

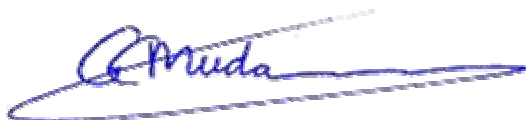
2110487-QUA/PHO 07-189_B

**Benchmark research to the quality of
projector lamps¹**

Arnhem, 10 January 2008

Author J.L. Walhout
QUA/PHO

By order of Philips Lighting in Turnhout, Belgium



author	: J.L. Walhout	10-01-2008	reviewed	: G.C. Muda	10-01-2008
B	16 pages	5 annexes	JLW	approved	: G.C. Muda (project manager) 10-01-2008

¹ Voor de Nederlandse versie zie rapport nr. 2110487-QUA/PHO 07-189_A

© KEMA Nederland B.V., Arnhem, the Netherlands. All rights reserved.

It is prohibited to change any and all versions of this document in any manner whatsoever, including but not limited to dividing it into parts. In case of a conflict between the electronic version (e.g. PDF file) and the original paper version provided by KEMA, the latter will prevail.

KEMA Nederland B.V. and/or its associated companies disclaim liability for any direct, indirect, consequential or incidental damages that may result from the use of the information or data, or from the inability to use the information or data contained in this document.

The contents of this report may only be transmitted to third parties in its entirety and provided with the copyright notice, prohibition to change, electronic versions' validity notice and disclaimer.

CONTENTS

	page
1 Introduction.....	4
2 Research overview.....	4
3 Measurement procedure.....	6
3.1 Front projectors.....	6
3.2 Rear projection televisions.....	7
4 Results.....	7
5 Conclusions.....	8
5.1 Visual inspection.....	8
5.2 Photometry.....	8
Annex 1 Visual inspection.....	10
Annex 2 Photometric results.....	11
Annex 3 Photos.....	13
Annex 4 List of manufacturers.....	15
Annex 5 KEMA Company profile.....	16

1 INTRODUCTION

This research is initiated by Philips Lighting in Turnhout, Belgium, to get a better insight in the quality of front projectors lamps and Rear Projection Televisions (RPTV) lamps which are available in the aftermarket.

Several manufacturers and distributors offer replacement lamps on the internet for when an original lamp in a projector or rear projection TV needs replacement. By searching the internet a lot of distributors can be found who are able to deliver these lamps. Philips Lighting wants to examine the quality of those lamps and wants to compare them with their own lamps.

2 RESEARCH OVERVIEW

To get a representative and comparable research, different lamp manufacturers are selected by Philips Lighting. The selected manufacturers are supposed to be the most important players in the aftermarket. For each manufacturer five lamps are subsequently ordered via the internet and are sent to KEMA² in Arnhem, the Netherlands. Even the Philips lamps are ordered by an external supplier to prevent pre-selection. The delivered lamps are in this way identical to the lamps which are bought by a consumer and therefore suitable for a comparable research.

Photometrical properties are measured following the IEC 61947-1 'Electronic projection – Measurement and documentation of key performance criteria; Part 1: Fixed resolution projectors'.

During the research UHP (Ultra High Pressure) lamps used with various technologies were tested. The photometric performance of the original and compatible lamps were tested in a projector, based on Digital Light Processing™ (DLP™) technology and in a projector based on Liquid Crystal Display (LCD) technology. Also, the photometric performance of the projection TV lamps was performed on two Rear Projection Television sets, one based on DLP™ technology and one based on LCD technology. An overview of the numbers, types and manufacturers is summarized in table 1.

² For a business profile of KEMA see annex 5

	<i>Front</i>		<i>Rear</i>		Total
	DLP 200W-1.0-E19	LCD 200W-1.0-E19.5	DLP 100W-1.0-E23	LCD 100W-120W- 1.0-P22	
Philips	5x	5x	5x	5x	20
Compatible player A³	5x	5x	5x	5x	20
Compatible player B	5x	--	5x	5x	15
Compatible player C	5x	5x	--	--	10
Total	20	15	15	15	65

Table 1

The examination itself exists of two parts. At first, there's a visual inspection performed on the lamps as they are delivered by the manufacturer. The aim is to get an objective qualification for the different manufacturers. The following criteria are used:

1. Whether or not a mercury mark, recycling mark and caution indication is printed on the lamp and/or packaging.
2. Whether or not an installation manual is enclosed.
3. Whether or not the delivered lamp is ready for installation without any further modification.

These criteria are thought to be the most objective unambiguous criteria for the visual inspection (see annex 1).

Secondly, the photometric properties of the lamps are measured. For front projectors this means an ANSI lumen measurement and for the rear projection televisions a luminance spot measurement (see chapter 3).

³ For the accompanying names see annex 4

3 MEASUREMENT PROCEDURE

3.1 Front projectors

The illuminance is measured by means of a 9 points measurement⁴. The average of the individual illuminance values is taken and multiplied by the surface area to get an ANSI lumen value. The illuminance is measured with a lux meter (Minolta CL-200) equipped with a cosine filter correction⁵.

The distance from beamer to screen is determined by a fixed frame on the wall with an aspect ratio of 4:3 (horizontal:vertical)⁶. By moving the beamer in transversal direction with maximum zoom⁷ the distance to the wall will be set. A white screen was obtained by a PowerPoint slide.

For the measurements on the DLP and LCD lamps respectively a DELL 2300MP projector and a SANYO PLC-XW55 projector are used.

The average temperature in the measurement room was 22° Celsius⁸.

All lamps are 15 minutes stabilised before starting any measurement⁹.

⁴ IEC 61947-1:2002(E) – page 12

⁵ ibid – page 12

⁶ ibid – page 11

⁷ ibid – page 10

⁸ ibid – page 11

⁹ ibid – page 11

3.2 Rear projection televisions

The luminance values for rear projection televisions are measured with a Konica Minolta LS-100. This meter is positioned on a prescribed distance¹⁰ (>4 x screen height) from the television in the middle of the screen. Both TV and luminance meter are fixed to keep every parameter constant¹¹.

For measurements on the DLP and LCD lamps respectively a SONY KF-42WE610 television and a SAMSUNG SVP-50L3HR are used.

The average temperature in the measurement room was 23° Celsius⁸.

All lamps are 15 minutes stabilised before starting any measurement⁹.

4 RESULTS

Results for the visual inspection are summarised in annex 1. Photometrical results for the front projectors and rear projection TV's are summarised on page 1 and 2 of annex 2.

¹⁰ IEC 61947-1:2002(E) – page 12

¹¹ ibid – page 11

5 CONCLUSIONS

5.1 Visual inspection

All Philips lamps contain markings for mercury and recycling and they were all accompanied by an installation manual but none of the compared lamps contains any marking for mercury or recycling nor did any manufacturer supply an installation manual.

Only the Philips Front Projection LCD has all warnings as stated in chapter 2 (see also annex 1) and lamps of compatible player A (Front Projection LCD/DLP) doesn't have any markings at all.

The lamps of compatible players B (Rear Projection TV LCD/DLP) and A (Rear Projection TV LCD) neither have any markings on packaging or lamp.

For a detailed list of present warnings see annex1.

Nearly all lamps were ready to install except the Front Projection LCD of compatible player C because a wrong lamp was delivered although the correct lamp was ordered. The Rear Projection LCD TV of compatible player B does not have a proper side connection so a dangerous situation will be created when replacing the lamp (see also Figure 1 – Rear LCD compatible player B).

5.2 Photometry

The mean values for the luminance are given in table 2:

	<i>Front</i>		<i>Rear</i>	
	DLP 200W-1.0-E19	LCD 200W-1.0-E19.5	DLP 100W-1.0-E23	LCD 100W-120W- 1.0-P22
Philips	1535	1845	418.1	335.3
Compatible player A¹²	1287	1264	151.8	188.8
Compatible player B	--	--	133.1	252.4
Compatible player C	1065	--	--	--

Table 2

The ANSI lumen values for the Philips Front Projection DLP lamps are at average 32% higher compared to lamps from compatible players A and C.

¹² For the accompanying names see annex 4

The ANSI lumen values for the Philips Front Projection LCD lamps are at average 46% higher compared to lamps from compatible player A.

The luminance in the center of the Rear Projection LCD TV is at average 54% higher for the Philips lamps compared to the lamps from compatible players A and B.

The luminance in the center of the Rear Projection DLP TV is at average 218% higher for the Philips lamps compared to the lamps from compatible players A and B.

The overall conclusion may be that the original Philips lamps for the Front Projection DLP/LCD and Rear Projection DLP/LCD TV gives a significantly higher luminance in the given positions¹³ than the lamps from other manufacturers¹⁴.

¹³ See Chapter 3

¹⁴ See Chapter 2

	Mercury mark ¹⁵	Recycling mark ¹⁶	Installation manual ¹⁷	Caution indication ¹⁸	Ready for installation ¹⁹
Front DLP – E19					
Compatible player A	--	--	--	--	X
Compatible player B	--	--	--	¹⁵	-- ²⁰
Compatible player C	--	--	--	A2	X
Philips	X	X	1,3	A3,B3	X
Front LCD 200W-1.0-E19.5					
Compatible player A	--	--	--	--	-- ²¹
Compatible player C	--	--	--	A2	-- ²²
Philips	X	X	1	X	X ²³
Rear DLP 100W-1.0-E23					
Compatible player A	--	--	--	--	--
Compatible player B	--	--	--	--	--
Philips	X	X	1,3	A1,2	X
Rear LCD 100W-120W-1.0-P22					
Compatible player A	--	--	--	A2	X
Compatible player B	--	--	--	--	-- ²⁴
Philips	X	X	1,2,3	A2,B1	X

¹⁵ State of Vermont Labeling Law – vsa.10 ch. 159

¹⁶ WEEE European directive 2002/96/EC

¹⁷ EN→1; NL→2; Other→3

¹⁸ Warnings on packaging (A) or lamp (B) for high temperatures (1), fragility (2) and mercury (3)

¹⁹ Check whether or not the lamp can be installed without any further modification

²⁰ Only the burner was delivered so it was not possible to measure this lamp

²¹ There were no screws to fix wires

²² Lamp did not fit in the lampholder because of its oversized dimensions (see also figure 3)

²³ Lamp was intended for an Infocus projector but this projector wasn't available anymore, so a Sanyo projector was used. Therefore the lamp must be replaced from the Infocus holder to the Sanyo holder.

²⁴ There were no screws to fix wires and very bad side connection (see also figure 1).

Front DLP 200W-1.0-E19			
	Lamp No.	ANSI Lumen	
Compatible player A	P1	1257	Mean: 1287
	P2	1308	
	P3	1331	
	P4	1248	
	P5	1291	
Compatible player C	J1	1134	Mean: 1065
	J2	1066	
	J3	1078	
	J4	1042	
	J5	1007	
Compatible player B	--	-- ²⁰	
	--	--	
	--	--	
	--	--	
	--	--	
Philips	PH1	1529	Mean: 1535
	PH2	1562	
	PH3	1514	
	PH4	1557	
	PH5	1513	

Front LCD 200W-1.0-E19.5			
	Lamp No.	ANSI Lumen	
Compatible player A	P1 LCD	1361	Mean: 1262
	P2 LCD	1271	
	P3 LCD	1267	
	P4 LCD	1237	
	P5 LCD	1172	
Compatible player C	J1 LCD	-- ²²	
	J2 LCD	--	
	J3 LCD	--	
	J4 LCD	--	
	J5 LCD	--	
Philips	PH1 LCD	2005	Mean: 1845
	PH2 LCD	1646	
	PH3 LCD	1916	
	PH4 LCD	1758	
	PH5 LCD	1899	

Rear LCD 100W-120W-1.0-P22			
	Lamp No.	Luminance (Cd/m ²)	
Compatible player A	RP1	184.5	Mean: 188.8
	RP2	-- ²⁵	
	RP3	199.5	
	RP4	172.8	
	RP5	195.9	
Compatible player B	S1 LCD	252.8	Mean: 252.4
	S2 LCD	255.6	
	S3 LCD	214.4	
	S4 LCD	265.4	
	S5 LCD	273.7	
Philips	RPH1 LCD	320.7	Mean: 335.3
	RPH2 LCD	349.3	
	RPH3 LCD	315.4	
	RPH4 LCD	355.2	
	RPH5 LCD	335.9	

Rear DLP 100W-1.0-E23			
	Lamp No.	Luminance (Cd/m ²)	
Compatible player A	1	248.5	Mean: 151.8
	3	181.9	
	5	89.5	
	6	90.1	
	7	149.1	
Compatible player B	2	109.5	Mean: 133.1
	4	112.8	
	8	175.5	
	9	162.3	
	10	105.3	
Philips	RPH1 DLP	425.1	Mean: 418.1
	RPH2 DLP	415.4	
	RPH3 DLP	414.1	
	RPH4 DLP	402.2	
	RPH5 DLP	433.9	

²⁵ Lamp was damaged when received (see also figure 2)

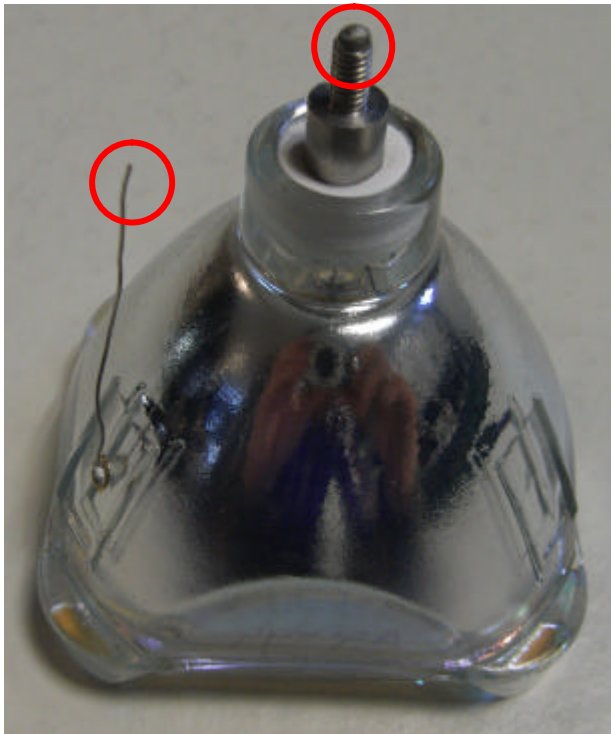


Figure 1 – Rear LCD lamp of player B

Bad side connection and no screw to fix wire. By replacement an extra tool must be used to connect the wire and this will introduce extra electrical risks.



Figure 2 – Rear LCD lamp of player A no. 2

Lamp was damaged upon arrival.

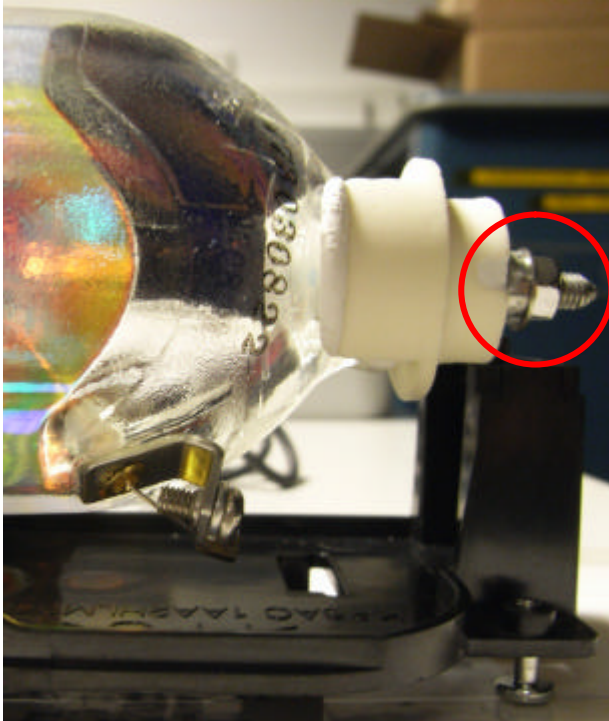


Figure 3 – Front LCD lamp of player C

Lamp did not fit because its oversized dimensions.

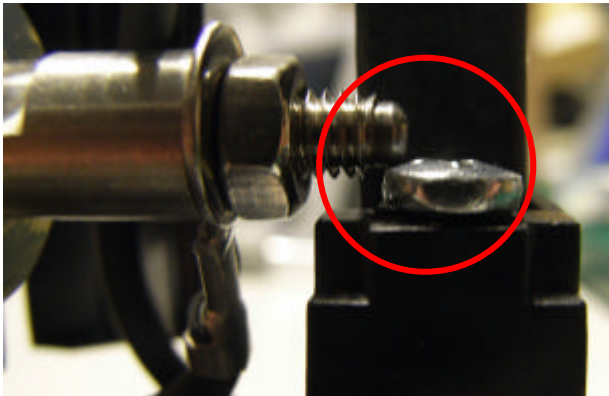


Figure 4 – Front LCD lamp of player A

Srew to fix connector must be removed otherwise it will shortcut the lamp.

List of suppliers which are used in the research	
Compatible player A	Polytech
Compatible player B	Shanghai Silbo Electric Lighting Mft Co. Ltd
Compatible player C	Jieneng Special Lighting And Equipment (Xiaogan) Co., Ltd.

KEMA

Established in 1927, KEMA is a commercial enterprise, specializing in high-grade business and technical consultancy, inspections and measurement, testing and certification. Much of the company's work centers round innovative technology. As an independent organization, KEMA supports clients concerned with the supply and use of electrical power and other forms of energy.

KEMA has a high-end reputation as a testhouse for the famous Dutch KEMA-KEUR and tens of other quality marks. Furthermore, the company's consultants provide technical solutions, strategic advice and insight into financial implications on all kinds of energy issues. KEMA tailors its services to clients' needs and often implements solutions on clients' behalf. Quality and reliability are integral to all KEMA's activities. In its 75 years in the utility business, KEMA has provided energy consulting and technology implementation expertise to some 500 utilities in 70 countries around the world. One of the things that make KEMA unique is the way it combines utility business management and technical skills in helping companies to improve the management of their assets.

For more information see our website www.kema.com