

# EMC TEST REPORT

No.1216688-1, Ed. 1

## Electromagnetic disturbances

### EQUIPMENT UNDER TEST

Equipment : Wine cooler  
Type / model : W185 and W155  
Manufacturer : VESTFROST A/S  
Tested by request of : VESTFROST A/S

### SUMMARY

Referring to the emission limits, the performance criteria and the operating mode during the tests specified in this report the equipment complies with the requirements according to the following standards.

EN 61 000-6-1 (2007)  
EN 61 000-6-3 (2007)

The equipment complies provided that the modifications described in section 2.3 are implemented.

Date of issue: August 14, 2012

Tested by:

  
Leif Hinnelund

Approved by:

  
Hans Kohlén

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**Revision History**

Edition.	Date	Description
1	2012-08-14	First release

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**1. CLIENT INFORMATION**

The EUT has been tested by request of

Company: VESTFROST A/S  
 Falkevej 12  
 DK-6705 Esbjerg Ö  
 Denmark

Name of contact: Jørn Skov

**2. EQUIPMENT UNDER TEST (EUT)**

**2.1 Identification of the EUT**

Equipment: Wine cooler  
 Type/Model: W185 and W155  
 Tested type: W185  
 Serial number: 20122559853  
 Manufacturer: VESTFROST A/S  
 Rating: 220-240 V AC, 50 Hz, 200 W  
 Class: I

**2.2 Additional information about the EUT**



The EUT was tested in a table top configuration.

The EUT was tested with the following cables:

Cable	Type	Length
Mains power	Three-core	2 m

### 2.3 Modifications made to improve EMC:

These modifications were required to obtain the results presented in this report.  
The LED PSU shall be of type LPV-20-12 manufactured by Mean Well.

### 2.4 Opinions and Interpretations

This test report covers an alternative type W155, presumed to have the same EMC-characteristics as previously tested type.

According to the manufacturer, the alternative type is W155 identical to tested type except for the following differences:

The differences are only difference size of cabinet.

The differences are considered not to imply different EMC-characteristics compared to tested type. Therefore, this type is not tested, but considered to have the same EMC-characteristics as the tested type.

### 3. TEST SPECIFICATIONS

#### 3.1 Standards

EN 61000-6-1 (2007): Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments

EN 61000-6-3 (2007): Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments

The standards above refer to basic standards. These are found in section 4, Test Summary, by name and edition.

#### 3.2 Additions, deviations and exclusions from standards and accreditation

EN 61000-4-3: (2006) +A1: Increased test level, 3 V/m between 2,0 GHz and 2,7 GHz

The following standard versions were applied:

Referenced:	Applied:
EN 61000-3-2 (2006)	EN 61000-3-2 (2006) + A1 (2009)+ A2 (2009)
EN 61000-3-3 (1995) + corr. (1997)	EN 61000-3-3 (2008)
EN 61 000-4-2 (1995)	EN 61 000-4-2 (2009)
EN 61 000-4-3 (2006)	EN 61 000-4-3 (2006) + A1 (2008) + A2 (2010)
EN 55014 -1 (2006)	EN 55014-1 (2006) + A1 (2009)
EN 55016-2-1 (2004)	EN 55016-2-1 (2004) + A1 (2005)

No other additions, deviations or exclusions have been made from standards and accreditation.

#### 3.3 Mode of operation during the test

The EUT was supplied with 230 V AC, 50 Hz.

The EUT was tested in normal operation.

### 3.4 Compliance

The EUT shall comply with the emission limits of EN 61000-6-3 (2007).

#### Conducted emission AC power port:

AC Power port Frequency [MHz]	Limits	
	Quasi-peak [dB $\mu$ V]	Average [dB $\mu$ V]
0,15-0,50	66-56*	56-46*
0,50-5,00	56	46
5,00-30,00	60	50

At transitional frequencies the lower limit applies.  
\*The limits decreases linearly with the logarithm of the frequency

#### Radiated emission at 3 m:

10 m distance Frequency [MHz]	Limits Quasi-peak [dB $\mu$ V/m]
30-230	30
230-1000	37

At transitional frequencies the lower limit applies.

The performance criteria are based on the general criteria in the standard, and derived from the product specification.

#### Criterion A:

The apparatus shall continue to operate as intended during the test. No degradations of performance characteristics are allowed. Compressor, fans and LEDs are not allowed to be affected in any way.

#### Criterion B:

The apparatus shall continue to operate as intended after the test. During testing, degradations of performance characteristics are allowed. Compressor, fans and LEDs can be affected temporarily during the test but must automatically return to original state after the test.

#### Criterion C:

Temporary loss of function is allowed during test, provided the function is self-recoverable or can be restored by the operation of the controls. Compressor, fans and LEDs can be affected during the test.

### 3.5 Performance verification

The test engineer continuously observed the EUT visually and by measuring the input current.

#### Verification equipment

Equipment	Manufacturer	Type	Semko Inv. No.
Ammeter	GOERZ	324768	1101

#### 4. TEST SUMMARY

The test has been carried out at the Intertek Semko AB premises in Kista, Sweden.  
The results in this report apply only to sample tested:

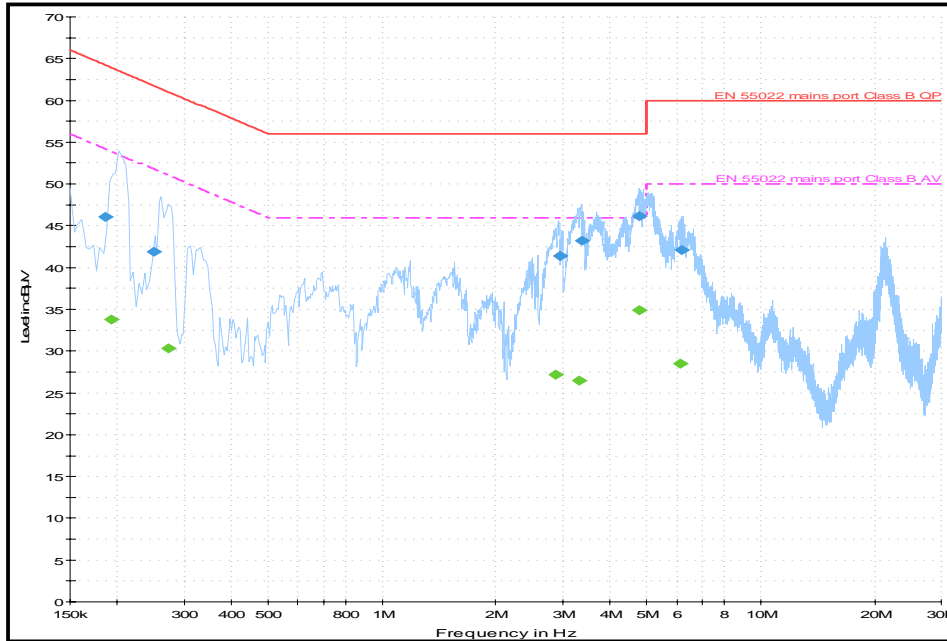
Basic standard	Description	Result
<b>Emission</b>		
<b>EN 55 016-2-1 (2004)</b>	<b>AC power port continuous disturbance voltage in the frequency range 0,15 MHz to 30 MHz</b>  The EUT comply with Class B limits. The margin to the Quasi-Peak limit was at least 9,8 dB, found at 4,772 MHz. The margin to the Average limit was at least 11,1 dB, found at 4,764 MHz. See diagram 1 and table 1.	<b>PASS</b>
<b>EN 55 014-1 (2006) +A1</b>	<b>AC power port discontinuous disturbance voltage in the frequency range 0,15 MHz to 30 MHz</b>  The EUT complies with the limits. See table 2.	<b>PASS</b>
<b>EN 55 016-2-3 (2006)</b>	<b>Radiated electromagnetic field in the frequency range 30 MHz to 1000 MHz</b>  The EUT complies with the Class B limits. The margin to the limit was at least 7,2 dB found at 62,472 MHz. See diagram 2 and table 3.	<b>PASS</b>
<b>EN 61 000-3-2 (2006) +A1</b>	<b>Harmonics</b>  The EUT complies with the limits for Class A equipment. The margin to the limit was at least 82 %, harmonic number 17. See table 4.	<b>PASS</b>
<b>EN 61 000-3-3 (2008)</b>	<b>Voltage fluctuations – flicker</b>  The EUT complies with the limits of the standard. See table 5.	<b>PASS</b>



Basic standard		Result
<b>Immunity</b>		
<b>EN 61 000-4-2 (2009)</b>	<b>Electrostatic discharge</b> Test level $\pm 2$ kV, $\pm 4$ kV contact discharges and $\pm 2$ kV, $\pm 4$ kV $\pm 8$ kV air discharges. The EUT operated without any degradation during the test. The EUT complies with the performance criterion A. Se section 6 for selected test points.	<b>PASS</b>
<b>EN 61 000-4-3 (2006) +A1</b>	<b>Radiated electromagnetic fields in the frequency range 80 – 2700 MHz</b> Test level 3 V/m with 80 % AM @ 1 kHz. The EUT operated without any degradation during the test The EUT complies with the performance criterion A.	<b>PASS</b>
<b>EN 61 000-4-4 (2004)</b>	<b>Fast transient/burst</b> Test level: $\pm 1$ kV on AC power port. The EUT operated without any degradation during the test. The EUT complies with the performance criterion A	<b>PASS</b>
<b>EN 61 000-4-5 (2006)</b>	<b>Surge</b> Test level: $\pm 0,5$ kV, $\pm 1$ kV and $\pm 2$ kV CM and $\pm 0,5$ kV and $\pm 1$ kV DM on AC power port. The EUT operated without any degradation during the test. The EUT complies with the performance criterion A.	<b>PASS</b>
<b>EN 61 000-4-6 (2009)</b>	<b>Conducted disturbances induced by rf-fields in the frequency range 0,15 MHz – 80 MHz</b> Test level 3 V with 80 % AM @ 1 kHz. The EUT operated without any degradation during the test The EUT complies with the performance criterion A.	<b>PASS</b>
<b>EN 61 000-4-8 (1993)</b>	<b>Power frequency magnetic fields</b> Test level: 3 A/m with the field in three orientations.	<b>Not applicable</b>
<b>EN 61 000-4-11 (2004)</b>	<b>Voltage dips and interruptions</b> Reduction: 100 % for 10 ms, pos, criterion B Reduction: 100 % for 10 ms, neg, criterion B Reduction: 100 % for 20 ms, criterion B Reduction: 30 % for 500 ms, criterion C Reduction: 100 % for 5 s, criterion C The EUT complies with the performance criteria.	<b>PASS</b>

**5. TABLES AND DIAGRAMS**

**Diagram 1, Conducted emission, continuous disturbance voltage, AC power port, Peak overview sweep**



**Table 1, Conducted emission, continuous disturbance voltage, AC power port, Measurement results**

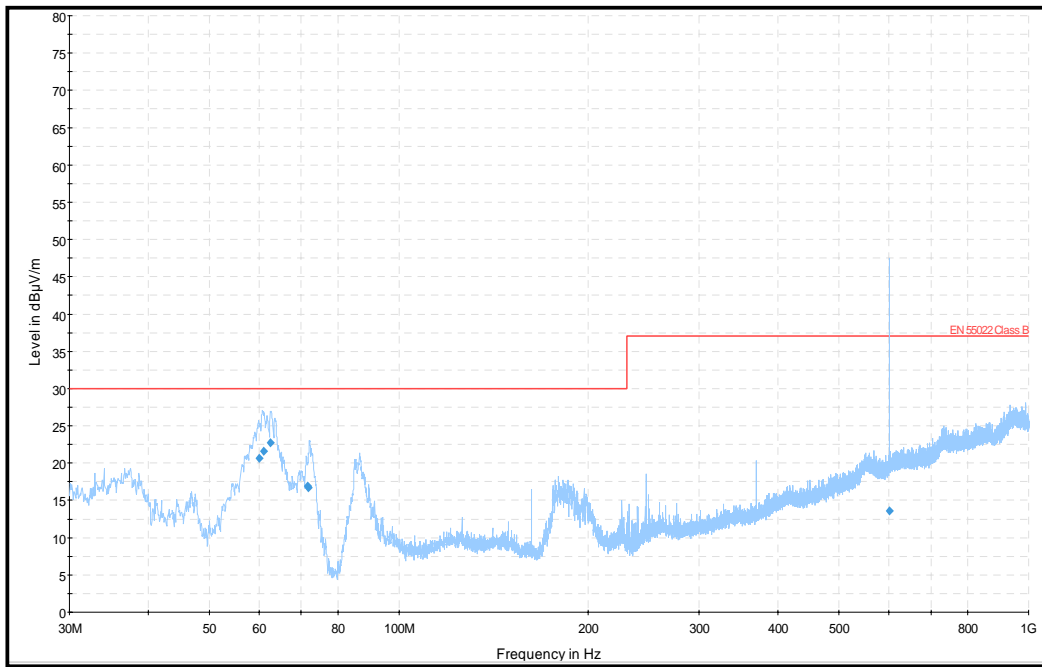
Frequency [MHz]	Quasi-Peak		Margin [dB]
	Disturbance level [dBµV]	Limit [dBµV]	
0,185	46,1	64,2	18,2
0,249	41,9	61,8	19,9
2,941	41,4	56,0	14,6
3,369	43,2	56,0	12,8
4,772	46,2	56,0	9,8
6,172	42,1	60,0	17,9

Frequency [MHz]	Average		Margin [dB]
	Disturbance level [dBµV]	Limit [dBµV]	
0,193	33,8	53,9	20,1
0,272	30,3	51,0	20,7
2,873	27,2	46,0	18,8
3,313	26,5	46,0	19,5
4,764	34,9	46,0	11,1
6,128	28,5	50,0	21,5

**Table 2, Conducted emission, discontinuous disturbance voltage, AC power port, Measurement results**

Frequency (MHz)	0,15	0,50	1,40	30,00
Limit for continuous interference (dB $\mu$ V)	66	56	56	60
Setting DIA 1512D	7	29	29	6
Branch	Worst case			
Counted click < 10 ms	7	29	29	6
Counted click > 10 ms	0	0	0	0
Sum of counted click, Sum ( $n_1$ )	7	29	29	6
Factor f	0,5	0,5	0,5	0,5
Click rate N; $N = f * n_1 / T$	0,06	0,24	0,24	0,05
Complies with the limit (Yes/No)	Yes	Yes	Yes	Yes

**Diagram 2, Radiated emission, Peak overview sweep, 10 m**



**Table 3, Radiated emission, Measurement results, 10 m**

Frequency [MHz]	Quasi-Peak		Margin [dB]
	Disturbance level [dBµV/m]	Limit [dBµV/m]	
59,989	20,6	30,0	9,4
61,069	21,6	30,0	8,4
62,472	22,8	30,0	7,2
71,694	16,9	30,0	13,1
71,759	16,7	30,0	13,3
601,581	13,6	37,0	23,4

**Table 4, Harmonics, Measurement results**

Voltage (V):	231,4
Active power (W):	116
Input current (mA):	548
Fundamental current (mA):	515
Power factor:	0,91
Test observation time, T <sub>obs</sub> (min):	1
Repeatability	Pass

Harmonic order N	Level average reading (mA)	Average Limit (mA)	Level Max reading (mA)	Max Limit (mA)
2	11	1080	11	1620
3	84	2300	84	3450
5	77	1140	77	1710
7	74	770	74	1150
9	76	400	76	600
11	75	330	75	495
13	51	210	51	315
15	34	150	34	225
17	23	132	23	199
19	19	118	19	178
21	18	161	18	161
23	18	147	18	147
25	18	135	18	135
27	17	125	17	125
29	16	116	16	116

**Table 5, Voltage fluctuations, Measurement results**

Parameter	Measured	Limit
P <sub>st</sub>	0,48	1,00
P <sub>lt</sub>	0,35	0,65
d <sub>c</sub>	0,1	3,30
d <sub>max</sub> (%)	2,17	4,00
d <sub>t</sub> (ms)	0	500

**6. IMMUNITY TO ESD – SELECTED TEST POINTS**



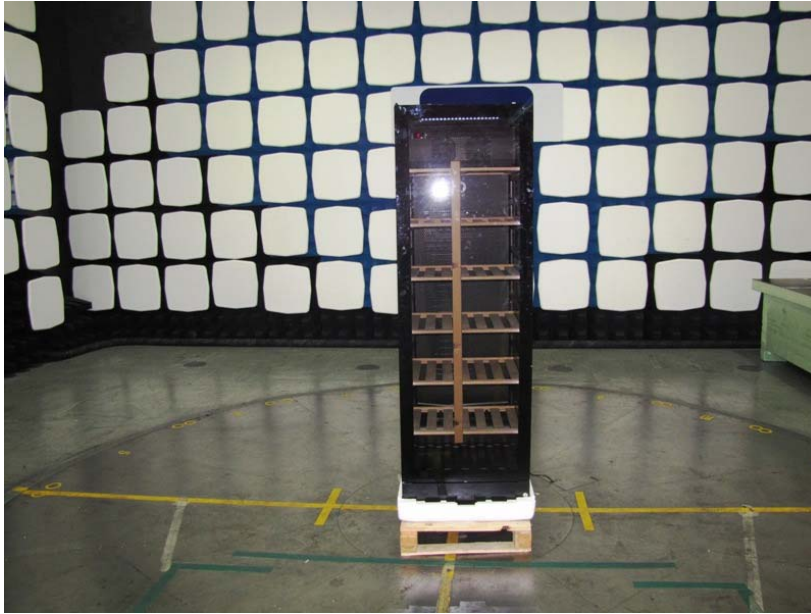
Test points Contact- and Air- Discharge



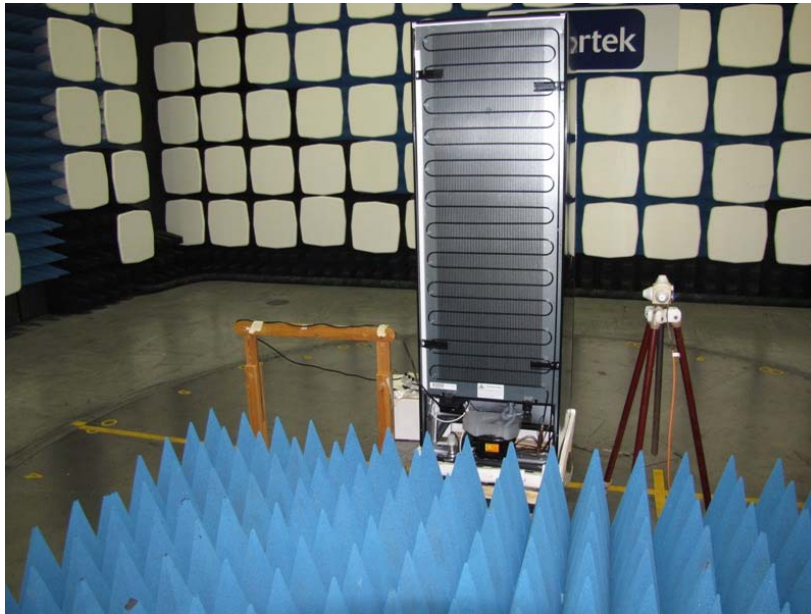
Test points Contact- and Air- Discharge



**7. PHOTOS**

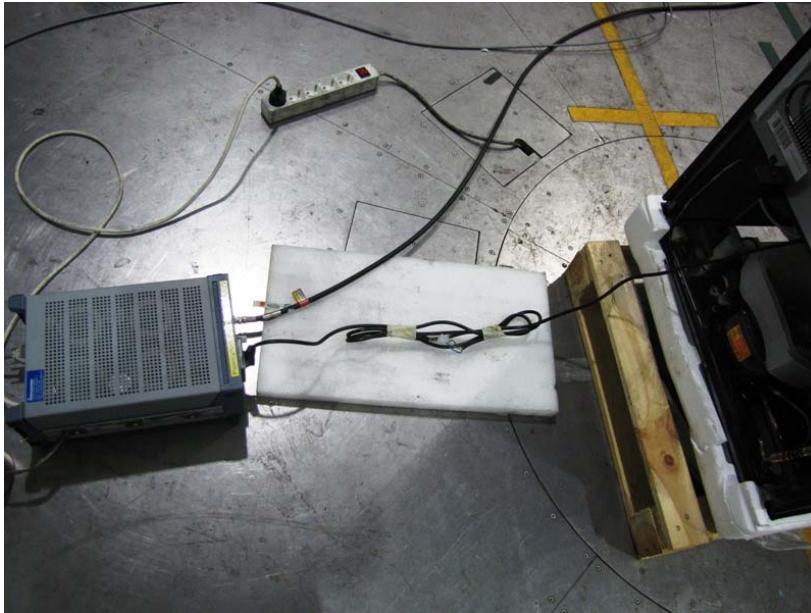


**Figure 1; Set-up for radiated emission test. 10m.**



**Figure 2; Set-up for radiated immunity test rear side.**

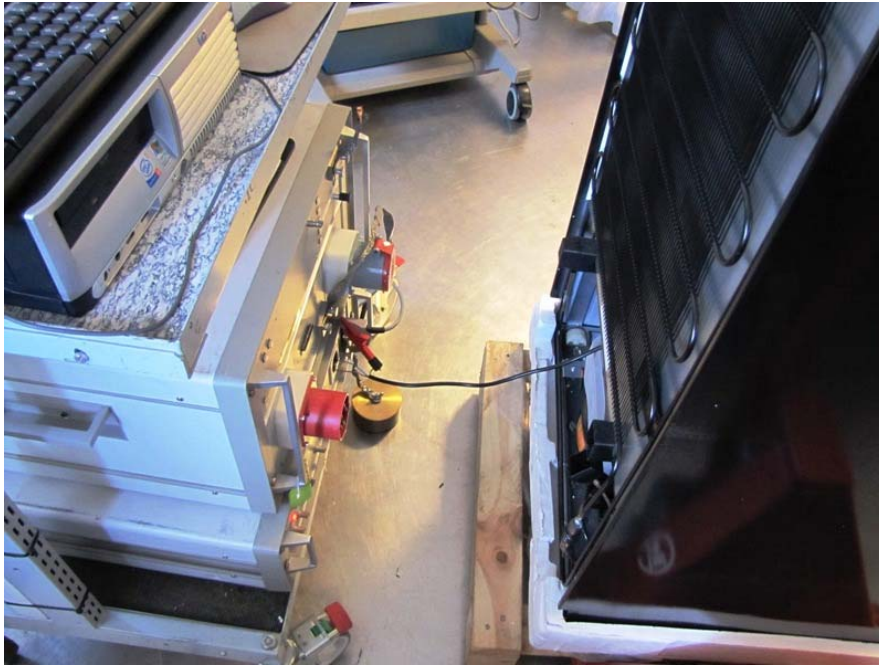




**Figure 3; Set-up for conducted emission test.**



**Figure 4; Set-up for conducted immunity test.**



**Figure 5; Set-up for Burst test.**



**Figur 6: Set up for Surge test**

## 8. INTERTEK SEMKO EMC CENTER MEASUREMENT UNCERTAINTIES

All uncertainties are given with a level of confidence of approximately 95% (k=2) and are the maximum values within the complete range. Measurement uncertainties are calculated in accordance with EA-4/02:1997.

Continuous conducted disturbances with AMN in the frequency range 9 kHz to 30 MHz	± 3,6 dB
Measurement uncertainty for discontinuous conducted disturbances	± 3,8 dB
Measurement uncertainty for radiated disturbance Uncertainty for the frequency range 30 to 1000 MHz at 10 m	± 4,6 dB
Measurement uncertainty for harmonics	± 1,3 %
Measurement uncertainty for voltage fluctuations, $d_{max}$ , $d_c$ and $d(t)$	± 3,7 %
Measurement uncertainty for flicker, $P_{st}$ and $P_{it}$	± 6,9 %
Measurement uncertainty for ESD immunity test	The generator meets the specified requirement in the standard
Measurement uncertainty for radiated immunity in the frequency range 26 MHz - 6 GHz 3 V/m	± 0,7 V/m / ± 1,9 dB
Measurement uncertainty for fast transient/burst immunity tests	The generator meets the specified requirement in the standard
Measurement uncertainty for surge immunity test	The generator meets the specified requirement in the standard
Measurement uncertainty for immunity to conducted disturbances CDN 3 V	± 0,7 V / ± 2,0 dB
Measurement uncertainty for power frequency magnetic field immunity test	± 29 %
Measurement uncertainty for voltage dips, short interruptions and voltage variations Time	± 4,6 %
Voltage	± 6,4 %