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2019-06-06

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## Prüfbericht / Test Report

Nr. / No. TR-01669-54257-01 (Edition 01)

Auftraggeber <i>Applicant</i>	Promatis GmbH
Geräteart <i>Type of equipment</i>	Control module
Typenbezeichnung <i>Type designation</i>	PP-418
Seriennummer / <i>Serial number</i>	---
Auftragsnummer / <i>Order No.</i>	--
Prüfgrundlage <i>Test standards</i>	EN 61000-6-3:2007/A1: 2011 EN 61000-3-2:2014 EN 61000-3-3:2013 EN 61000-6-2:2005

Trade Register Munich  
HRB 85742  
VAT ID No. DE129484267  
Information pursuant to Section 2(1)  
DL-InfoV (Germany) at  
[www.tuev-sued.com/imprint](http://www.tuev-sued.com/imprint)

Managing Directors:  
Dr. Peter Havel (CEO)  
Dr. Jens Butenandt

Phone: +49 9421 55 22-0  
Fax: +49 9421 55 22-99  
[www.tuev-sued.de](http://www.tuev-sued.de)



DAkkS  
Deutsche  
Akkreditierungsstelle  
D-PL-11321-11-02

TÜV SÜD Product Service GmbH

Äußere Frühlingsstraße 45  
94315 Straubing  
Germany



**Summary**

<b>Prüfergebnisse / Test Results</b>	Auftragsnummer / Order No. --
--------------------------------------	----------------------------------

Die Prüfungen wurden nach folgenden Vorschriften durchgeführt:  
 Tests were performed according to:  
**EN 61000-6-3:2007/A1: 2011**  
**EN 61000-3-2:2014**  
**EN 61000-3-3:2013**  
**EN 61000-6-2:2005**

Durchgeführte Prüfung Test performed	Prüfergebnis Test result
Emission - Enclosure port	Pass
Emission - DC power port	Pass
Harmonic current emission	Pass
Flicker	Pass
Immunity - Enclosure ports - Power-frequency magnetic	Pass
Immunity - Enclosure ports - Radio-frequency electromagnetic field. Amplitude modulated	Pass
Immunity - Enclosure Port - Electrostatic Discharge	Pass
Immunity - Input and output DC power ports - Radio-frequency common mode	Pass
Immunity - Input and output DC power ports - Surges	N/A
Immunity - Input and output DC power ports - Fast transients	Pass
Immunity - Input and output AC power ports - Radio-frequency common mode	Pass
Immunity - Input and output AC power ports - Voltage dips	Pass
Immunity - Input and output AC power ports - Voltage interruptions	Pass
Immunity - Input and output AC power ports - Surges	Pass
Immunity - Input and output AC power ports - Fast transients	Pass

**Bemerkungen / Remarks:**  
 ---

Die Prüfergebnisse beziehen sich ausschließlich auf das zur Prüfung vorgestellte Prüfmuster. Ohne schriftliche Genehmigung des Prüflabors darf der Prüfbericht auszugsweise nicht vervielfältigt werden. The test results relate only to the individual item which has been tested. Without the written approval of the test laboratory this report may not be reproduced in extracts.

Datum / Date	Geprüft von / Tested by	Freigabe durch / Checked by	<b>Prüfergebnis / Test Result</b>  <b>Pass</b>
2019-06-06	<i>C. Haimel</i> Christopher Haimel Responsible for testing	<i>Hannes Adelsberger</i> Hannes Adelsberger Reviewer	



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## 1 Administrative Data

### Application details

Applicant:	Promatis GmbH Andrije Zaje 35 10 000 Zagreb Croatia
Contact person:	Zdenko Pavic
Order number:	--
Receipt of EUT:	2019-03-07
Date(s) of test:	2019-04-25 - 2019-06-06
Note(s):	---
Responsible for testing:	Christopher Haimerl
Responsible for test report:	Christopher Haimerl
Test report checked by:	Hannes Adelsberger

### Report details

Report number:	TR-01669-54257-01
Edition:	01
Issue date:	2019-06-06



## 2 Details about the Test Laboratory

### Details about the Test Laboratory

Company name:	TÜV SÜD Product Service GmbH
Address:	Äußere Frühlingstraße 45 D-94315 Straubing Germany
Laboratory accreditation:	DAkKS Registration No. D-PL-11321-11-02
Contact:	Mr. Markus Biberger
	Phone: +49 9421 5522-0 Fax: +49 9421 5522-99

### 3 Description of the Equipment Under Test

Equipment characteristics	
Type designation:	PP-418
Parts of the system:	---
Options and accessories:	---
Type of equipment:	Control module
Manufacturer:	Promatis GmbH
Serial number:	---
Build status:	April 2018
Power supply:	Battery supply Nominal: 24 V Minimum: --- Maximum: --- Nominal frequency: DC
Highest internal frequency:	< 108 MHz

## Marking Plate(s)

Marking Plate



### 3.1 Modification Record

The table below details modifications made to the EUT during the test programme. The modifications incorporated during each test are recorded on the appropriate test pages.

<i>Modification State</i>	<i>Description of Modification still fitted to EUT</i>	<i>Modification Fitted By</i>	<i>Date</i>
Model: PP-418 - Serial Number: ---			
0	As supplied by the customer	Not Applicable	Not Applicable



## 4 Operation Mode and Configuration of EUT

### Test Configuration(s)

<i>Configuration</i>	<i>Description</i>
24 V DC power supply on JB1, 230 V / 50 Hz AC power on JB2 & JB3	40 W light bulbs as load.

### Mode(s) of Operation

<i>Mode</i>	<i>Description</i>
EUT in Operation Mode	current on JB2 & JB3 switched through

### List of ports and cables

<i>Description</i>	<i>Classification</i>	<i>Screened</i>	<i>Length (used)</i>	<i>Length (max. specified)</i>
DC power supply 1	24VDC power supply	No	30 cm	---
DC power supply 2	24VDC power supply	No	30 cm	---
AC power input JB 2	AC power	No	30 cm	---
AC power input JB 3	AC power	No	30 cm	---

### List of devices connected to EUT

<i>Description</i>	<i>Type designation</i>	<i>Serial no. or ID</i>	<i>Manufacturer</i>
---	---	---	---

### List of support devices

<i>Description</i>	<i>Type designation</i>	<i>Serial no. or ID</i>	<i>Manufacturer</i>
40 W light bulbs	---	---	---



## 5 Performance Criteria and Methods of Observation

### Definition of General Performance Criteria

**Common Requirements:** If, as a result of the application of the tests defined in this standard, the apparatus becomes dangerous or unsafe, the apparatus shall be deemed to have failed the test.

<i>Performance criterion</i>	<i>Specification</i>
A	<p>The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance.</p> <p>If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.</p>
B	<p>The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed.</p> <p>If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.</p>
C	<p>Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.</p>

### Additional Requirements and/or Notes

---

### Methods of Observation

<i>Function</i>	<i>Observed size</i>	<i>Permissible range</i>	<i>Observation method</i>
Light bulbs on; blue LED on	current flow	no loss of function, no degradation of performance level	visual, via current clamp

---

## 6 Annotations to Performed Tests

### 6.1 Conducted emission tests

In general conducted emission tests in the frequency range 150 kHz - 30 MHz are required to be performed with quasi-peak and average detector. To simplify testing the following procedure is used: First the whole spectrum of emission caused by equipment under test (EUT) is recorded with detector set to peak. After that all emission levels having less margin than 20 dB to or exceeding the appropriate limit (in general average limit is 10 dB lower than quasi-peak limit) are retested with detector set to quasi-peak. If average limit is kept no additional scan with average detector is necessary. In cases of emission levels between quasi-peak and average limit an additional scan with detector set to average has to be recorded.

### 6.2 Radiated emission tests

Radiated emission tests in the frequency range 30 - 1000 MHz are performed in a semi-anechoic room with groundplane at the required test distance (maximum 10 metres): First a peak scan is performed in four positions to get the whole spectrum of emission caused by EUT with the measuring antenna raised and lowered from 1 to 4 m to find table position, antenna height and antenna polarisation for the maximum emission levels. Data reduction is applied to these results to select those levels having less margin than 10 dB to or exceeding the limit using subranges and limited number of maximums. Further maximization is following. With detector of the test receiver set to quasi-peak final measurements are performed immediately after frequency zoom (for drifting disturbances) and maximum adjustment.

## 7 Measurement Uncertainty Values

Radio Interference Emission Testing			
Test	$k_p$	Expanded Uncertainty	Note
Conducted Voltage Emission			
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB	1
150 kHz to 30 MHz (Voltage Probe)	2	± 2.9 dB	1
150 kHz to 30 MHz (AAN)	2	± 4.2 dB	1
Discontinuous Conducted Emission			
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB	1
Conducted Current Emission			
9 kHz to 30 MHz	2	± 2.9 dB	1
Magnetic Fieldstrength			
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB	1
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB	1
Radiated Emission			
Test distance 1 m (ALSE)			
9 kHz to 150 kHz	2	± 4.6 dB	1
150 kHz to 30 MHz	2	± 4.1 dB	1
30 MHz to 200 MHz	2	± 5.2 dB	1
200 MHz to 2 GHz	2	± 4.4 dB	1
2 GHz to 3 GHz	2	± 4.6 dB	1
Test distance 3 m			
30 MHz to 200 MHz	2	± 4.9 dB	1
200 MHz to 1 GHz	2	± 5.1 dB	1
1 GHz to 6 GHz	2	± 4.6 dB	1
Test distance 10 m			
30 MHz to 200 MHz	2	± 4.9 dB	1
200 MHz to 1 GHz	2	± 4.9 dB	1

<b>Radio Interference Emission Testing (continued)</b>			
<i>Test</i>	<i>k<sub>p</sub></i>	<i>Expanded Uncertainty</i>	<i>Note</i>
Radio Interference Power			
30 MHz to 300 MHz	2	± 3.7 dB	1
Harmonic Current Emissions			4
Voltage Changes, Voltage Fluctuations and Flicker			4

<b>Immunity Testing</b>			
<i>Test</i>	<i>k<sub>p</sub></i>	<i>Expanded Uncertainty</i>	<i>Note</i>
Electrostatic Discharges			4
Radiated RF-Field			
Pre-calibrated field level	2	+32.2 / -24.3 %	5
Dynamic feedback field level	2.05	+21.2 / -17.5 %	3
Electrical Fast Transients (EFT) / Bursts			4
Surges			4
Conducted Disturbances, induced by RF-Fields			
via CDN	2	+15.1 / -13.1 %	6
via EM clamp	2	+42.6 / -29.9 %	6
via current clamp	2	+43.9 / -30.5 %	6
Power Frequency Magnetic Field	2	+20.7 / -17.1 %	2
Pulse Magnetic Field			4
Voltage Dips, Short Interruptions and Voltage Variations			4
Oscillatory Waves			4
Conducted Low Frequency Disturbances			
Voltage setting	2	± 0.9 %	2
Frequency setting	2	± 0.1 %	2
Electrical Transient Transmission in Road Vehicles			4

*Note 1:*

The expanded uncertainty reported according to CISPR 16-4-2:2011 + A1:2014 is based on a standard uncertainty multiplied by a coverage factor of  $k_p = 2$ , providing a level of confidence of  $p = 95.45\%$

*Note 2:*

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of  $k_p = 2$ , providing a level of confidence of  $p = 95.45\%$

*Note 3:*

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of  $k_p = 2.05$ , providing a level of confidence of  $p = 95.45\%$

*Note 4:*

It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95% confidence.

*Note 5:*

The expanded uncertainty reported according to IEC 61000-4-3 is based on a standard uncertainty multiplied by a coverage factor of  $k_p = 2$ , providing a level of confidence of  $p = 95.45\%$

*Note 6:*

The expanded uncertainty reported according to IEC 61000-4-6 is based on a standard uncertainty multiplied by a coverage factor of  $k_p = 2$ , providing a level of confidence of  $p = 95.45\%$

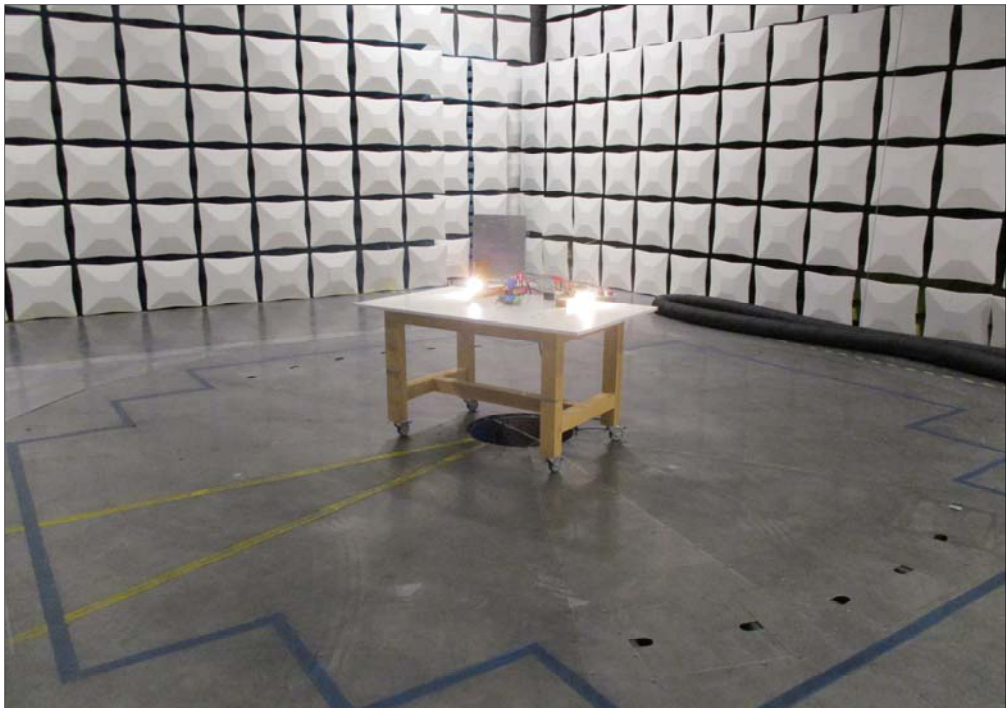
## 8 Test Results

A brief summary of the tests carried out in accordance with EN 61000-6-3, EN 61000-3-2, EN 61000-3-3 and EN 61000-6-2 is shown below.

<i>Specification Clause</i>	<i>Test Description</i>	<i>Result</i>	<i>Comments</i>
24 V DC power supply on JB1, 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode			
11 Table 1, 1.1 and 1.4	Emission - Enclosure port	Pass	---
11 Table 3, 3.1	Emission - DC power port	Pass	---
7	Harmonic current emission	Pass	---
6	Flicker	Pass	---
8 Table 1; 1.1	Immunity - Enclosure ports - Power-frequency magnetic	Pass	---
8 Table 1; 1.2, 1.3, 1.4	Immunity - Enclosure ports - Radio-frequency electromagnetic field. Amplitude modulated	Pass	---
8 Table 1; 1.5	Immunity - Enclosure Port - Electrostatic Discharge	Pass	---
8 Table 3; 3.1	Immunity - Input and output DC power ports - Radio-frequency common mode	Pass	---
8 Table 3; 3.2	Immunity - Input and output DC power ports - Surges	N/A	
8 Table 3; 3.3	Immunity - Input and output DC power ports - Fast transients	Pass	---
8 Table 4; 4.1	Immunity - Input and output AC power ports - Radio-frequency common mode	Pass	---
8 Table 4; 4.2	Immunity - Input and output AC power ports - Voltage dips	Pass	---
8 Table 4; 4.3	Immunity - Input and output AC power ports - Voltage interruptions	Pass	---
8 Table 4; 4.4	Immunity - Input and output AC power ports - Surges	Pass	---
8 Table 4; 4.5	Immunity - Input and output AC power ports - Fast transients	Pass	---

## 8.1 Emission - Enclosure port

### 8.1.1 Test Setup





## 8.1.2 Test Equipment List

<i>Type</i>	<i>Designation</i>	<i>T-ID</i>	<i>Serial No. or ID</i>	<i>Manufacturer</i>
EMI test receiver	ESW26	28268	101315	Rohde & Schwarz
Trilog antenna	VULB 9163	19918	9163-408	Schwarzbeck
Semi anechoic room	No. 8	19917	---	Albatross

## 8.1.3 Test Results

Results for Emission - Enclosure port are documented as listed below.

## Emission - Enclosure port

Prüfdatum / <i>Date of test:</i>	2019-04-25
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Semi anechoic room - cabin no. 8

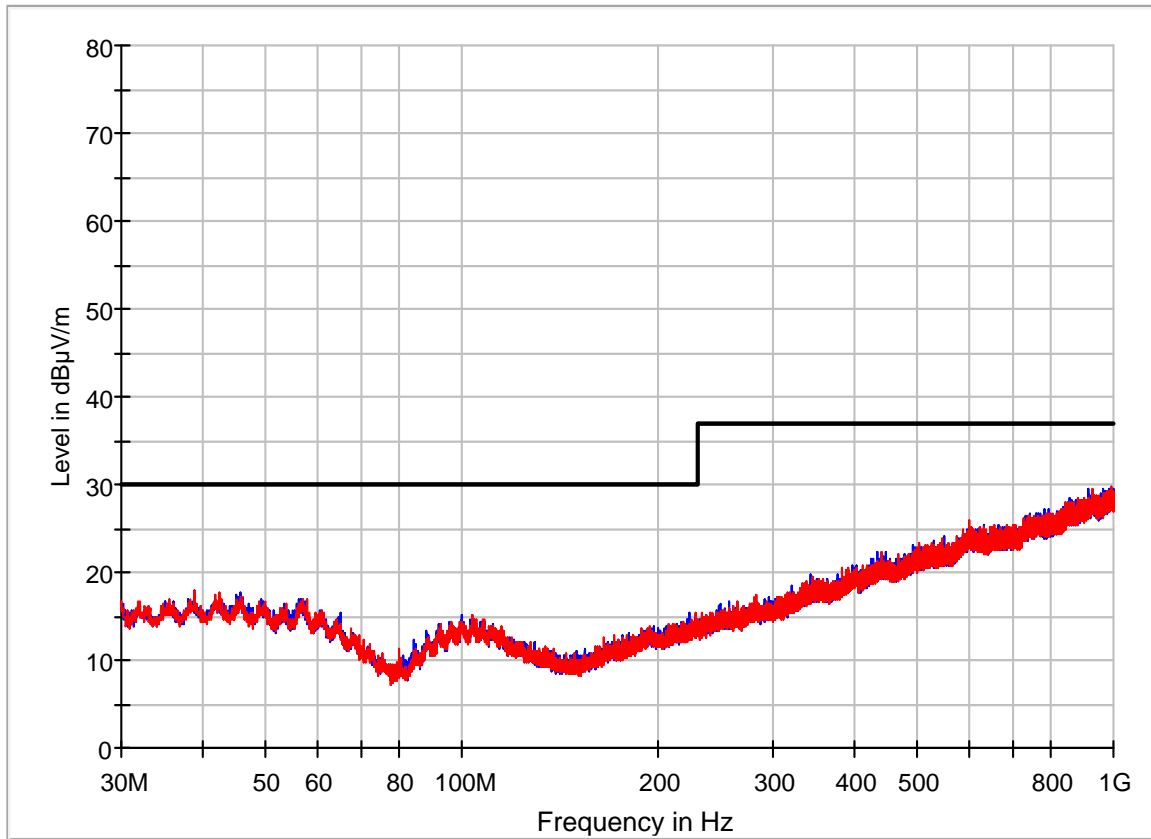
<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

Luftdruck / <i>Barometric pressure:</i>	972,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	34,0 %
Temperatur / <i>Ambient temperature:</i>	24,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-6-3:2007/A1: 2011, Clause 11 Table 1, 1.1 and 1.4
Prüfling / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

**Frequency Range of Test: 30 MHz to 1 GHz**  
**Polarity: Combined**

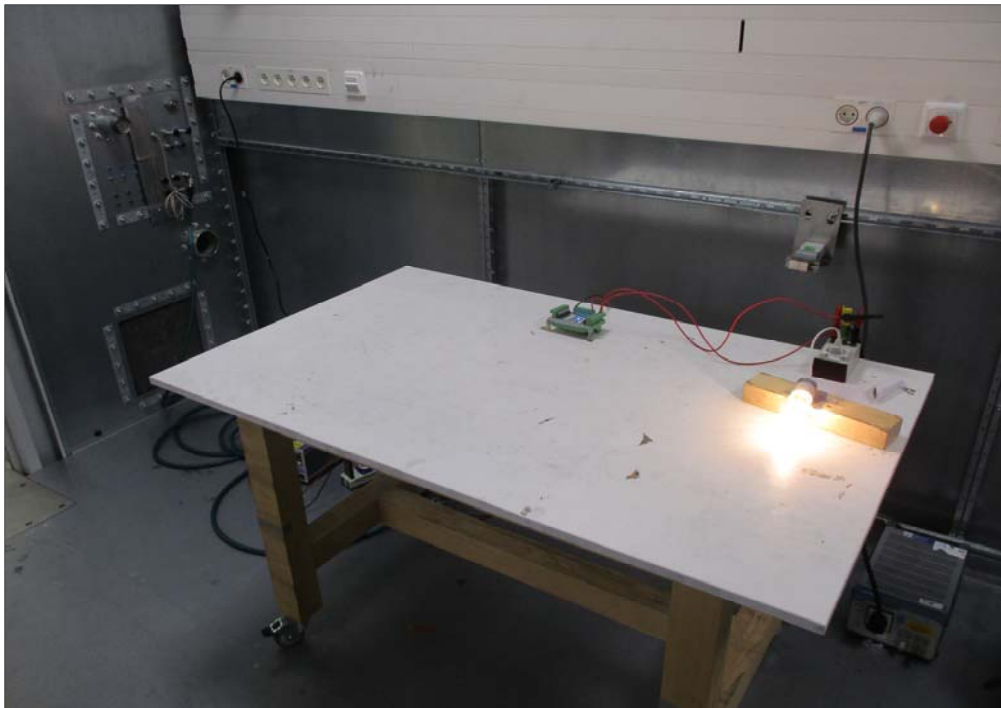
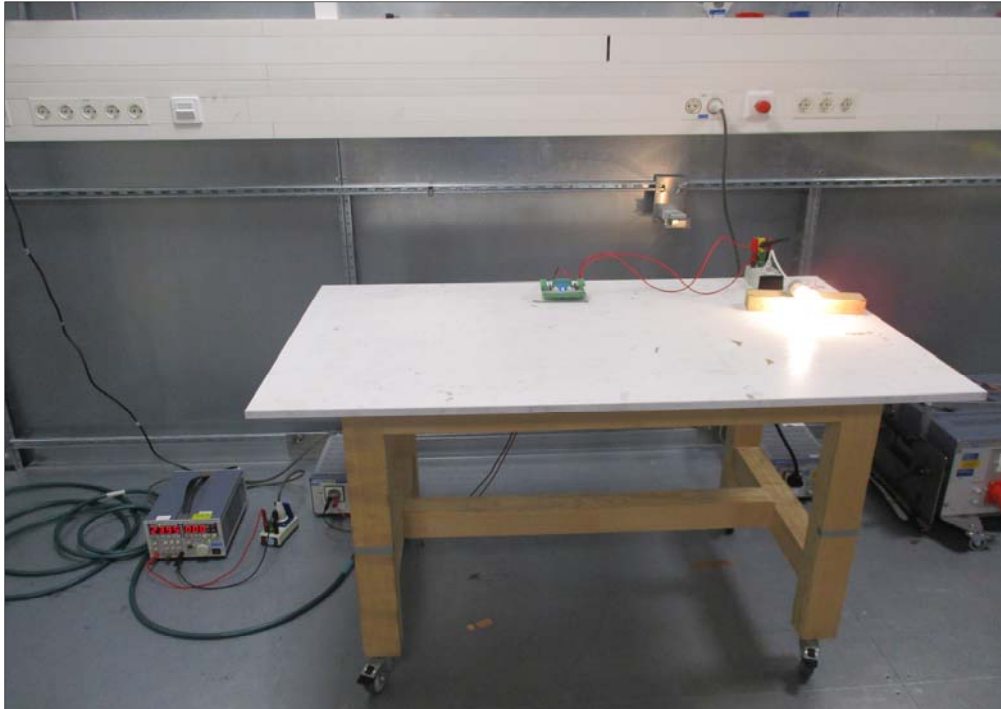
Full Spectrum



— Preview Result 1V-PK+                      — Preview Result 1H-PK+  
— EN 61000-6-3 Electric Field Strength 10 m QP \* Final\_Result QPK

## 8.2 Emission - DC power port

### 8.2.1 Test Setup



## 8.2.2 Test Equipment List

<i>Type</i>	<i>Designation</i>	<i>T-ID</i>	<i>Serial No. or ID</i>	<i>Manufacturer</i>
EMI test receiver	ESU8	19904	100232	Rohde & Schwarz
V-network	ESH 3-Z5	18919	894785/005	Rohde & Schwarz
Shielded room	No. 9	21083	---	Albatross

## 8.2.3 Test Results

Results for Emission - DC power port are documented as listed below.



## Emission - DC power port

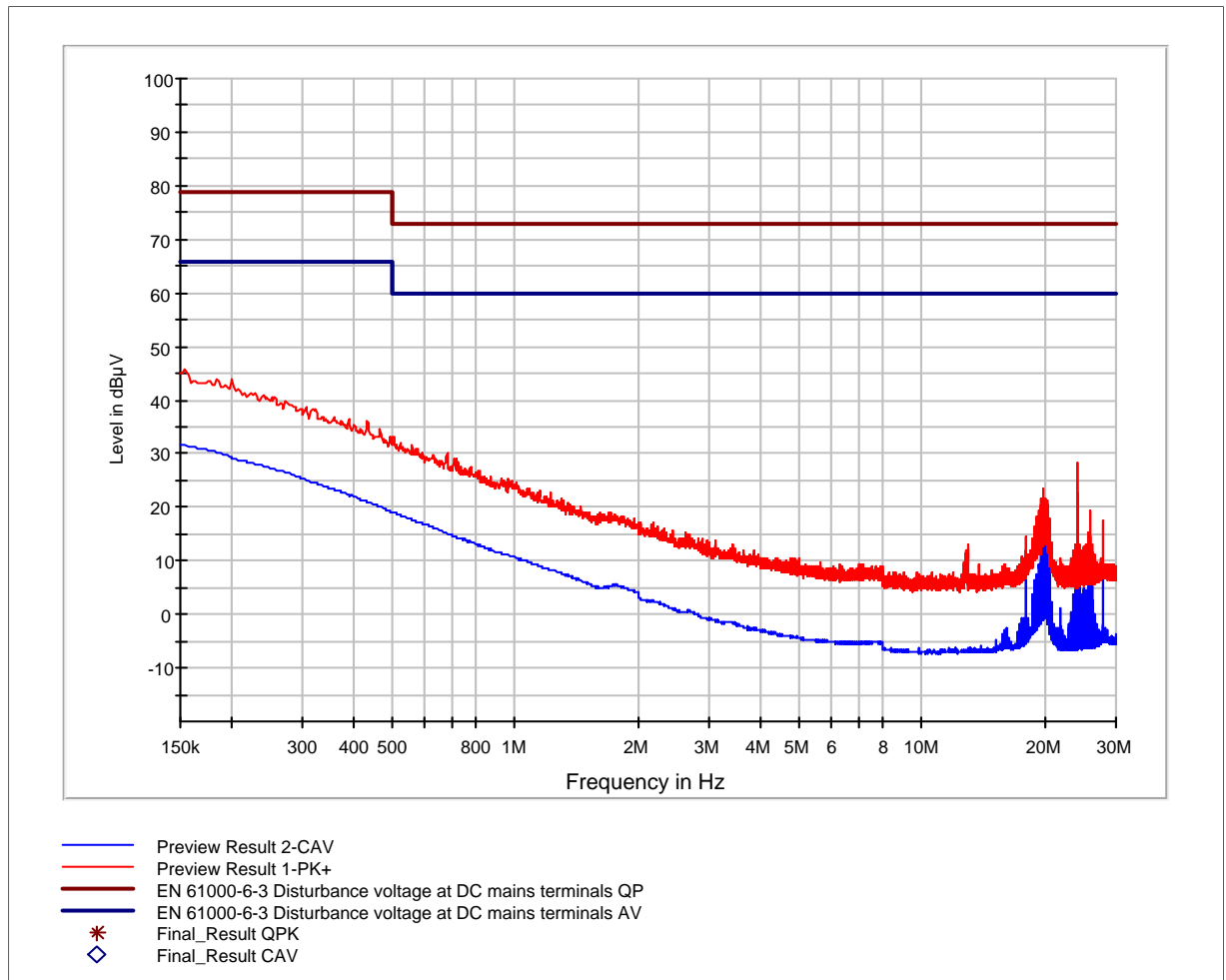
Prüfdatum / <i>Date of test:</i>	2019-05-03
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Shielded room - cabin no. 9

<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

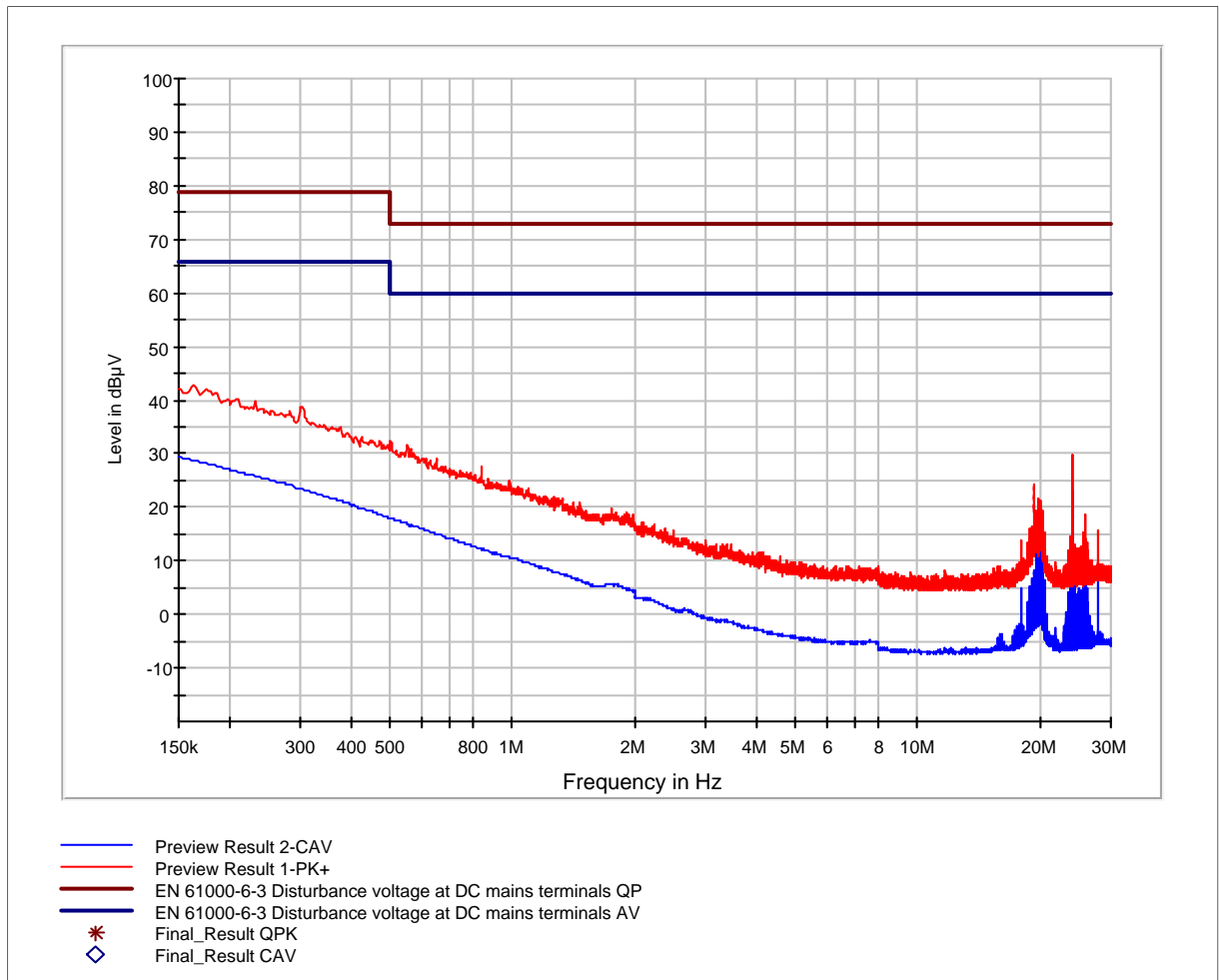
Luftdruck / <i>Barometric pressure:</i>	972,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	40,0 %
Temperatur / <i>Ambient temperature:</i>	23,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-6-3:2007/A1: 2011, Clause 11 Table 3, 3.1
Prüfling / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

Line Under Test: DC power supply 1 - Plus



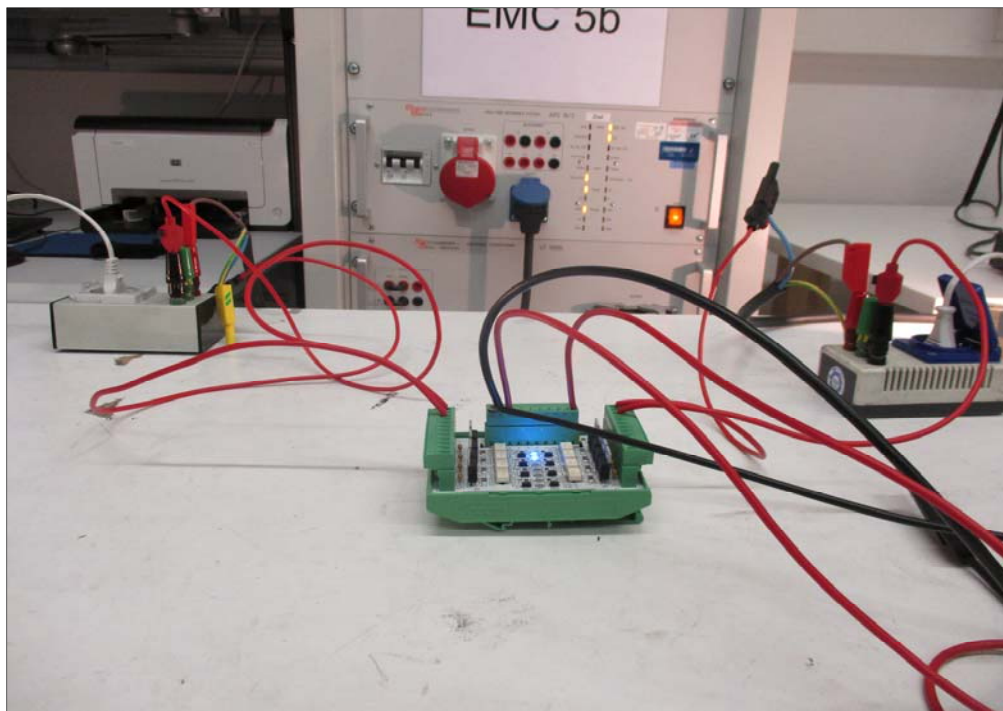
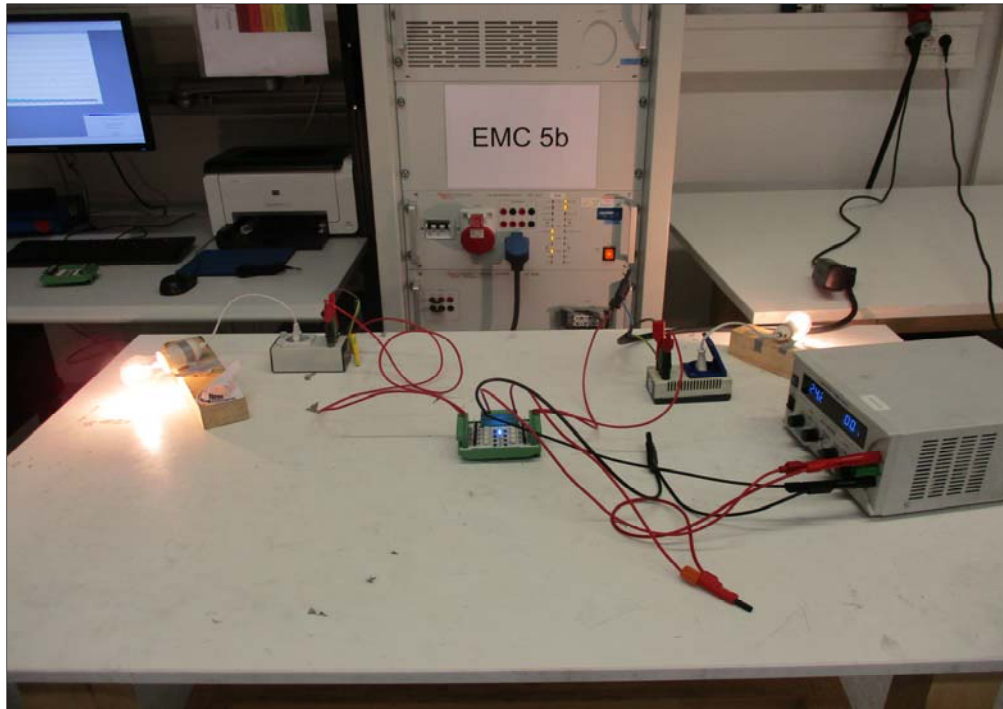
Line Under Test: DC power supply 1 - Minus





## 8.3 Harmonic current emission

### 8.3.1 Test Setup



### 8.3.2 Test Equipment List

Type	Designation	T-ID	Serial No. or ID	Manufacturer
Analyzer reference system (including mains impedance)	ARS 16/3	19975	A4235 07/0 0209	Spitzenberger & Spies
Control unit (synthesizers)	SyCore 1k1	18842	UO355 12/0 1109	Spitzenberger & Spies
Amplifier	PAS 5000	18841	UO355 01/0 1109, UO355 02/0 1109	Spitzenberger & Spies

### 8.3.3 Test Results

Results for Harmonic current emission are documented as listed below.



## Harmonic current emission

Prüfdatum / <i>Date of test:</i>	2019-05-02
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Non shielded room

<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

Luftdruck / <i>Barometric pressure:</i>	970,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	36,0 %
Temperatur / <i>Ambient temperature:</i>	24,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-3-2:2014, Clause 7
Prüfling / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

Beobachtungsdauer / <i>Observation time:</i>	150 s
Geräteklasse / <i>Equipment class:</i>	A



**Line Under Test: AC power input JB 2**

Maximum RMS current and corresponding values in timewindow 8:

Voltage: 230.27 Vrms THD=0.00 % THV=0.007 V POHV=0.001 V PWHD=0.00 %  
 Current: 0.171 Arms THD=1.73 % THC=0.003 A POHC=0.000 A PWHD=2.41 %  
 Power: 39.5 W P1=39.5 W 39.5 VA  
 Power factor: 1.000 CosPhi1: 1.000

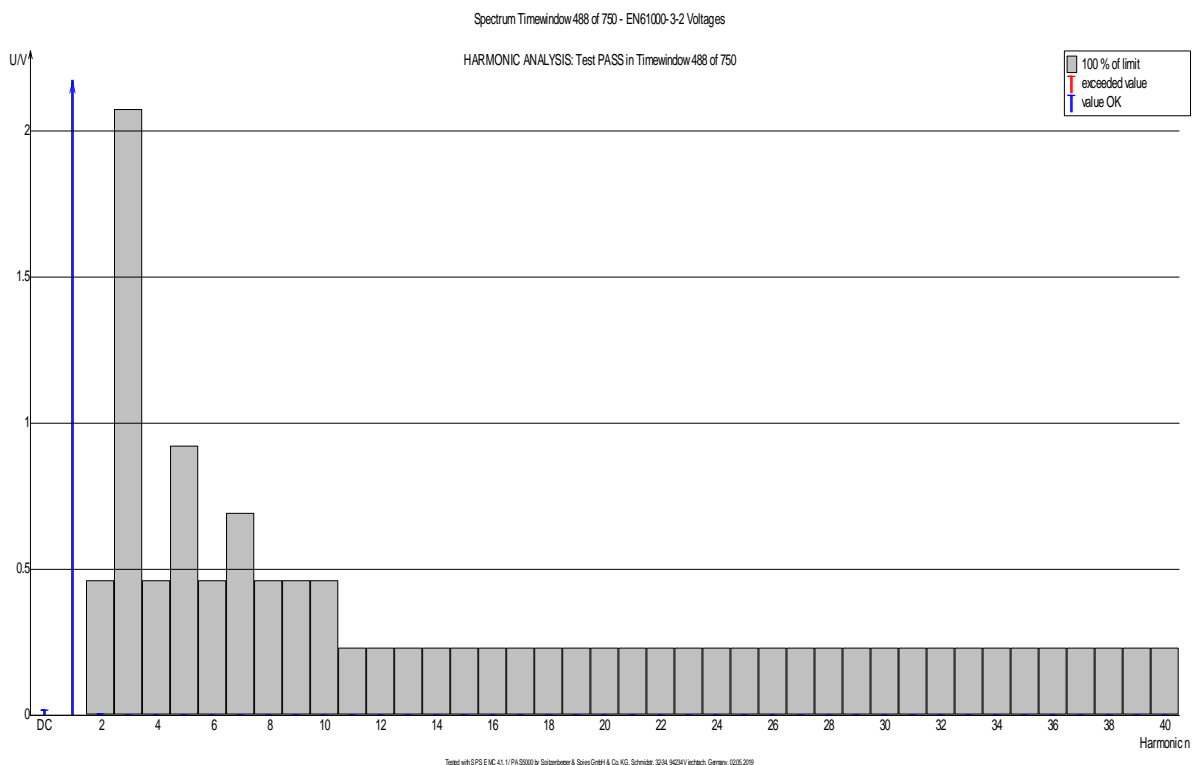
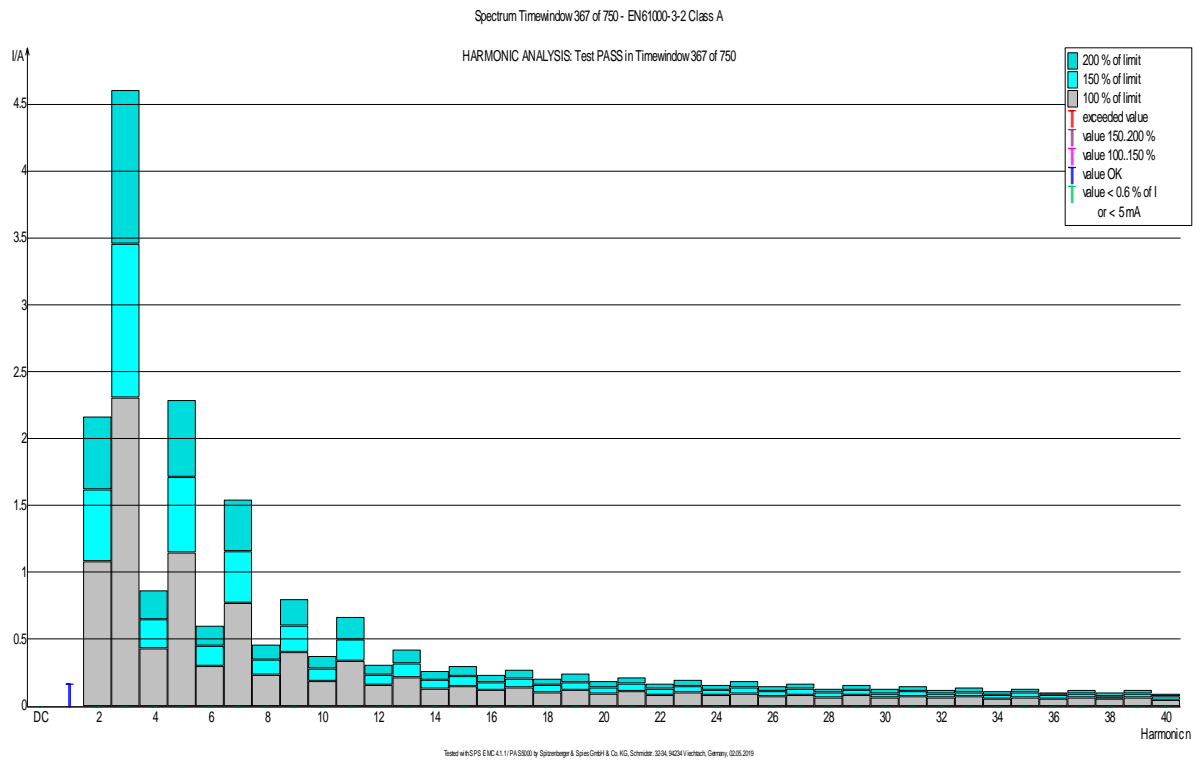
Test conditions: EN 61000-3-2:2014, f=50 Hz, Phase=L1, Range=0.80 A  
 Time window=10/12 (200ms), Grouping (>2nd harm.)=on  
 No Ztest selected  
 harmonic currents < 0.6 % of I or < 5 mA are disregard for calc. of THD, THC, POHC, PWHD

HARMONIC ANALYSIS: Test PASS  
 Tobs = entire measurement; POHC: avg=0.00 A, limits=0.25 A  
 Iavg=0.171 Arms

Ha	Entire measurement (2.5 min = 750 time windows)						Worst 2.5 min		Average		P A S S	F A I L
	Maximum	Window	EN61000-3-2 Class A	Margin in MaxWin	100 to 150%	150 to 200%	Ex- ceeded	100 to 150%	Ex- ceeded	Value		
DC	-0.0023 A	667	- - - -	- - - -	0	0	0	n.e.	n.e.	-0.0022 A	0	X
1	0.1714 A	8	- - - -	- - - -	0	0	0	n.e.	n.e.	0.1714 A	0	X
2	0.0002 A	583	1.0800 A	-100.0 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
3	0.0026 A	426	2.3000 A	-99.9 %	0	0	0	n.e.	n.e.	0.0026 A	0	X
4	0.0002 A	495	0.4300 A	-100.0 %	0	0	0	n.e.	n.e.	0.0002 A	0	X
5	0.0005 A	1	1.1400 A	-100.0 %	0	0	0	n.e.	n.e.	0.0005 A	0	X
6	0.0002 A	418	0.3000 A	-99.9 %	0	0	0	n.e.	n.e.	0.0002 A	0	X
7	0.0005 A	1	0.7700 A	-99.9 %	0	0	0	n.e.	n.e.	0.0005 A	0	X
8	0.0002 A	62	0.2300 A	-99.9 %	0	0	0	n.e.	n.e.	0.0002 A	0	X
9	0.0005 A	1	0.4000 A	-99.9 %	0	0	0	n.e.	n.e.	0.0005 A	0	X
10	0.0002 A	457	0.1840 A	-99.9 %	0	0	0	n.e.	n.e.	0.0002 A	0	X
11	0.0005 A	291	0.3300 A	-99.8 %	0	0	0	n.e.	n.e.	0.0005 A	0	X
12	0.0002 A	301	0.1533 A	-99.9 %	0	0	0	n.e.	n.e.	0.0002 A	0	X
13	0.0005 A	3	0.2100 A	-99.8 %	0	0	0	n.e.	n.e.	0.0005 A	0	X
14	0.0002 A	737	0.1314 A	-99.9 %	0	0	0	n.e.	n.e.	0.0002 A	0	X
15	0.0005 A	367	0.1500 A	-99.7 %	0	0	0	n.e.	n.e.	0.0004 A	0	X
16	0.0002 A	651	0.1150 A	-99.9 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
17	0.0004 A	389	0.1324 A	-99.7 %	0	0	0	n.e.	n.e.	0.0004 A	0	X
18	0.0001 A	694	0.1022 A	-99.9 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
19	0.0003 A	301	0.1184 A	-99.7 %	0	0	0	n.e.	n.e.	0.0003 A	0	X
20	0.0001 A	1	0.0920 A	-99.9 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
21	0.0003 A	1	0.1071 A	-99.8 %	0	0	0	n.e.	n.e.	0.0002 A	0	X
22	0.0001 A	2	0.0836 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
23	0.0002 A	700	0.0978 A	-99.8 %	0	0	0	n.e.	n.e.	0.0002 A	0	X
24	0.0001 A	104	0.0767 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
25	0.0001 A	494	0.0900 A	-99.9 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
26	0.0002 A	8	0.0708 A	-99.8 %	0	0	0	n.e.	n.e.	0.0002 A	0	X
27	0.0001 A	580	0.0833 A	-99.9 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
28	0.0002 A	665	0.0657 A	-99.7 %	0	0	0	n.e.	n.e.	0.0002 A	0	X
29	0.0001 A	143	0.0776 A	-99.9 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
30	0.0002 A	462	0.0613 A	-99.7 %	0	0	0	n.e.	n.e.	0.0002 A	0	X
31	0.0001 A	492	0.0726 A	-99.9 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
32	0.0001 A	629	0.0575 A	-99.7 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
33	0.0001 A	1	0.0682 A	-99.9 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
34	0.0001 A	126	0.0541 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
35	0.0001 A	204	0.0643 A	-99.9 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
36	0.0001 A	2	0.0511 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
37	0.0001 A	115	0.0608 A	-99.9 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
38	0.0001 A	197	0.0484 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
39	0.0001 A	1	0.0577 A	-99.9 %	0	0	0	n.e.	n.e.	0.0001 A	0	X
40	0.0001 A	443	0.0460 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X

average value < 0.6 % of Iavg or < 5 mA n.e. = not evaluated

Tested with SP5 EMC 4.1.1/PA-S5000 by Spitzenberger & Spies GmbH & Co. KG, Schmidstr. 3234, 94234V Ischach, Germany, 02.05.2019





Maximum RMS current and corresponding values in timewindow 8:

Voltage: 230.27 Vrms THD=0.00 % THV=0.007 V POHV=0.001 V PWHD=0.00 %  
 Current: 0.171 Arms THD=1.73 % THC=0.003 A POHC=0.000 A PWHD=2.41 %  
 Power: 39.5 W P1=39.5 W 39.5 VA  
 Power factor: 1.000 CosPhi: 1.000

Test conditions: EN 61000-3-2:2014, f=50 Hz, Phase=L1, Range=0.80 A  
 Time window=10/12 (200ms), Grouping (>2nd harm)=on  
 No Ztest selected  
 harmonic currents < 0.6 % of I or < 5 mA are disregard for calc. of THD, THC, POHC, PWHD

HARMONIC ANALYSIS: Test PASS  
 Tabs = entire measurement; POHC: avg=0.00V, limits=0.73 V  
 Vavg=230.28 Vrms

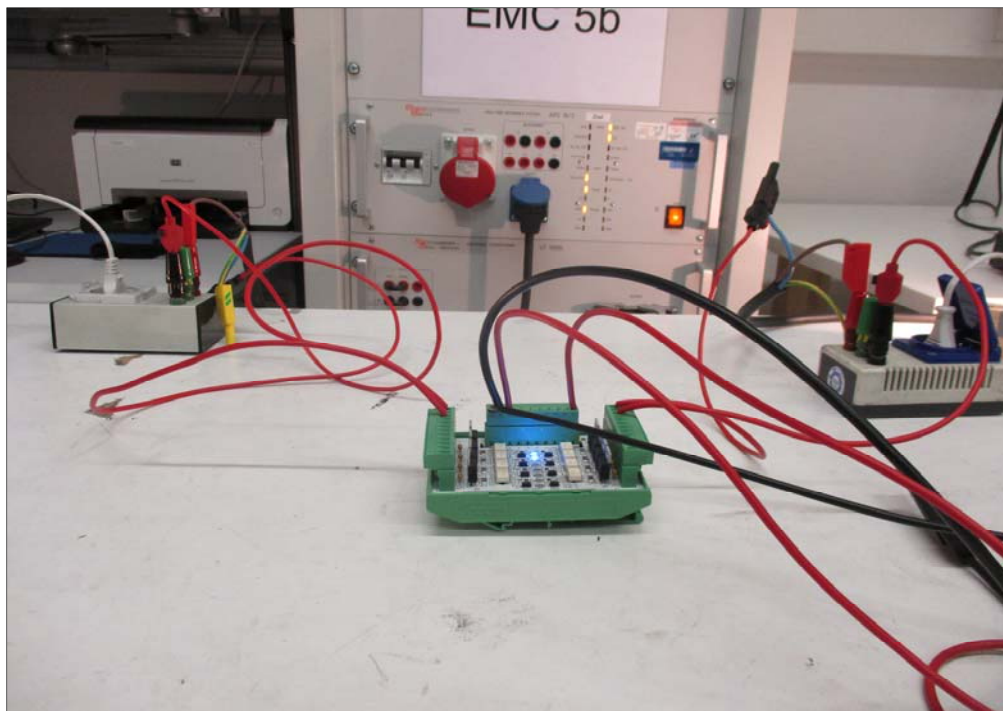
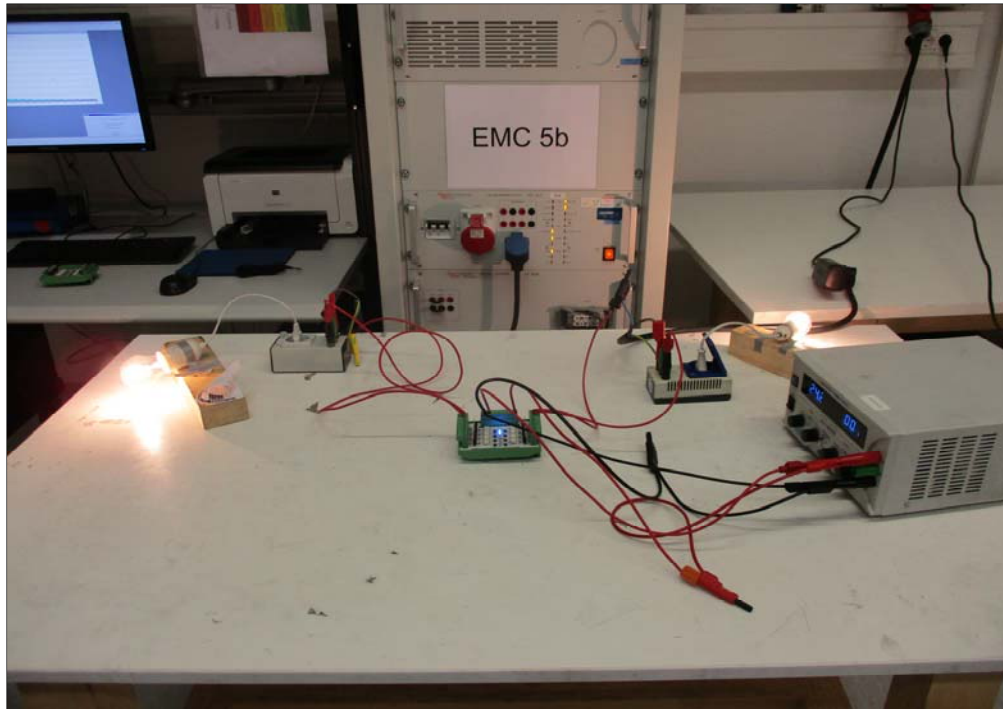
Ha	Entire measurement (2.5 min = 750 time windows)						Worst 2.5 min		Average		P A S S	F A I L
	Maximum	Window	EN61000-3-2 Voltages	Margin in MaxWin	100 to 150%	Ex- ceeded	100 to 150%	Ex- ceeded	Value	Ex- ceeded		
DC	-0.0235 V	237	-- --	-- --	--	0	n.e.	n.e.	-0.0179 V	0	--	
1	230.2819 V	488	-- --	-- --	--	0	n.e.	n.e.	230.2772 V	0	X	
2	0.0092 V	400	fluctuating	-98.0 %	--	0	n.e.	n.e.	0.0052 V	0	X	
3	0.0029 V	229	fluctuating	-99.9 %	--	0	n.e.	n.e.	0.0015 V	0	X	
4	0.0029 V	576	fluctuating	-99.4 %	--	0	n.e.	n.e.	0.0014 V	0	X	
5	0.0016 V	170	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0010 V	0	X	
6	0.0012 V	232	fluctuating	-99.7 %	--	0	n.e.	n.e.	0.0005 V	0	X	
7	0.0025 V	570	fluctuating	-99.6 %	--	0	n.e.	n.e.	0.0020 V	0	X	
8	0.0010 V	190	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0005 V	0	X	
9	0.0026 V	30	fluctuating	-99.4 %	--	0	n.e.	n.e.	0.0020 V	0	X	
10	0.0008 V	1	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0004 V	0	X	
11	0.0014 V	144	fluctuating	-99.4 %	--	0	n.e.	n.e.	0.0011 V	0	X	
12	0.0009 V	252	fluctuating	-99.6 %	--	0	n.e.	n.e.	0.0006 V	0	X	
13	0.0014 V	492	fluctuating	-99.4 %	--	0	n.e.	n.e.	0.0010 V	0	X	
14	0.0008 V	132	fluctuating	-99.7 %	--	0	n.e.	n.e.	0.0004 V	0	X	
15	0.0014 V	473	fluctuating	-99.4 %	--	0	n.e.	n.e.	0.0011 V	0	X	
16	0.0007 V	342	fluctuating	-99.7 %	--	0	n.e.	n.e.	0.0004 V	0	X	
17	0.0007 V	546	fluctuating	-99.7 %	--	0	n.e.	n.e.	0.0004 V	0	X	
18	0.0005 V	567	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0002 V	0	X	
19	0.0008 V	121	fluctuating	-99.7 %	--	0	n.e.	n.e.	0.0005 V	0	X	
20	0.0004 V	268	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0002 V	0	X	
21	0.0005 V	245	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0003 V	0	X	
22	0.0004 V	48	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0002 V	0	X	
23	0.0009 V	566	fluctuating	-99.6 %	--	0	n.e.	n.e.	0.0006 V	0	X	
24	0.0005 V	152	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0003 V	0	X	
25	0.0009 V	51	fluctuating	-99.6 %	--	0	n.e.	n.e.	0.0007 V	0	X	
26	0.0004 V	130	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0002 V	0	X	
27	0.0007 V	175	fluctuating	-99.7 %	--	0	n.e.	n.e.	0.0005 V	0	X	
28	0.0007 V	260	fluctuating	-99.7 %	--	0	n.e.	n.e.	0.0004 V	0	X	
29	0.0008 V	602	fluctuating	-99.7 %	--	0	n.e.	n.e.	0.0005 V	0	X	
30	0.0005 V	279	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0003 V	0	X	
31	0.0005 V	132	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0003 V	0	X	
32	0.0007 V	410	fluctuating	-99.7 %	--	0	n.e.	n.e.	0.0002 V	0	X	
33	0.0004 V	323	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0002 V	0	X	
34	0.0004 V	428	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0002 V	0	X	
35	0.0007 V	147	fluctuating	-99.7 %	--	0	n.e.	n.e.	0.0005 V	0	X	
36	0.0004 V	89	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0002 V	0	X	
37	0.0004 V	317	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0002 V	0	X	
38	0.0004 V	338	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0002 V	0	X	
39	0.0008 V	295	fluctuating	-99.7 %	--	0	n.e.	n.e.	0.0005 V	0	X	
40	0.0004 V	334	fluctuating	-99.8 %	--	0	n.e.	n.e.	0.0002 V	0	X	

n.e. = not evaluated

Tested with SPS EMC 4.1.1/PAS5000 by Spitzberger & Spies GmbH & Co. KG, Schmidstr. 32/34, 94234 Viedach, Germany, 02.05.2019

## 8.4 Flicker

### 8.4.1 Test Setup



## 8.4.2 Test Equipment List

Type	Designation	T-ID	Serial No. or ID	Manufacturer
Analyzer reference system (including mains impedance)	ARS 16/3	19975	A4235 07/0 0209	Spitzenberger & Spies
Control unit (synthesizers)	SyCore 1k1	18842	UO355 12/0 1109	Spitzenberger & Spies
Amplifier	PAS 5000	18841	UO355 01/0 1109, UO355 02/0 1109	Spitzenberger & Spies

## 8.4.3 Test Results

Results for Flicker are documented as listed below.



## Flicker

Prüfdatum / <i>Date of test:</i>	2019-05-03
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Non shielded room

<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

Luftdruck / <i>Barometric pressure:</i>	970,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	36,0 %
Temperatur / <i>Ambient temperature:</i>	24,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-3-3:2013, Clause 6
Prüfiling / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

Test conditions for Flicker test				
Observation time for P <sub>st</sub>	Total time	Flicker impedance	Special test conditions	Special test conditions for d <sub>max</sub>
10 min	10 min (1 Flicker measurement)	Zref (IEC 60725)	---	---

### Line Under Test: AC power input JB 2

Test conditions: EN 61000-3-3:2013 / 230 V / 50 Hz / Phase L1  
 EN 61000-4-15:2011 / Obs 1 x 10 min / Ztest (0.400+j0.250) Ohm  
 Ra+jXa (0.2400+j0.1500) Ohm / Rn+jXn (0.1600+j0.1000) Ohm

FLICKER: T test PASS!

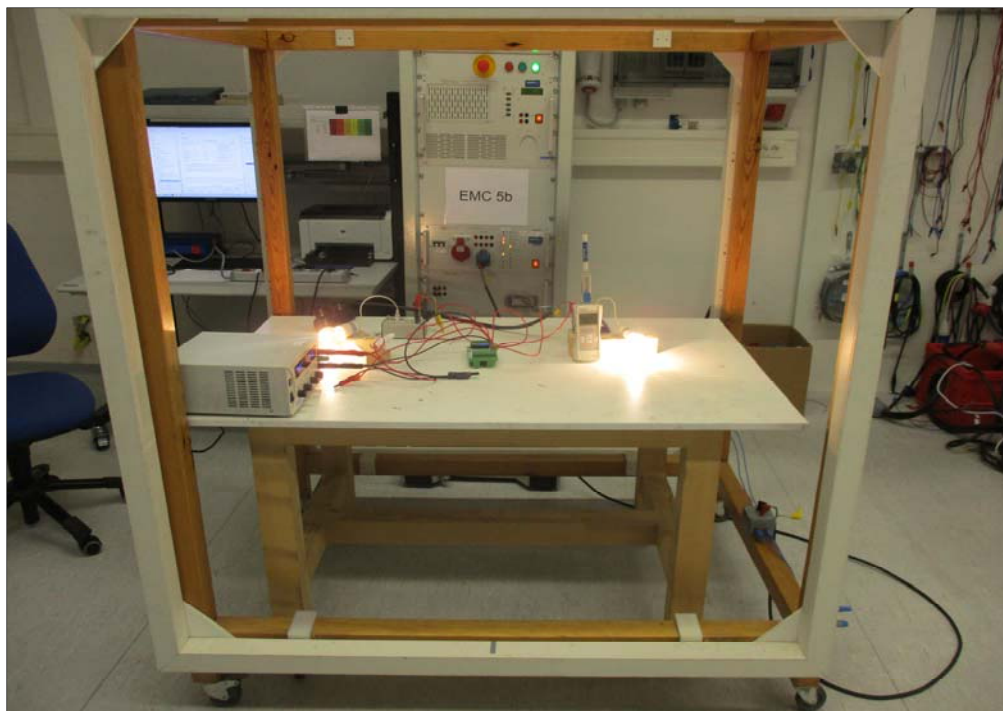
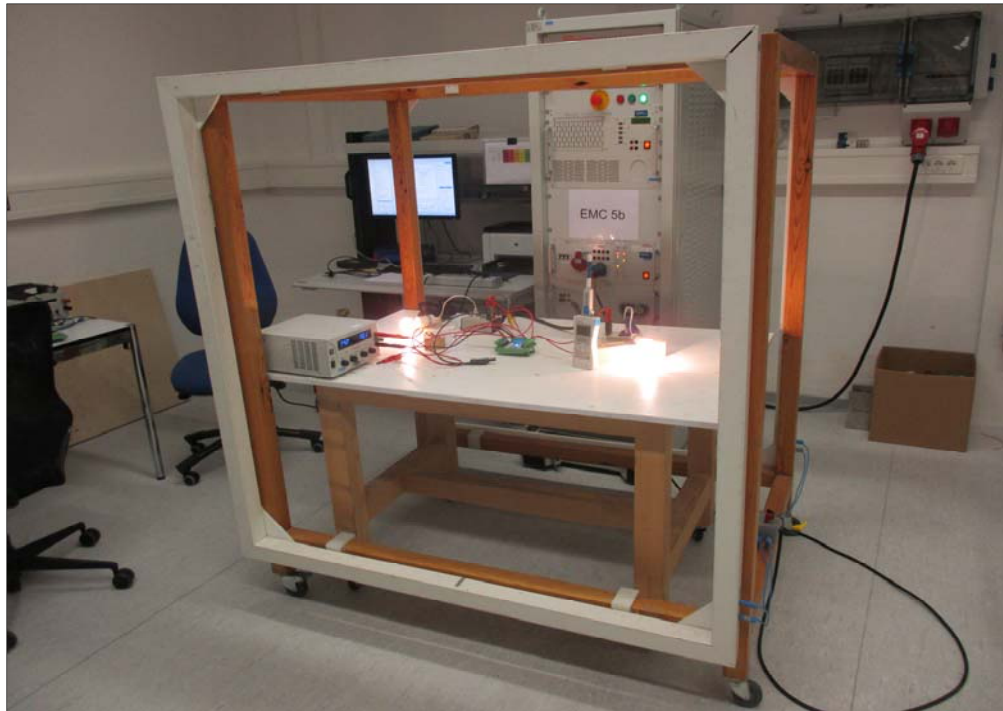
Time	Pmax	Pst	Sliding Plt	d(t)>3.30% [s]	dmax[%]	dc [%]	PASS	FAIL
20:13:36	0.000	0.0050	0.0050	0.000	+0.000	- . - - -	X	
Limits:		1.000	0.650	0.500	4.000	3.300		
Plt: 0.005000							X	
Evaluated: PST, PLT, Sliding PLT, dc, dmax, d(t)								

FLICKER: Source test PASS!

Time	Pmax	Pst	Sliding Plt	d(t)>3.30% [s]	dmax[%]	dc [%]	PASS	FAIL
20:13:36	0.000	0.0040	- . - - -	0.000	+0.000	- . - - -	X	
Plt: 0.004000								
Evaluated: PST <= 0.4 dmax < 20 % dmax1								

## 8.5 Immunity - Enclosure ports - Power-frequency magnetic

### 8.5.1 Test Setup



## 8.5.2 Test Equipment List

Type	Designation	T-ID	Serial No. or ID	Manufacturer
Analyzer reference system (including mains impedance)	ARS 16/3	19975	A4235 07/0 0209	Spitzenberger & Spies
Control unit (synthesizers)	SyCore 1k1	18842	UO355 12/0 1109	Spitzenberger & Spies
Amplifier	PAS 5000	18841	UO355 01/0 1109, UO355 02/0 1109	Spitzenberger & Spies
Magnetometer	KOSHAVA 5	19947	K101201	Wuntronic
Helmholtz coils	HC01	19507	001	TÜV SÜD PS

## 8.5.3 Test Results

Results for Immunity - Enclosure ports - Power-frequency magnetic are documented as listed below.



## Immunity - Enclosure ports - Power-frequency magnetic

Prüfdatum / <i>Date of test:</i>	2019-05-03
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Non shielded room

<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

Luftdruck / <i>Barometric pressure:</i>	970,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	36,0 %
Temperatur / <i>Ambient temperature:</i>	24,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-6-2:2005, Clause 8 Table 1; 1.1
Basisnorm / <i>Basic standard:</i>	EN 61000-4-8:2010
Prüfing / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

<i>Required Test Levels</i>			
Application	Level (A/m)	Duration	Performance Criteria
Continuous Field	30	dependant on EUT operating cycle	A

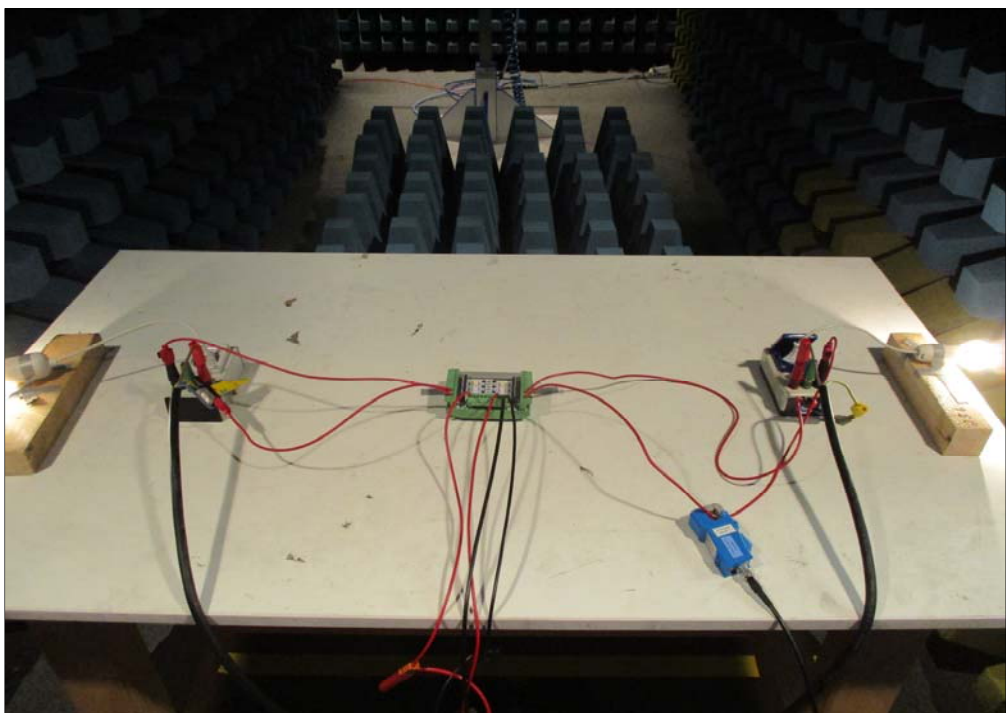
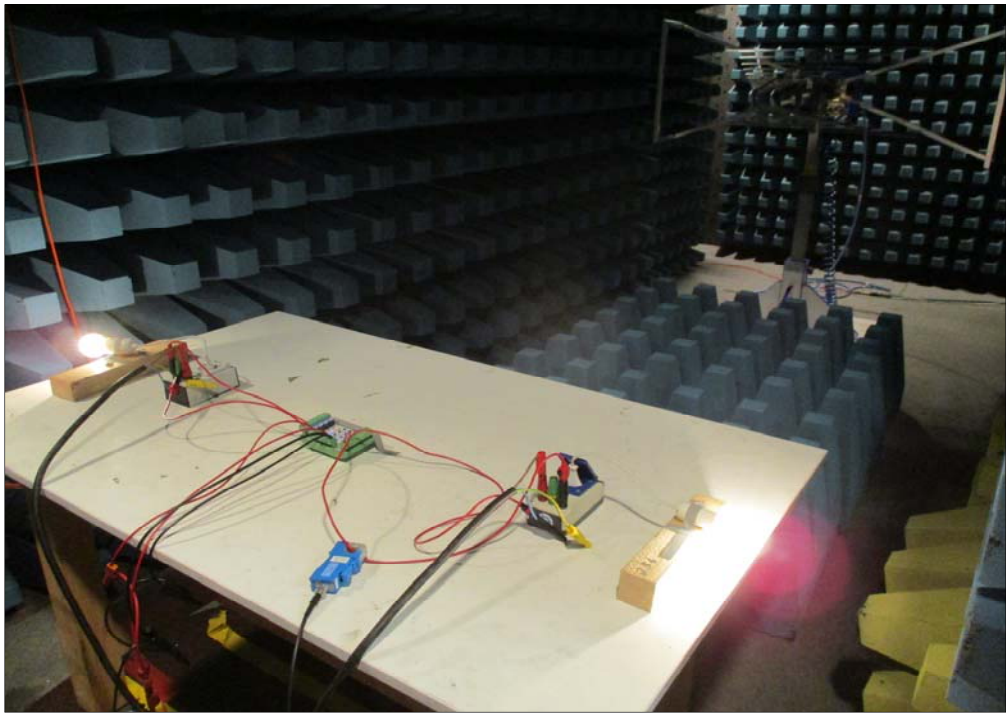
**Supplementary information:**  
 Note: The test shall be carried out at the frequencies appropriate to the power supply frequency. Equipment intended for use in areas supplied only at one of these frequencies need only be tested at that frequency. Applicable only to apparatus containing devices susceptible to magnetic fields.

<i>Field direction</i>	<i>Test frequency</i>	<i>Field strength level</i>	<i>Result</i>
X axis	50 Hz	30 A/m	Pass PC A
X axis	60 Hz	30 A/m	Pass PC A
Y axis	50 Hz	30 A/m	Pass PC A
Y axis	60 Hz	30 A/m	Pass PC A
Z axis	50 Hz	30 A/m	Pass PC A
Z axis	60 Hz	30 A/m	Pass PC A

<i>Results Descriptions / Observations:</i>	
1	No influence to EUT has been detected.

## 8.6 Immunity - Enclosure ports - Radio-frequency electromagnetic field. Amplitude modulated

### 8.6.1 Test Setup



## 8.6.2 Test Equipment List

Type	Designation	T-ID	Serial No. or ID	Manufacturer
Signal generator	SMB100A	38400	115242	Rohde & Schwarz
Power amplifier	BBA150	38404	103144	Rohde & Schwarz
Power sensor	NRP6AN	38398	101170	Rohde & Schwarz
Power sensor	NRP6AN	38399	101171	Rohde & Schwarz
ULTRALOG antenna	HL562E	38401	100992	Rohde & Schwarz
Isotropic field probe	Lumiloop LSProbe 1.2	38404	161	Rohde & Schwarz
Fully anechoic room	No. 2	19312	T162	Albatross Projects

## 8.6.3 Test Results

Results for Immunity - Enclosure ports - Radio-frequency electromagnetic field. Amplitude modulated are documented as listed below.

## Immunity - Enclosure ports - Radio-frequency electromagnetic field. Amplitude modulated

Prüfdatum / <i>Date of test:</i>	2019-04-25
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Fully anechoic room - cabin no. 2

<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

Luftdruck / <i>Barometric pressure:</i>	972,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	36,0 %
Temperatur / <i>Ambient temperature:</i>	23,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-6-2:2005, Clause 8 Table 1; 1.2, 1.3, 1.4
Basisnorm / <i>Basic standard:</i>	EN 61000-4-3:2006 A1: 2008 A2: 2010
Prüfling / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

<i>Required Test Levels</i>					
Frequency Range (MHz)	Level (V/m)	Modulation	Step Size (%)	Dwell (s)	Performance Criteria
80 to 1000	10	AM (80 %, 1kHz sine wave)	1	> 0.5 <sup>1</sup>	A
1400 to 2000	3	AM (80 %, 1kHz sine wave)	1	> 0.5 <sup>1</sup>	A
2000 to 2700	1	AM (80 %, 1kHz sine wave)	1	> 0.5 <sup>1</sup>	A

**Supplementary information:**

Note 1. The dwell time shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0.5 s

<i>Tabulated Results for RF Electromagnetic Field</i>				
<i>Step Size: 1%</i>		<i>Dwell Time: 3 s</i>		<i>Modulation: 1kHz Sine 80% AM</i>
Frequency Range (MHz)	Position of EUT	Antenna polarization	Test Level (V/m)	Result
80 MHz to 1 GHz	Front, Right, Left and Rear	Horizontal and Vertical	10 V/m	Pass PC A
1.4 GHz to 2 GHz	Front, Right, Left and Rear	Horizontal and Vertical	3 V/m	Pass PC A
2 GHz to 2.7GHz	Front, Right, Left and Rear	Horizontal and Vertical	1 V/m	Pass PC A

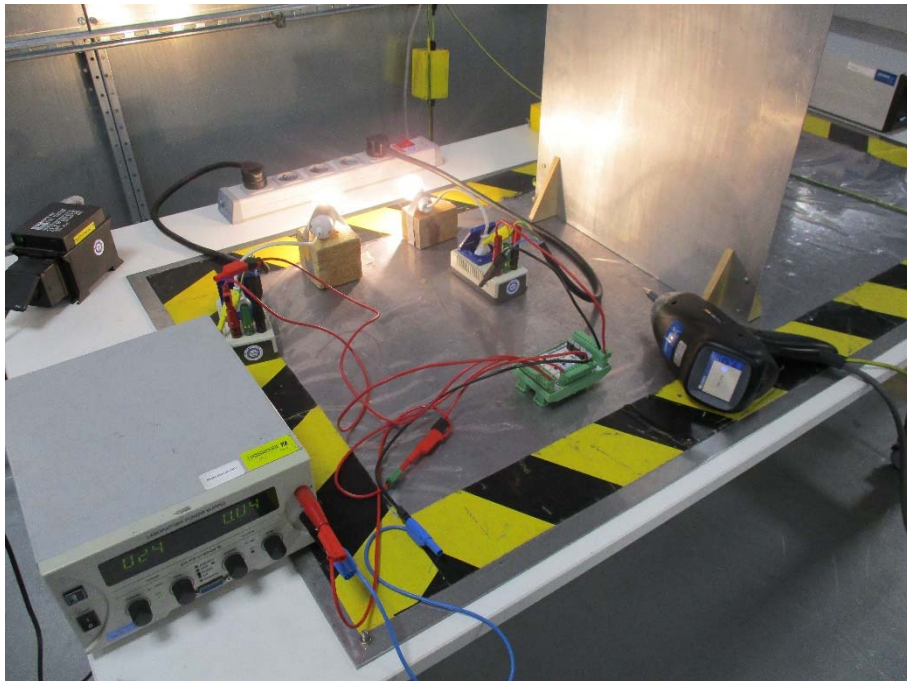
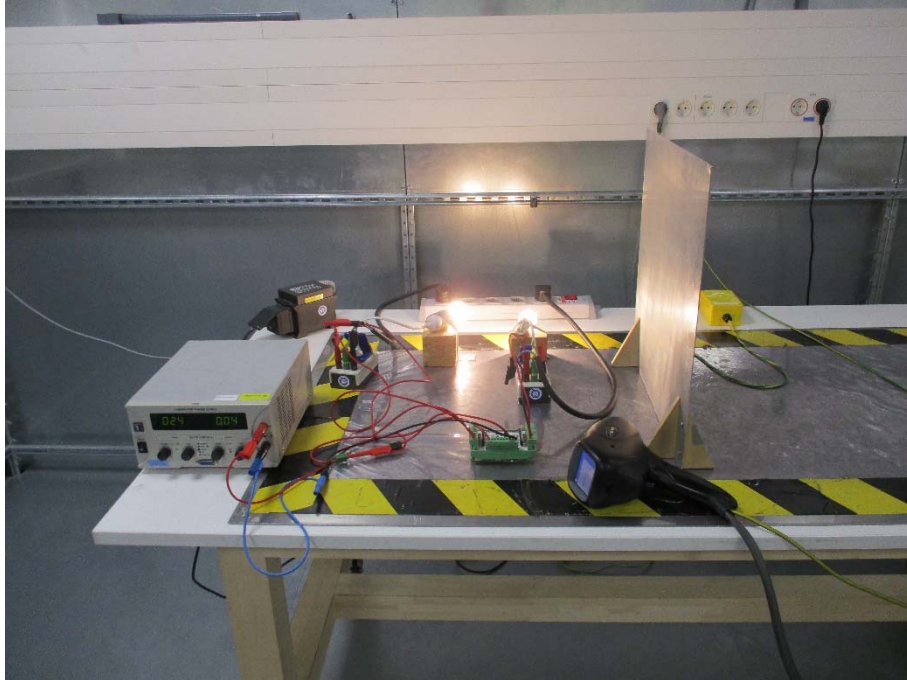
*Results Descriptions / Observations:*

1 No influence to EUT has been detected.



## 8.7 Immunity - Enclosure Port - Electrostatic Discharge

### 8.7.1 Test Setup



## 8.7.2 Test Equipment List

<i>Type</i>	<i>Designation</i>	<i>T-ID</i>	<i>Serial No. or ID</i>	<i>Manufacturer</i>
ESD simulator	ESD NX30	23191	22821	Ametek
Shielded room	No. 9	21083	---	Albatross

## 8.7.3 Test Results

Results for Immunity - Enclosure Port - Electrostatic Discharge are documented as listed below.



## Immunity - Enclosure Port - Electrostatic Discharge

Prüfdatum / <i>Date of test:</i>	2019-06-06
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Shielded room - cabin no. 9

<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

Luftdruck / <i>Barometric pressure:</i>	973,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	48,0 %
Temperatur / <i>Ambient temperature:</i>	24,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-6-2:2005, Clause 8 Table 1; 1.5
Basisnorm / <i>Basic standard:</i>	EN 61000-4-2:2009
Prüfling / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

<i>Required Test Levels</i>				
Discharge type	Discharge Level (kV)		Number of discharges per location (each polarity)	Performance Criteria
	Positive	Negative		
Air – Direct	8	8	10	B
Contact – Direct	4	4	10	B
Contact – Indirect	4	4	10	B




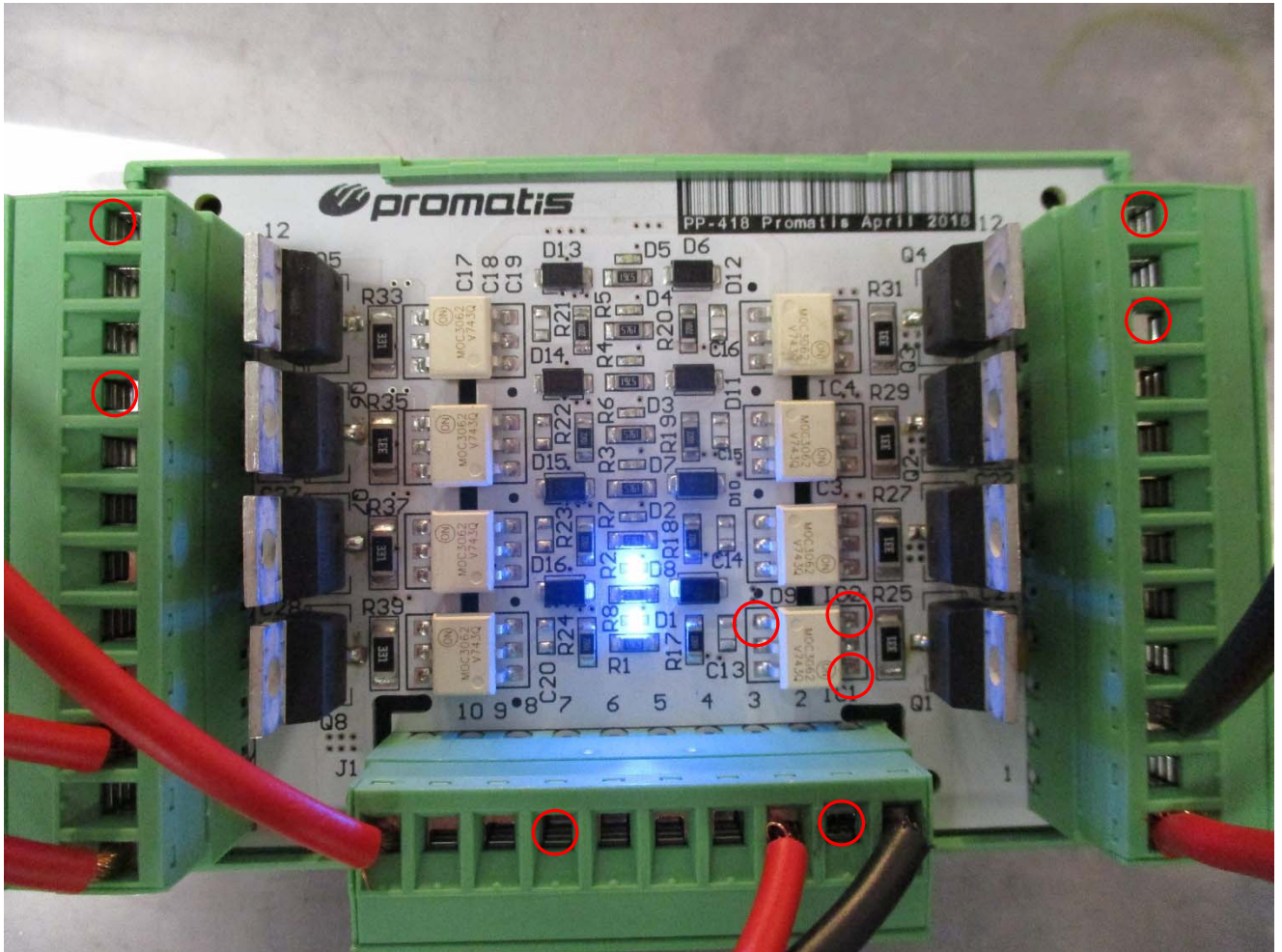
ID	Test Point	Discharge	Results									
			2kV		4kV		6kV		8kV		15kV	
			+	-	+	-	+	-	+	-	+	-
	Horizontal Coupling Plane	Contact	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A
	Vertical Coupling Plane	Contact	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A
	Contact Discharge Points	Contact	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A
	Air Discharge Points	Air	✓	✓	✓	✓	N/A	N/A	✓	✓	N/A	N/A

Key to Results	
✓	The EUT's performance was not impaired at this test point when the ESD pulse was applied.
✓*	No discharge occurred at this point when the ESD pulse was applied.
N/A	Not Applicable.

## Electrostatic Discharge – Test Points

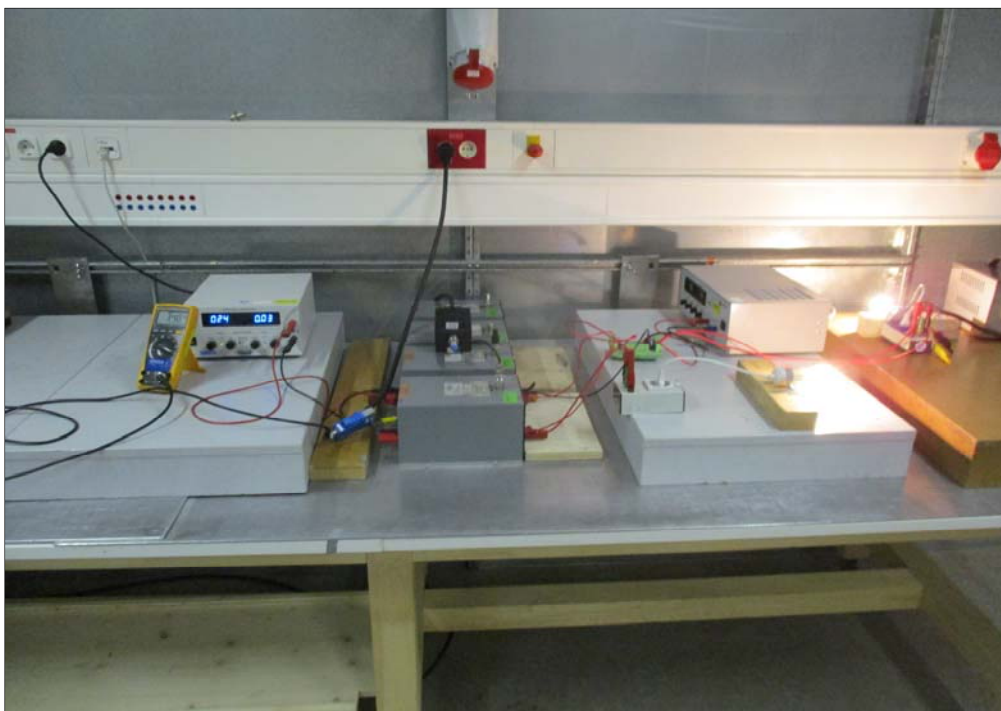
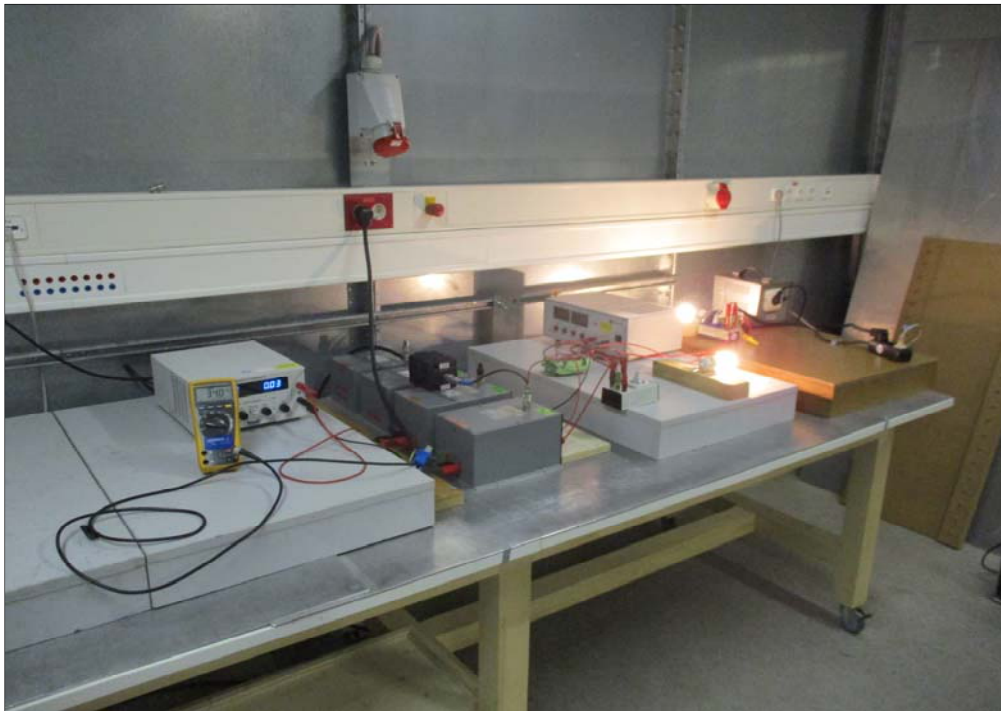
 Contact discharge

 Air discharge



## 8.8 Immunity - Input and output DC power ports - Radio-frequency common mode

### 8.8.1 Test Setup



## 8.8.2 Test Equipment List

Type	Designation	T-ID	Serial No. or ID	Manufacturer
Signal generator	SML 02	19626	836926/0016	Rohde & Schwarz
Power amplifier	M-100	19763	J164-1105	ifi
Power meter	NRVS	19362	838624/016	Rohde & Schwarz
Power sensor	NRV-Z4	18894	863828/015	Rohde & Schwarz
Directional coupler	BDC 0110-40/100	19783	066248	Bonn
Attenuator	40-6-34	19834	NZ775	Aeroflex
Coupling network	FCC-801-M3-25	19421	117	FCC
Coupling network	FCC-801-M4-25	19422	17	FCC
Shielded room	No. 1	19311	---	Albatross

## 8.8.3 Test Results

Results for Immunity - Input and output DC power ports - Radio-frequency common mode are documented as listed below.

## Immunity - Input and output DC power ports - Radio-frequency common mode

Prüfdatum / <i>Date of test:</i>	2019-04-25
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Shielded room - cabin no. 1

<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

Luftdruck / <i>Barometric pressure:</i>	972,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	33,0 %
Temperatur / <i>Ambient temperature:</i>	25,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-6-2:2005, Clause 8 Table 3; 3.1
Basisnorm / <i>Basic standard:</i>	EN 61000-4-6:2009
Prüfling / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

Required Test Levels						
Line Under Test	Frequency Range (MHz)	Level (V)	Modulation	Step Size (%)	Dwell (s)	Performance Criteria
DC Power Port	0.15 to 80	10	AM (80 %, 1kHz sine wave)	1	> 0.5 <sup>1</sup>	A

### Supplementary information:

Note 1. The dwell time shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0.5 s

Tabulated Results for Conducted Radio Frequency Interference				
Modulation = 80 % AM (1 kHz)		Step Size = 1 %	Dwell = 3 s	
Line Under Test	Frequency Range	Test Level	Coupling Method	Result
DC power supply 1	150kHz to 80MHz	10 V	M4 CDN	Pass PC A

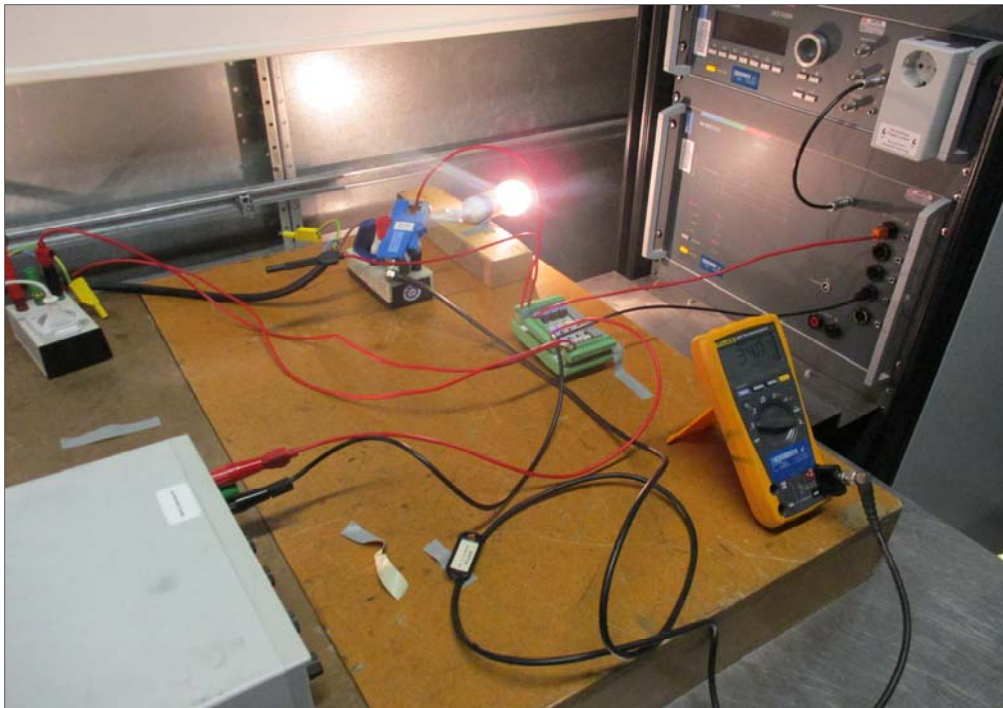
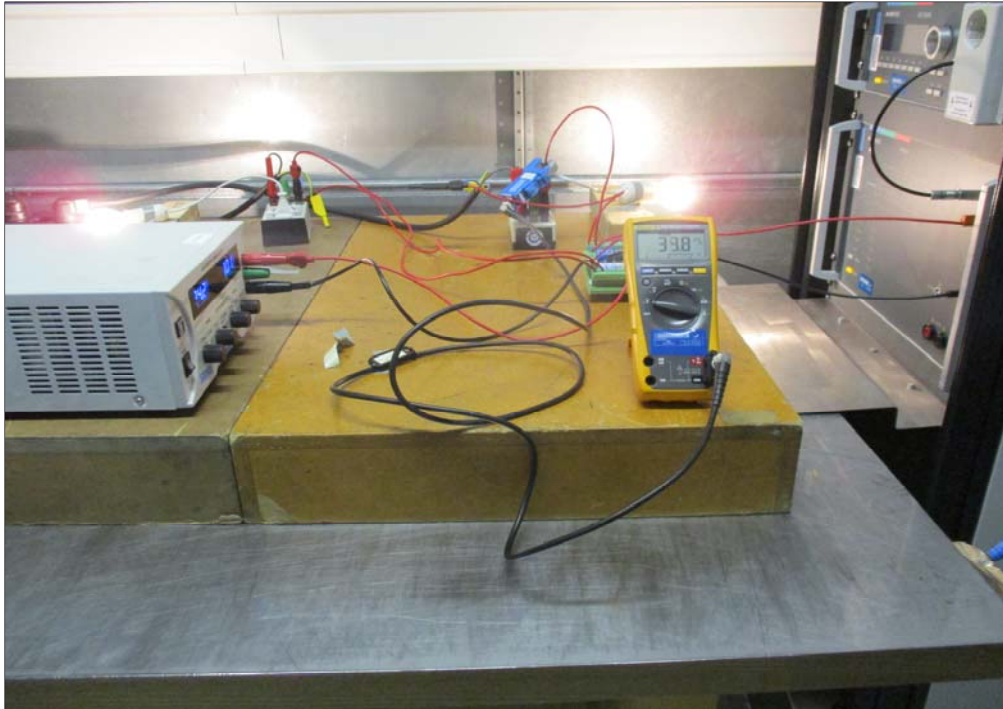
### Results Descriptions / Observations:

1 No influence to EUT has been detected.



## 8.9 Immunity - Input and output DC power ports - Fast transients

### 8.9.1 Test Setup



## 8.9.2 Test Equipment List

<i>Type</i>	<i>Designation</i>	<i>T-ID</i>	<i>Serial No. or ID</i>	<i>Manufacturer</i>
Ultra compact simulator	UCS500N5	20143	P1330120736	EM Test
Coupling network	CNI 503A3	20018	V1150111228	EM Test
Shielded room	No. 1	19311	---	Albatross

## 8.9.3 Test Results

Results for Immunity - Input and output DC power ports - Fast transients are documented as listed below.

## Immunity - Input and output DC power ports - Fast transients

Prüfdatum / <i>Date of test:</i>	2019-04-30
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Shielded room - cabin no. 1

<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

Luftdruck / <i>Barometric pressure:</i>	978,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	37,0 %
Temperatur / <i>Ambient temperature:</i>	24,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-6-2:2005, Clause 8 Table 3; 3.3
Basisnorm / <i>Basic standard:</i>	EN 61000-4-4:2012
Prüfling / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

<i>Required Test Levels</i>					
Line Under Test	Level (kV)	Repetition Rate (kHz)	Test Duration	Coupling Method	Performance Criteria
DC Power Port	± 2	5	1 min per polarity	Direct	B

### Supplementary information:

Not applicable to input ports intended for connection to a battery or a rechargeable battery which must be removed or disconnected from the apparatus for recharging. Apparatus with a DC power input port intended for use with an AC-DC power adaptor shall be tested on the AC power input of the AC-DC power adaptor specified by the manufacturer or, where none is so specified, using a typical AC-DC power adapter. The test is applicable to DC power input ports intended to be connected permanently to cables longer than 3 m.

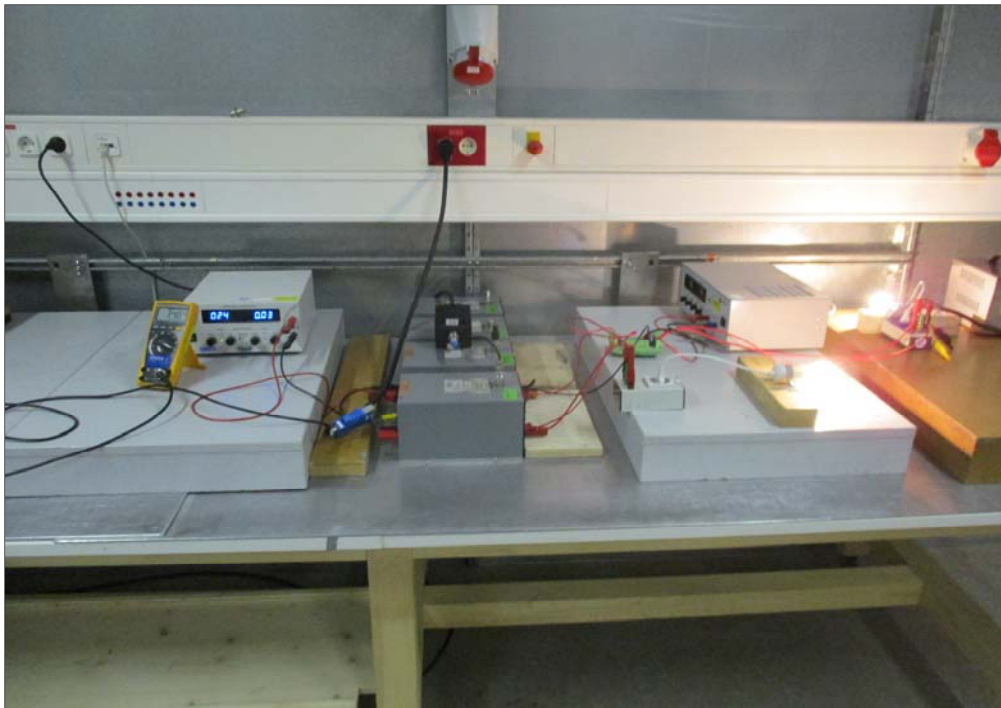
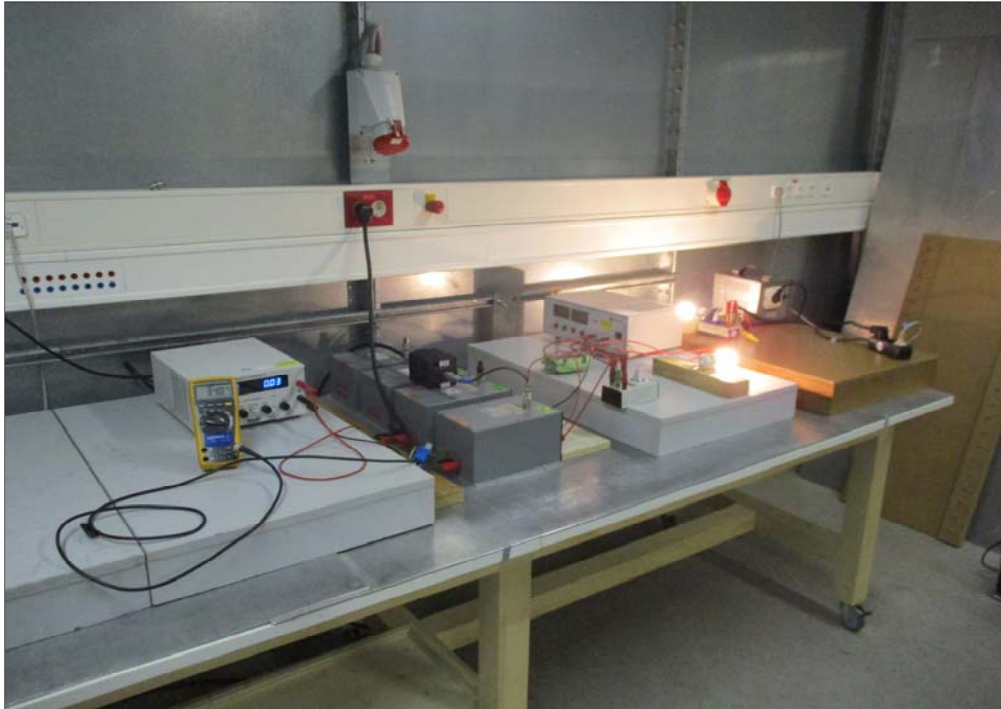
<i>Tabulated Results for Fast Transient Burst Immunity</i>					
Line under test	Test Level (kV)	Repetition Rate (kHz)	Test Duration (s)	Coupling Method	Result
DC power supply 1	±2.0	5	60	Direct	Pass PC A

### Results Descriptions / Observations:

1 No influence to EUT has been detected.

## 8.10 Immunity - Input and output AC power ports - Radio-frequency common mode

### 8.10.1 Test Setup



## 8.10.2 Test Equipment List

Type	Designation	T-ID	Serial No. or ID	Manufacturer
Signal generator	SML 02	19626	836926/0016	Rohde & Schwarz
Power amplifier	M-100	19763	J164-1105	ifi
Power meter	NRVS	19362	838624/016	Rohde & Schwarz
Power sensor	NRV-Z4	18894	863828/015	Rohde & Schwarz
Directional coupler	BDC 0110-40/100	19783	066248	Bonn
Attenuator	40-6-34	19834	NZ775	Aeroflex
Coupling network	FCC-801-M3-25	19421	117	FCC
Coupling network	FCC-801-M4-25	19422	17	FCC
Shielded room	No. 1	19311	---	Albatross

## 8.10.3 Test Results

Results for Immunity - Input and output AC power ports - Radio-frequency common mode are documented as listed below.

## Immunity - Input and output AC power ports - Radio-frequency common mode

Prüfdatum / <i>Date of test:</i>	2019-04-25
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Shielded room - cabin no. 1

<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

Luftdruck / <i>Barometric pressure:</i>	972,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	33,0 %
Temperatur / <i>Ambient temperature:</i>	25,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-6-2:2005, Clause 8 Table 4; 4.1
Basisnorm / <i>Basic standard:</i>	EN 61000-4-6:2009
Prüfling / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

Required Test Levels						
Line Under Test	Frequency Range (MHz)	Level (V)	Modulation	Step Size (%)	Dwell (s)	Performance Criteria
AC Power Port	0.15 to 80	10	AM (80 %, 1kHz sine wave)	1	> 0.5 <sup>1</sup>	A

### Supplementary information:

Note 1. The dwell time shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0.5 s

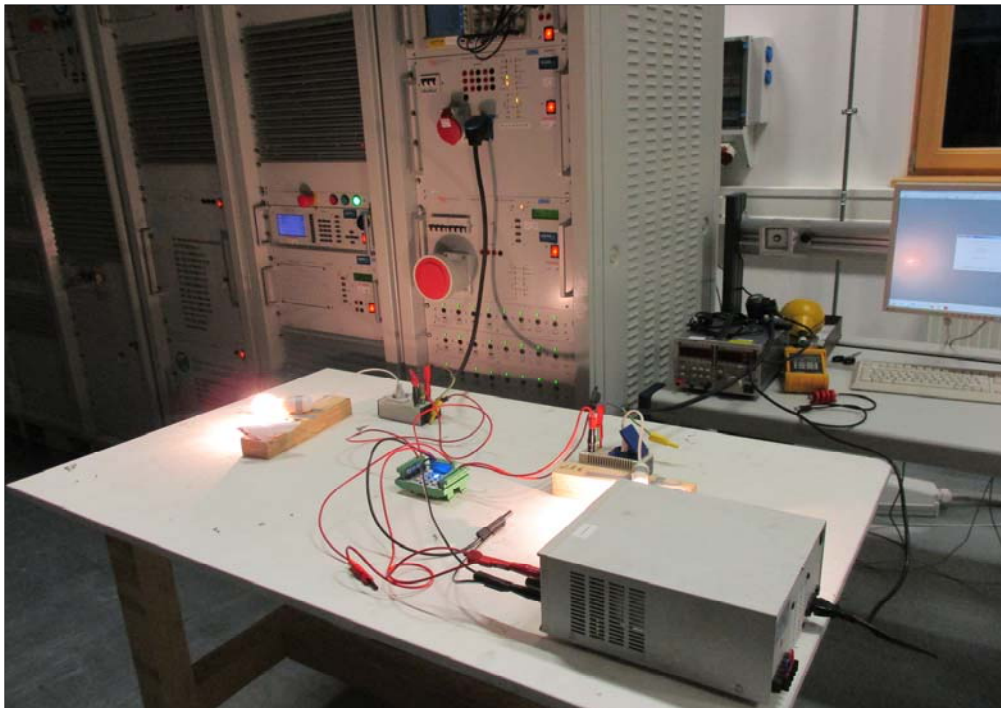
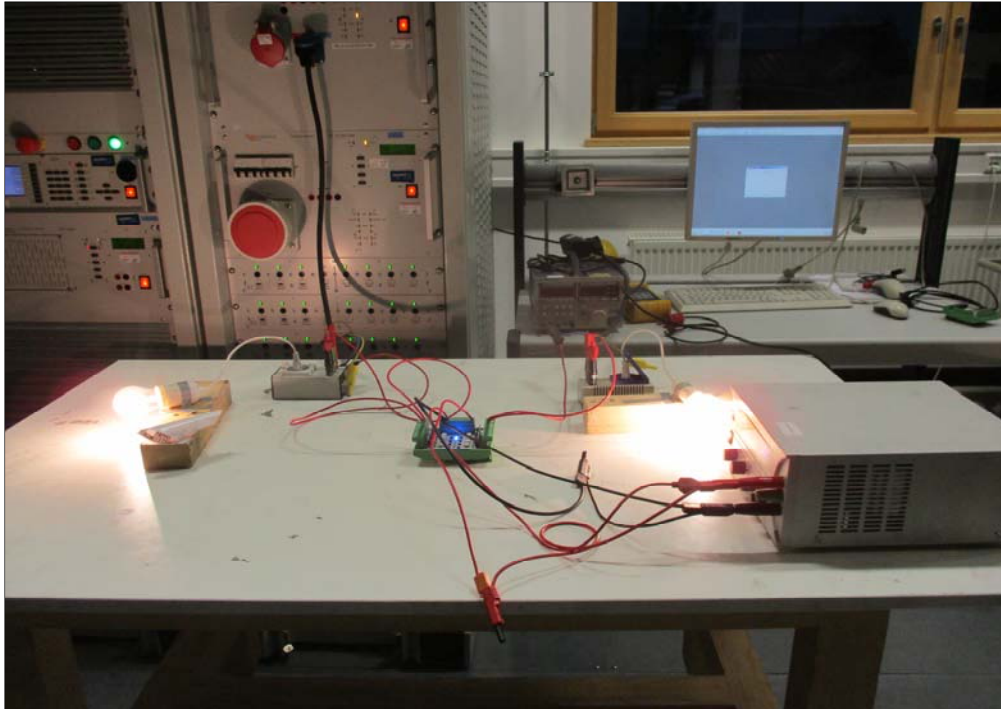
Tabulated Results for Conducted Radio Frequency Interference				
Modulation = 80 % AM (1 kHz)		Step Size = 1 %	Dwell = 3 s	
Line Under Test	Frequency Range	Test Level	Coupling Method	Result
AC power input JB 2	150kHz to 80MHz	10 V	M3 CDN	Pass PC A

### Results Descriptions / Observations:

1 No influence to EUT has been detected.

## 8.11 Immunity - Input and output AC power ports - Voltage dips

### 8.11.1 Test Setup



## 8.11.2 Test Equipment List

Type	Designation	T-ID	Serial No. or ID	Manufacturer
Analyzer reference system (including mains impedance)	ARS 16/3/TPM	20057	A4990 07/1 1112	Spitzenberger & Spies
Additional mains impedance	AIP 75/3/P/TPM	20058	A4990 07/2 1112	Spitzenberger & Spies
Control unit (synthesizers)	SyCore 1k4	20056	A4235 12/0 0209	Spitzenberger & Spies
Amplifier	PAS 10000	19898	A4235 01/1 0209	Spitzenberger & Spies
Oscilloscope	TDS2014B	19899	C041606	Tektronix

## 8.11.3 Test Results

Results for Immunity - Input and output AC power ports - Voltage dips are documented as listed below.





## Immunity - Input and output AC power ports - Voltage dips

Prüfdatum / <i>Date of test:</i>	2019-05-03
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Non shielded room

<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

Luftdruck / <i>Barometric pressure:</i>	970,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	36,0 %
Temperatur / <i>Ambient temperature:</i>	24,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-6-2:2005, Clause 8 Table 4; 4.2
Versorgungsspannung / <i>Supply voltage:</i>	230 Vac
Versorgungsfrequenz / <i>Supply frequency:</i>	50 Hz
Basisnorm / <i>Basic standard:</i>	EN 61000-4-11:2004
Prüfling / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

<i>Required Test Levels</i>			
Test	Test Level	Duration	Performance Criteria
Voltage Dips	0 % of Vnom	1 cycle	B
	40 % of Vnom	10/12 cycle at 50/60 Hz	C
	70 % of Vnom	25/30 cycle at 50/60 Hz	C
<b>Supplementary information:</b> Applicable only to input ports			



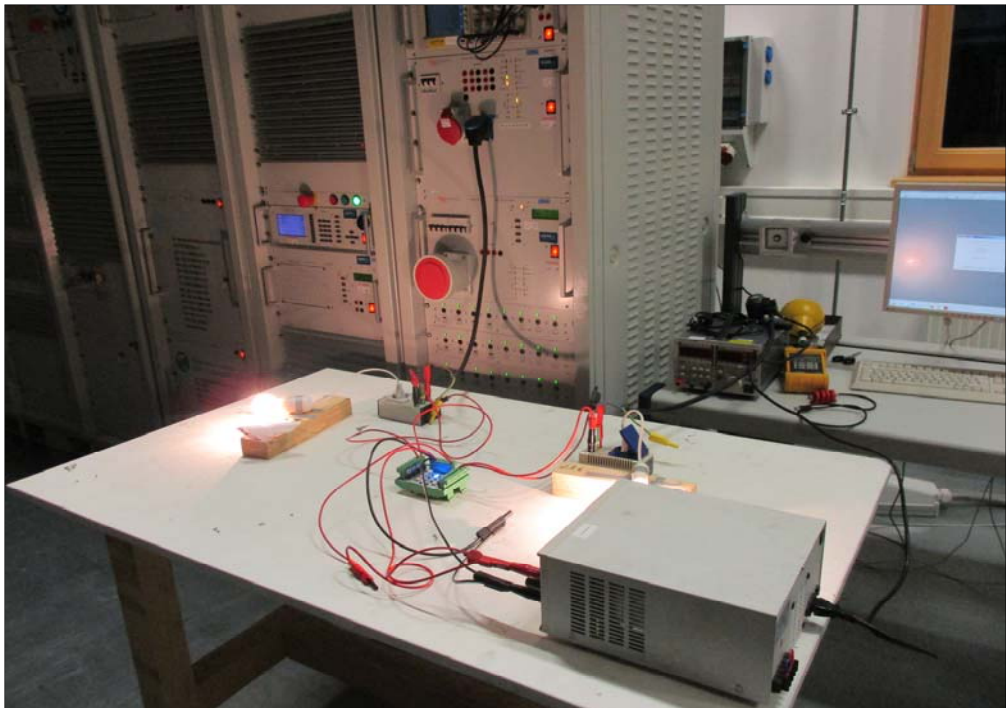
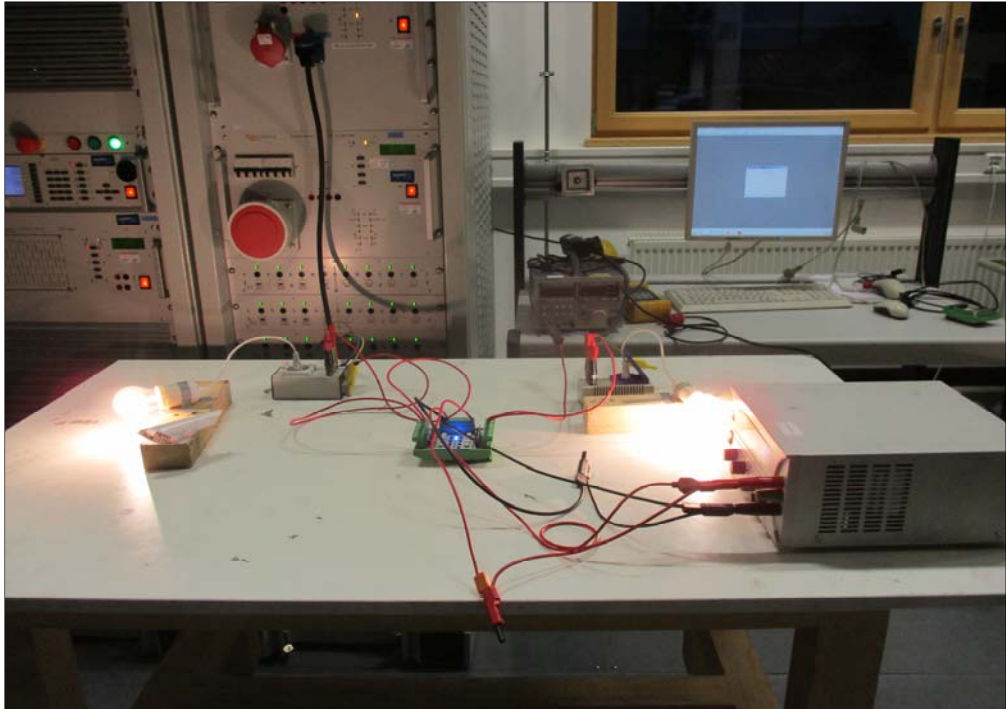
<i>Tabulated Results for Voltage Dips</i>					
Line under test	Vnom (V)	Operating Frequency (Hz)	Test Level (%)	Duration (cycle)	Result
AC power input JB 2	230	50	0 %	1	Pass
AC power input JB 2	230	50	40 %	10	Pass
AC power input JB 2	230	50	70 %	25	Pass

*Results Descriptions / Observations:*

- 1 Short interruptions of function during the test. No influence to performance level detected after the test.

## 8.12 Immunity - Input and output AC power ports - Voltage interruptions

### 8.12.1 Test Setup



## 8.12.2 Test Equipment List

Type	Designation	T-ID	Serial No. or ID	Manufacturer
Analyzer reference system (including mains impedance)	ARS 16/3/TPM	20057	A4990 07/1 1112	Spitzenberger & Spies
Additional mains impedance	AIP 75/3/P/TPM	20058	A4990 07/2 1112	Spitzenberger & Spies
Control unit (synthesizers)	SyCore 1k4	20056	A4235 12/0 0209	Spitzenberger & Spies
Amplifier	PAS 10000	19898	A4235 01/1 0209	Spitzenberger & Spies
Oscilloscope	TDS2014B	19899	C041606	Tektronix

## 8.12.3 Test Results

Results for Immunity - Input and output AC power ports - Voltage interruptions are documented as listed below.



## Immunity - Input and output AC power ports - Voltage interruptions

Prüfdatum / <i>Date of test:</i>	2019-05-02
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Non shielded room

<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

Luftdruck / <i>Barometric pressure:</i>	970,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	33,0 %
Temperatur / <i>Ambient temperature:</i>	24,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-6-2:2005, Clause 8 Table 4; 4.3
Versorgungsspannung / <i>Supply voltage:</i>	230 Vac
Versorgungsfrequenz / <i>Supply frequency:</i>	50 Hz
Basisnorm / <i>Basic standard:</i>	EN 61000-4-11:2004
Prüfling / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

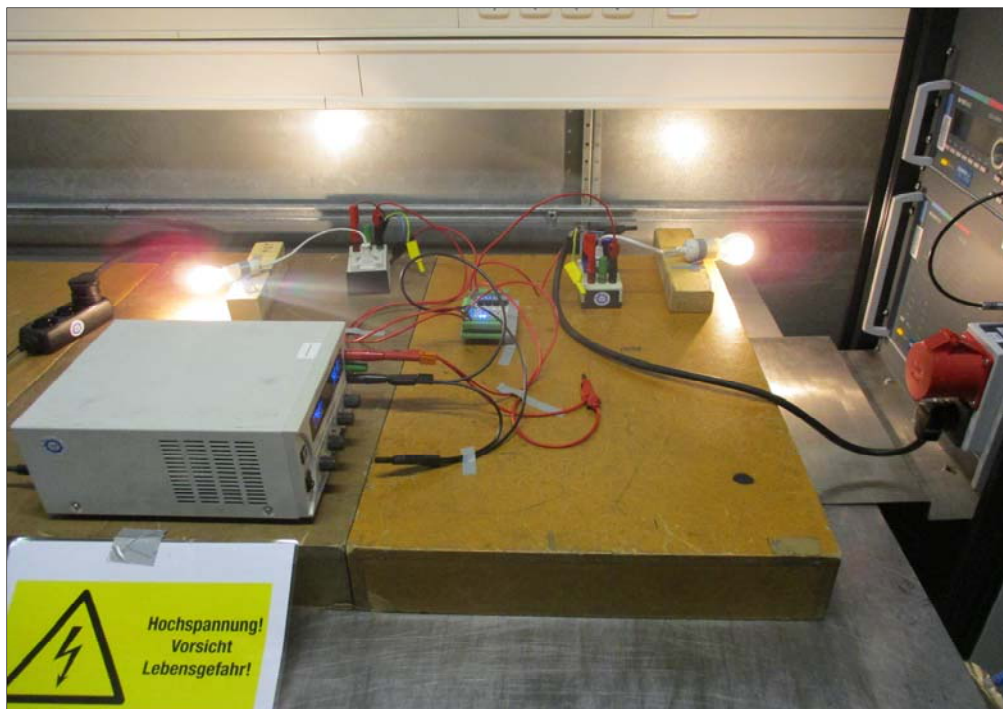
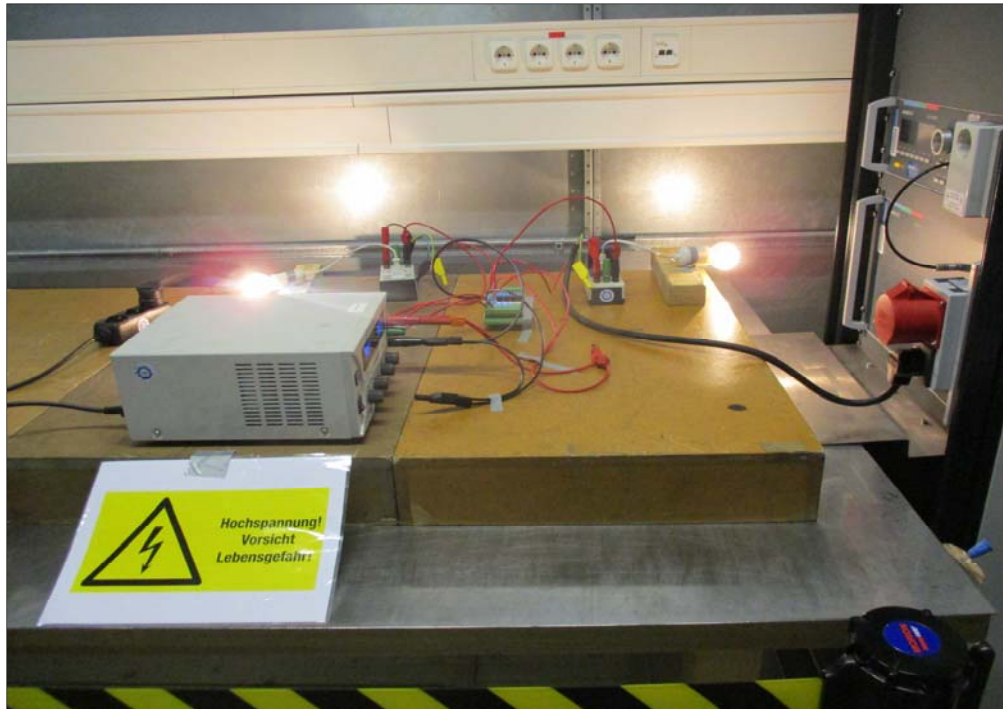
<i>Required Test Levels</i>			
Test	Test Level	Duration	Performance Criteria
Voltage Interruptions	0 % of Vnom	250/300 cycle at 50/60Hz	C
<b>Supplementary information:</b> Applicable only to input ports			

<i>Tabulated Results for Voltage Interruptions</i>					
Line under test	Vnom (V)	Operating Frequency (Hz)	Test Level (%)	Duration (cycle)	Result
AC power input JB 2	230	50	0 %	250	Pass

<i>Results Descriptions / Observations:</i>
1 Short interruptions of function during the test. No influence to performance level detected after the test.

## 8.13 Immunity - Input and output AC power ports - Surges

### 8.13.1 Test Setup



### 8.13.2 Test Equipment List

<i>Type</i>	<i>Designation</i>	<i>T-ID</i>	<i>Serial No. or ID</i>	<i>Manufacturer</i>
Ultra compact simulator	UCS500N5	20143	P1330120736	EM Test
Coupling network	CNI 503A3	20018	V1150111228	EM Test
Shielded room	No. 1	19311	---	Albatross

### 8.13.3 Test Results

Results for Immunity - Input and output AC power ports - Surges are documented as listed below.

## Immunity - Input and output AC power ports - Surges

Prüfdatum / <i>Date of test:</i>	2019-04-30
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Shielded room - cabin no. 1

<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

Luftdruck / <i>Barometric pressure:</i>	978,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	37,0 %
Temperatur / <i>Ambient temperature:</i>	24,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-6-2:2005, Clause 8 Table 4; 4.4
Basisnorm / <i>Basic standard:</i>	EN 61000-4-5:2006
Prüfling / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

Required Test Levels					
Line Under Test	Level (kV)	Surge Waveform	Phase Angles (°)	No of Pulse	Performance Criteria
AC Power Port	± 1 (Line to Line) ± 2 (Line to Earth)	1.2/50 (8/20)	0, 90, 180, 270	5 per polarity	B

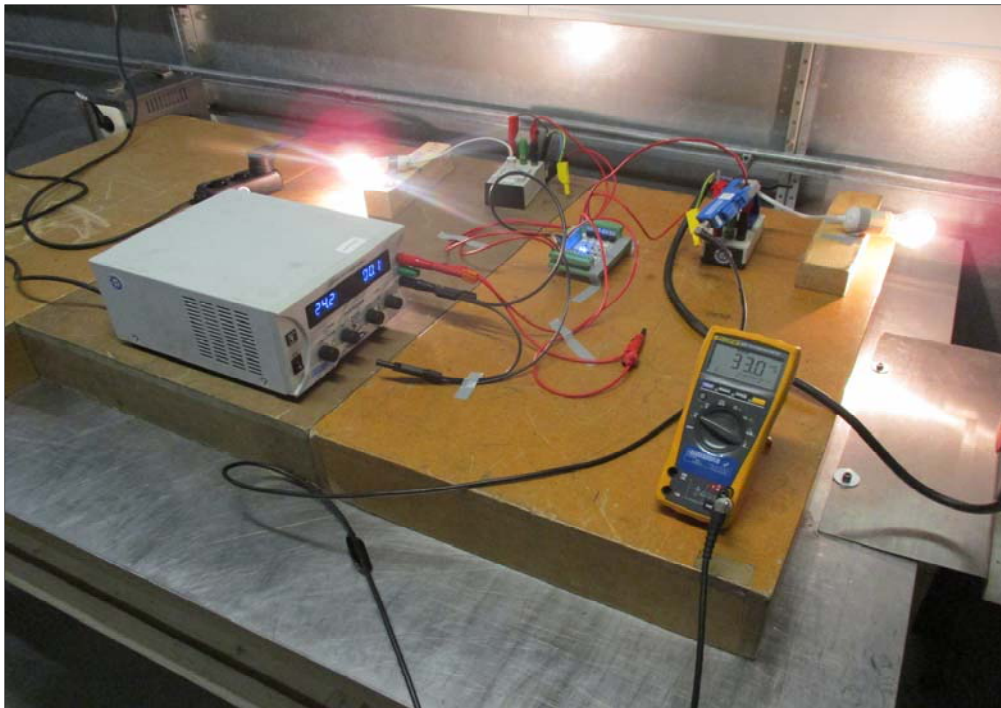
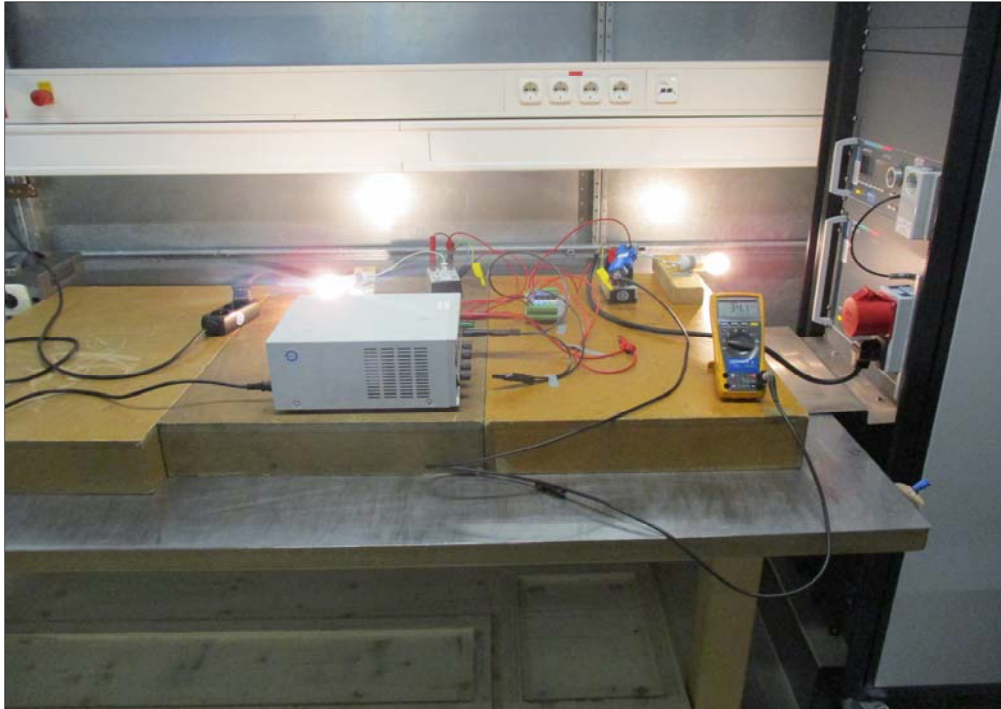
Tabulated Results for Surge Immunity (Power Ports)							
Line under test	Coupling	Level (kV)	Polarity	Phase Angle (°)	Repetition Rate (s)	No of Pulses	Result
AC power input JB 2	L1 to Neutral	±0.5 & ±1.0	Positive & Negative	0, 90, 180 & 270 deg	60	5 per polarity	Pass PC A

<i>Results Descriptions / Observations:</i>
1 No influence to EUT has been detected.



## 8.14 Immunity - Input and output AC power ports - Fast transients

### 8.14.1 Test Setup



## 8.14.2 Test Equipment List

<i>Type</i>	<i>Designation</i>	<i>T-ID</i>	<i>Serial No. or ID</i>	<i>Manufacturer</i>
Ultra compact simulator	UCS500N5	20143	P1330120736	EM Test
Coupling network	CNI 503A3	20018	V1150111228	EM Test
Shielded room	No. 1	19311	---	Albatross

## 8.14.3 Test Results

Results for Immunity - Input and output AC power ports - Fast transients are documented as listed below.

## Immunity - Input and output AC power ports - Fast transients

Prüfdatum / <i>Date of test:</i>	2019-04-30
Prüfer / <i>Operator:</i>	Christopher Haimerl
Messplatz / <i>Test site:</i>	Shielded room - cabin no. 1

<b>Prüfergebnis / <i>Test Result</i></b>
<b>Pass</b>

Luftdruck / <i>Barometric pressure:</i>	978,0 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity:</i>	37,0 %
Temperatur / <i>Ambient temperature:</i>	24,0 °C

Prüfgrundlage / <i>Specifications:</i>	EN 61000-6-2:2005, Clause 8 Table 4; 4.5
Basisnorm / <i>Basic standard:</i>	EN 61000-4-4:2012
Prüfling / <i>Equipment under test:</i>	PP-418, S/N: --- - Modification State 0
Betriebsart / <i>Operation mode:</i>	24 V DC power supply on JB1 and 230 V / 50 Hz AC power on JB2 & JB3 EUT in Operation Mode
Kommentar / <i>Comment:</i>	---

<i>Required Test Levels</i>					
Line Under Test	Level (kV)	Repetition Rate (kHz)	Test Duration	Coupling Method	Performance Criteria
AC Power Port	± 2	5	1 min per polarity	Direct	B

<i>Tabulated Results for Fast Transient Burst Immunity</i>					
Line under test	Test Level (kV)	Repetition Rate (kHz)	Test Duration (s)	Coupling Method	Result
AC power input JB 2	±2.0	5	60	Direct	Pass PC A

<i>Results Descriptions / Observations:</i>
1 No influence to EUT has been detected.



## 9 Revision History

<i>Edition</i>	<i>Date</i>	<i>Issued by</i>	<i>Modifications</i>
1	2019-06-06	Christopher Haimerl	---