



Environmental Qualification Report

Rotapanel RP-2000

Harmonics and Flicker tests in accordance with EN 61000-3-2 and EN 61000-3-3

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Tests started at : 01-06-2017
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 Test location : Thales EMC labs Hengelo
 Present : H. Born

Copies to : Rotapanel, Thales

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 :

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Revision sheet

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Revision	Date	Modifications
00	2017-06-21	Released version

During review phase this document is marked "IN WORK" (see page footer under "STATUS"). Once released to "RELEASED" status, the document is final and the correct version is displayed under "VERSION" (see page footer under "VERSION")

List with abbreviations

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AC	Alternating Current
Cal.	Calibration
CE	Conducted Emission
DC	Direct Current
e.m.f.	Electromotive force
EN	European Norm
ESD	Electro Static Discharge
EUT	Equipment Under Test
GRP	Ground Reference Plane
N.A.	Not Applicable
PE	Protective Earth
RE	Radiated Emission
RF	Radio Frequency
RMS	Root Mean Square

1. INTRODUCTION

1.1. Purpose of the test

The purpose of this test is to establish whether or not the EUT, as identified in section 1.2, meets the requirements for Electromagnetic Compatibility, when tested in accordance with the standards EN 61000-3-2:2014 and EN 61000-3-3:2013.

1.2. Equipment Under Test (EUT)

Kind of product	: Control module for rotating panels
Manufacturer	: Rotapanel
Brand	: Rotapanel
Model	: RP-2000 Profibus
Serial number(s)	: n.a.
Revision	: n.a.
Software version	: n.a.
Receipt date	: 01-06-2017
No of samples tested	: 1

1.2.1. Description of the EUT

The EUT is a device to drive and control rotating boards.

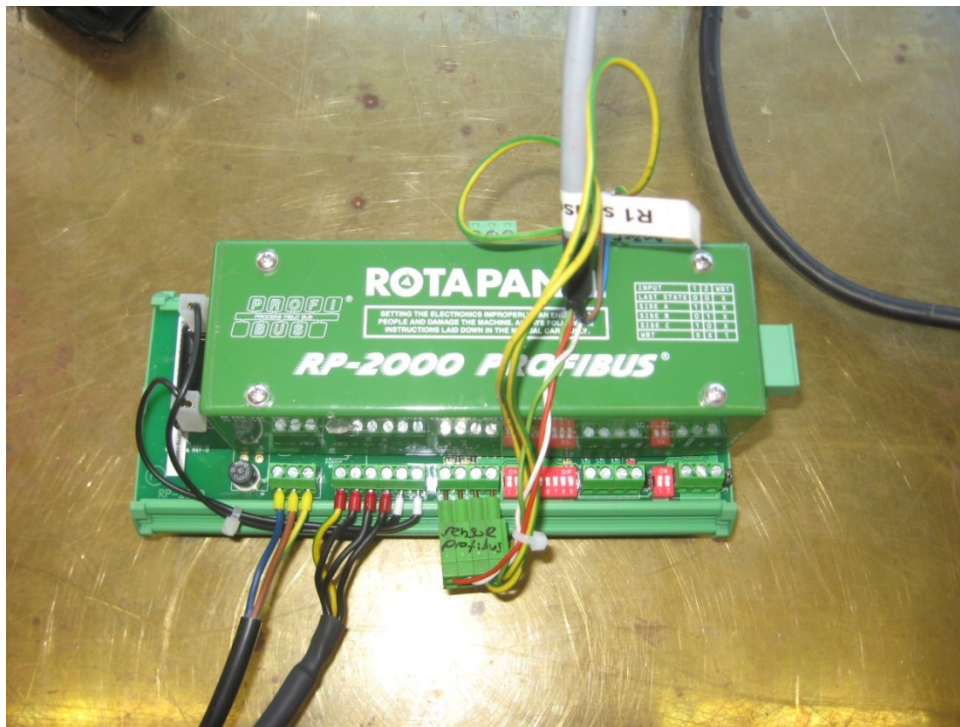


Figure 1 Photograph of the EUT

1.2.2. EUT Port description

Table 1 Input and or Output Power Port description

Port No.	Name	specification	length [m]	shield [Y/N]
#1	Power Port	230 V AV 50 Hz single phase + PE + N	1.5	N

1.2.3. Auxiliary equipment

The auxiliary equipment was a rotation mechanism typical for its application with the EUT.

1.2.4. Operating modes

The EUT is tested in 1 (one) operating mode. This mode is defined below.

Operating mode 1: EUT is functioning normally, the rotating mechanism is driven by the EUT to rotate in fixed intervals.

1.3. Requirements

Requirements are stated in the relevant sections in chapters 3.

1.4. List of reference documents

Emission: Basic standards:

- [1] EN 61000-3-2:2014
Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

- [2] EN 61000-3-3:2013
“ Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection, Edition 3.0, 2013-05”

2. CONCLUSION

The EUT as identified in section 1 meets the requirements of meets the requirements for Electromagnetic Compatibility, when tested in accordance with the standards accordance with the standards EN 61000-3-2:2014 and EN 61000-3-3:2013.

This result complements the results as reported in Thales Report no. 9501 025 551XX EQR DSN 001.

Note: The results in this report are only valid for the EUT as identified in section 1.2.

Table 2 Summarized conclusion

Test description	requirement	Complies	Remarks
EN 61000-3-2 Harmonic Current emission	Class A limit	YES	None
EN 61000-3-3 Limitation of voltage changes, voltage fluctuations and flicker	Pst < 1.0 Plt < 0.65	YES	none

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3. EMISSION TESTS

3.1. Harmonic Current Emissions

3.1.1. Applicable standards

Basic Standard: EN 61000-3-2:2014 [1]

3.1.2. Objective

The objective of this test is to establish whether or not the EUT injects harmonic currents in the mains supply system with respect to the limits as prescribed by this standard.

3.1.3. Requirements

The requirements depend on the EUT classification. The classification criteria can be found in the standard.

Table 3 EUT classification

	The EUT is classified as
<input checked="" type="checkbox"/>	class A
<input type="checkbox"/>	class B
<input type="checkbox"/>	Class C
<input type="checkbox"/>	Class D

3.1.4. Test procedure

The test procedure is in accordance with EN 61000-3-2:2014

3.1.5. Test equipment

Table 4 Test equipment harmonic current measurement

category	barcode	brand	model	description	cal due
harmonics analyser	61499	Spitzenberger	ARS16/3	Analyser Reference system	2018-05-19
Load	61510	Spitzenberger	Reference-load	Reference load	none
Waveform Generator	61502	Spitzenberger	MFD1	Magnetic Field Source	2019-04-26
Oscilloscope	61350	Lecroy	6100A	Oscilloscope 4 channel, 1 GHz, 5/10 GS/s	2018-05-18
AC supply	77166	Spitzenberger	PAS5000	4-quadrant amplifier	N.A.
AC supply	77167	Spitzenberger	SyCore	Sycore	N.A.
AC supply	77168	Spitzenberger	PAS5000	4-quadrant amplifier	N.A.

<i>category</i>	<i>barcode</i>	<i>brand</i>	<i>model</i>	<i>description</i>	<i>cal due</i>
AC supply	77169	Spitzenberger	PAS5000	4-quadrant amplifier	N.A.
AC supply	77170	Spitzenberger	NT/D5000	Power supply	N.A.

3.1.6. Test results

The EUT meets the requirements for class A equipment.

The results are listed in the table below.

Name: J. Schuurmans Serial no:
 Department: ECC EMC Operating modes: normal
 Company: Thales Nederland BV Comment1: --
 Test report no: Comment2: --
 Device: Comment3: --
 Specimen: Comment4: --
 Manufacturer: Date: 01.06.2017
 Type: Test date: 01.06.2017

Maximum RMS current and corresponding values in timewindow 34:

Voltage: 230.48 V rms THD=0.01 % THV=0.032 V POHV=0.012 V PWHD=0.04 %
 Current: 0.153 A rms THD=17.78 % THC=0.026 A POHC=0.001 A PWHD=3.37 %
 Power: 33.0 W P1=32.2 W 35.3 VA
 Power factor: 0.937 CosPhi1: 0.960

Test conditions: EN 61000-3-2: 2014, f=50 Hz, Phase=1, Range=0.80 A
 Time window=1012 (200ms), Grouping (>2nd harm) =on
 No Ztest selected
 harmonic currents < 0.6 % of I or < 5 mA are disregarded for calc. of THD, THC, POHC, PWHD

HARMONIC ANALYSIS: Test PASS

Tobs = entire measurement; POHC: avg=0.00 A, limits=0.25 A
 Iavg = 0.103 A rms

Har	Entire measurement (1.0 min = 300 time windows)							Worst 2.5 min		Average		P A S S	F A I L
	Maximum	Window	EN61000-3-2 Class A	Margin in MaxVIn	100 to 150%	150 to 200%	Ex- ceeded	100 to 150%	Ex- ceeded	Value	Ex- ceeded		
DC	-0.0159 A	234			0	0	0	n.e.	n.e.	-0.0020 A	0	X	
1	0.1479 A	145			0	0	0	n.e.	n.e.	0.0973 A	0	X	
2	0.0019 A	35	1.0800 A	-99.8 %	0	0	0	n.e.	n.e.	0.0005 A	0	X	
3	0.0217 A	291	2.3000 A	-99.1 %	0	0	0	n.e.	n.e.	0.0207 A	0	X	
4	0.0009 A	204	0.4300 A	-99.8 %	0	0	0	n.e.	n.e.	0.0002 A	0	X	
5	0.0165 A	2	1.1400 A	-98.6 %	0	0	0	n.e.	n.e.	0.0160 A	0	X	
6	0.0005 A	35	0.3000 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X	
7	0.0018 A	35	0.7700 A	-99.8 %	0	0	0	n.e.	n.e.	0.0016 A	0	X	
8	0.0004 A	291	0.2300 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X	
9	0.0024 A	122	0.4000 A	-99.4 %	0	0	0	n.e.	n.e.	0.0023 A	0	X	
10	0.0003 A	35	0.1840 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X	
11	0.0015 A	204	0.3300 A	-99.5 %	0	0	0	n.e.	n.e.	0.0014 A	0	X	
12	0.0003 A	35	0.1533 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X	
13	0.0006 A	35	0.2100 A	-99.7 %	0	0	0	n.e.	n.e.	0.0004 A	0	X	
14	0.0002 A	35	0.1314 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X	
15	0.0007 A	178	0.1500 A	-99.6 %	0	0	0	n.e.	n.e.	0.0005 A	0	X	
16	0.0002 A	204	0.1150 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X	
17	0.0005 A	178	0.1324 A	-99.6 %	0	0	0	n.e.	n.e.	0.0004 A	0	X	
18	0.0002 A	35	0.1022 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X	
19	0.0003 A	122	0.1184 A	-99.7 %	0	0	0	n.e.	n.e.	0.0002 A	0	X	
20	0.0004 A	35	0.0920 A	-99.6 %	0	0	0	n.e.	n.e.	0.0002 A	0	X	
21	0.0003 A	9	0.1071 A	-99.7 %	0	0	0	n.e.	n.e.	0.0003 A	0	X	
22	0.0004 A	35	0.0836 A	-99.5 %	0	0	0	n.e.	n.e.	0.0002 A	0	X	
23	0.0003 A	204	0.0978 A	-99.7 %	0	0	0	n.e.	n.e.	0.0002 A	0	X	
24	0.0002 A	204	0.0767 A	-99.8 %	0	0	0	n.e.	n.e.	0.0000 A	0	X	
25	0.0002 A	204	0.0900 A	-99.7 %	0	0	0	n.e.	n.e.	0.0002 A	0	X	
26	0.0001 A	204	0.0708 A	-99.8 %	0	0	0	n.e.	n.e.	0.0000 A	0	X	
27	0.0002 A	122	0.0833 A	-99.7 %	0	0	0	n.e.	n.e.	0.0002 A	0	X	
28	0.0001 A	9	0.0657 A	-99.8 %	0	0	0	n.e.	n.e.	0.0000 A	0	X	
29	0.0002 A	9	0.0776 A	-99.7 %	0	0	0	n.e.	n.e.	0.0001 A	0	X	
30	0.0001 A	204	0.0613 A	-99.8 %	0	0	0	n.e.	n.e.	0.0000 A	0	X	
31	0.0002 A	9	0.0726 A	-99.7 %	0	0	0	n.e.	n.e.	0.0001 A	0	X	
32	0.0001 A	9	0.0575 A	-99.8 %	0	0	0	n.e.	n.e.	0.0000 A	0	X	
33	0.0002 A	35	0.0682 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X	
34	0.0001 A	291	0.0541 A	-99.8 %	0	0	0	n.e.	n.e.	0.0000 A	0	X	
35	0.0002 A	204	0.0643 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X	
36	0.0001 A	204	0.0511 A	-99.8 %	0	0	0	n.e.	n.e.	0.0000 A	0	X	
37	0.0001 A	204	0.0608 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X	
38	0.0001 A	9	0.0484 A	-99.8 %	0	0	0	n.e.	n.e.	0.0000 A	0	X	
39	0.0001 A	291	0.0577 A	-99.8 %	0	0	0	n.e.	n.e.	0.0001 A	0	X	
40	0.0001 A	35	0.0460 A	-99.8 %	0	0	0	n.e.	n.e.	0.0000 A	0	X	

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

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3.2. Voltage fluctuations and flicker

3.2.1. Applicable standards

Basic Standard: EN 61000-3-3:2013 [2]

3.2.2. Objective

The objective of this test is to establish whether or not the EUT causes variations in the voltage of the public low-voltage mains network with respect to the limits of the standard.

3.2.3. Requirements

Table 5 Requirements for flicker

Parameter	Maximum absolute value
Short term flicker indicator Pst	1.0
Long Term Flicker indicator Plt	0.65
Relative steady state voltage change dg	3 %
Relative voltage change dl	3 % for more than 200 ms
Maximum relative voltage change dmax	4 %

3.2.4. Test procedure

The test procedure is in accordance with EN 61000-3-3:2013

Automatic test procedure with dedicated software including a presentation of the test results.

3.2.5. Test equipment

Table 6 Test equipment Flicker measurement

3.2.6. Test results

The EUT meets the requirements. The detailed results are listed in the table below.

Name:	J. Schuurmans	Serial no:	
Department:	EC-C EMC	Operating modes:	normal
Company:	Thales Nederland BV	Comment1:	--
Test report no:	1	Comment2:	--
Device:	Rotapanel Control Unit	Comment3:	--
Specimen:	RP-2000 Profibus	Comment4:	--
Manufacturer:	Rotapanel	Date:	01.06.2017
Type:		Test date:	01.06.2017

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±0.250) Ohm
 Ra+jXa (0.2400±j0.1500) Ohm / Rn+jXn (0.1600±j0.1000) Ohm

FLICKER: Test PASS!

Time	Pmax	Pst	Sliding Pt	Tmax [s]	dmax[%]	dc [%]	PASS	FAIL
10:43:17	0.010	0.0700	-	0.000	+0.000	-	X	
Limits		1.000	0.650	0.500	4.000	3.300		
Pst: 0.030575 (calculated over 12 periods)							X	
Evaluated: PST, PLT								

FLICKER: Source test PASS!

Time	Pmax	Pst	Sliding Pt	Tmax [s]	dmax[%]	dc [%]	PASS	FAIL
10:43:17	0.000	0.0030	-	0.000	+0.000	-	X	
Pst: 0.001310 (calculated over 12 periods)								
Evaluated: PST <= 0.4 dmax < 20 % dmaxf								

Tested with EMC 4.1.2 P14.000 by Eysenberger & Eysen GmbH & Co. KG, Bornheim 5204, 52041 Vornheim, Germany, 01.06.2017

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