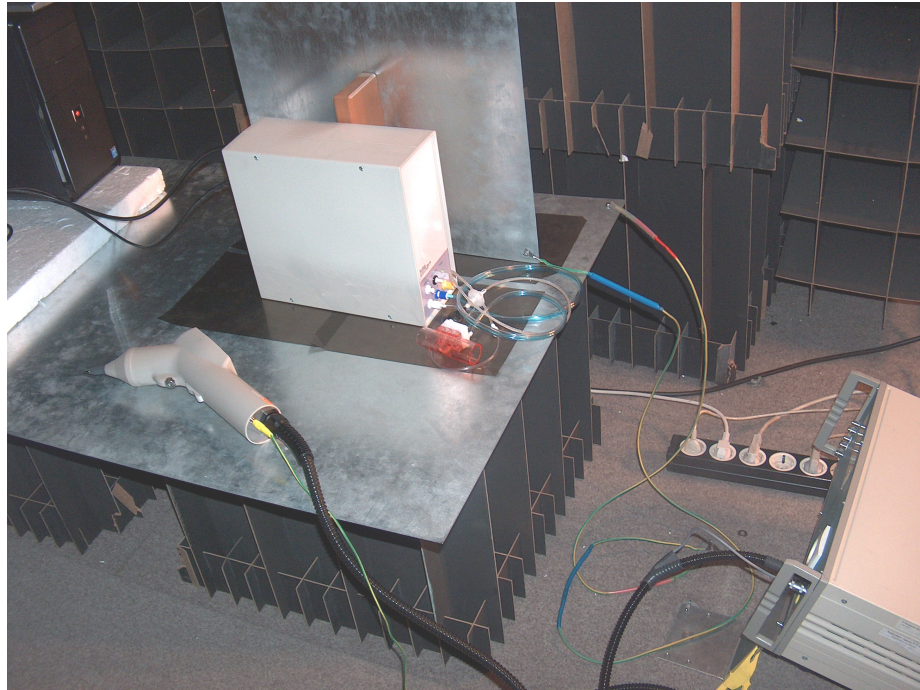
Test method is according to the related EN 61000-4-2:2009 Standard.

The applied test voltages are according to the EN 60601-1-2:2007 Standard.

### Test equipment

| Device name   | Type                 | S/N  | Calibration expires |
|---------------|----------------------|------|---------------------|
| CWG Generator | EMC Partner TRA-2000 | 969  | 2016. December      |
| ESD Pistol    | EMC Partner ESD2000  | 0360 | 2015. Augustus      |
| Test Chamber  | T-Network Ltd. FAR   | -    | 2016. January       |

$\pm 6$  kV indirect discharges were applied ten times at 4 sides of the equipment to the horizontal and vertical coupling plate and to the touchable conductive parts of the equipment, further  $\pm 8$  kV air discharges were performed ten times to the touchable non conductive parts of the equipment accordingly to the related Standard.



The equipment's placement on the test site

**Evaluation of the test result:** The equipment operated perfectly during the test.