

# The **clear** global leader



On the threshold of a new era, Philips Display Components and the Display Division of LG Electronics joined forces, thereby creating the undisputed global leader in display technologies: LG.Philips Displays. It is the clear number one in cathode-ray tube technologies and related components, producing over 57 million tubes in 2001: 24% of all televisions and computer monitors in the world contain our CRT displays.

LG.Philips Displays will lead the way in new display technologies as well, showing an unequalled track record in innovations. It is present in all the major economic regions, and in 34 locations all over the world. It employs over 36,000 dedicated people in an exciting multicultural environment.

The picture is crystal clear:

LG.Philips Displays is the world's leading company in display technologies.



# Company history

## LGE Profiles

1975	Production of 17" and 20" Black & White picture tubes started in Gumi
1978	Start of 12" and 14" Black & White picture tubes production in Gumi
1979	Introduction of 14" and 20" Color Picture Tubes in Gumi
1980	Production of 12" and 14" Monochrome Monitor tubes started in Gumi
1982	The 1 millionth CPT produced in Gumi
1987	Introduction of 14" and 20" CPT in the new Changwon factory
1988	Start production of 14" 0.39D CDT in Gumi
1989	Introduction of 21" 1.0R CPT in Gumi
1990	Production of 25" HS CPT and 14" 0.28D ST CDT in Gumi
1991	Production of 29" S-HS CPT and 14" 0.28D SS CDT in Gumi Introduction of 25", 29" CPT in Gumi
1993	Certification of ISO 9000 and production of 15" CDT in Gumi
1995	First 17" CDT production started in Gumi
1996	Introduction of 24", 28", 32" CPT in Gumi Start up of production of wide screen, both in China and Indonesia plant
1997	Introduction of the FLATRON technology for CDT in Gumi Wales factory established
1998	Production of 29" Real Flat CPT and 19" CDT in Gumi
1999	New product introduction, 21", 25", 32" wide screen Real Flat CPT and 19" FLATRON CDT in Gumi
2000	Introduction of 28"W, 15" Real Flat CPT in Changwon Production of 17", 19" ezFlat CDT in Gumi
2001	<b>July 2001, Formation of LG.Philips Displays</b>

## Philips Profiles

1954	Production of first black & white picture tube (as Philips Lighting) in Eindhoven
1955	CPT factory established in Aachen, Germany
1975	Change over from delta to in-line technology (the successful 20AX type and later the 30AX)
1976	Color picture tube (CPT) production started
1989	Production of Black Line 28", 25" Flat Square (FS) in Aachen
1990	Production of Black Line 34" Flat Square in Aachen
1991	Introduction of the first Wide Screen (WS) product with 36" Wide Screen Flat Square in Eindhoven, Netherlands Black matrix introduction for 25", 28" Flat Square products in Europe
1992	Introduction of 32", 28" Wide Screen Flat Square in Aachen
1993	Production of 29" Super Flat (SF) Black Line in Dreux, France
1994	New CDT plant started in Dapon, Taiwan Production of Black Line 34" Flat Square in Ottawa, USA
1995	Joint venture for CPT established in Hua Fei, China
1996	First 17" CDT production in started in Dapon, Taiwan
1997	Introduction of 24" Wide Screen Super Flat in Dreux
1998	Wide Screen CRT in Europe exceeds 1 millions since introduction in 1991 Introduction of 17" 0.25mm high contrast CDT in Lebring, Austria
1999	Production of 14", 20" Black Line in Sao Jose dos Campos, Brazil 32" Wide Screen Cybertube introduced in Aachen
2000	Chupei plant in Taiwan transferred to Nanjing in China 28" Wide Screen Cybertube introduced in Aachen 29" Cybertube introduced in Dreux Start of construction of CPT factory in Hranice, Czech Republic
2001	Production of 17" Real Flat CDT started in Lebring 34" Cybertube introduced in Ottawa 21" Cybertube introduced in Durham, UK Opening CPT factory in Hranice, Czech Republic Start of construction of CPT factory in Gomez Palacio, Mexico End of 2001, opening CPT factory in Gomez Palacio, Mexico
2001	<b>July 2001, Formation of LG.Philips Displays</b>



**FLATRON**

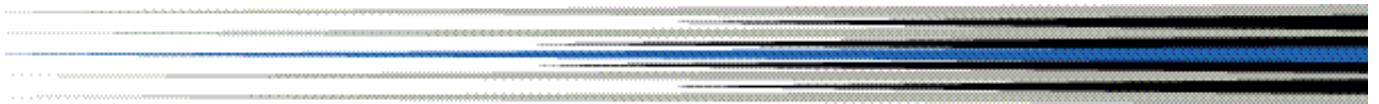


**ezFLAT**



**conventional**

# Product **strategy**



## The **cutting-edge** technology in Color Display Tube Tubes

The key customer benefit of the monitor is, besides an excellent display performance, also the adaptability for functional application ranging from office PC's to multi media devices and Internet.

These requirements for both excellent display performance and multifunctional applications are strongly driven by rapid growth of PC utilization, software packages and various related industries such as TV receiving, CD or DVD players, and other digital auxiliary devices.

They create higher demands on technological capability of color display tubes in terms of high resolution, sharp and crispy picture images, flatter and larger screens, lower power consumption and space saving.

LG.Philips Displays has developed and will develop "cutting edge technologies" to offer three categories of CDT's, which meet the monitor requirements on display performances, quality, and market competitiveness;

FLATRON	Perfect high-end flat CDT - 17", 19" and 22"
ezFLAT	Flat image with double curved mask - 17" and 19"
Conventional	Optimized for perfection on all sharpness aspects - 14", 15", 17" and 19"

# FLATRON

## ● perfect flat,

### **Key FLATRON benefits**

#### **clean**

Enhanced color purity

Invisible mask damping wire

Designed and manufactured with care for the environment

#### **clear**

Crispy picture with high brightness and contrast

0.24 mm fine pitch with accurate phosphor dot positioning

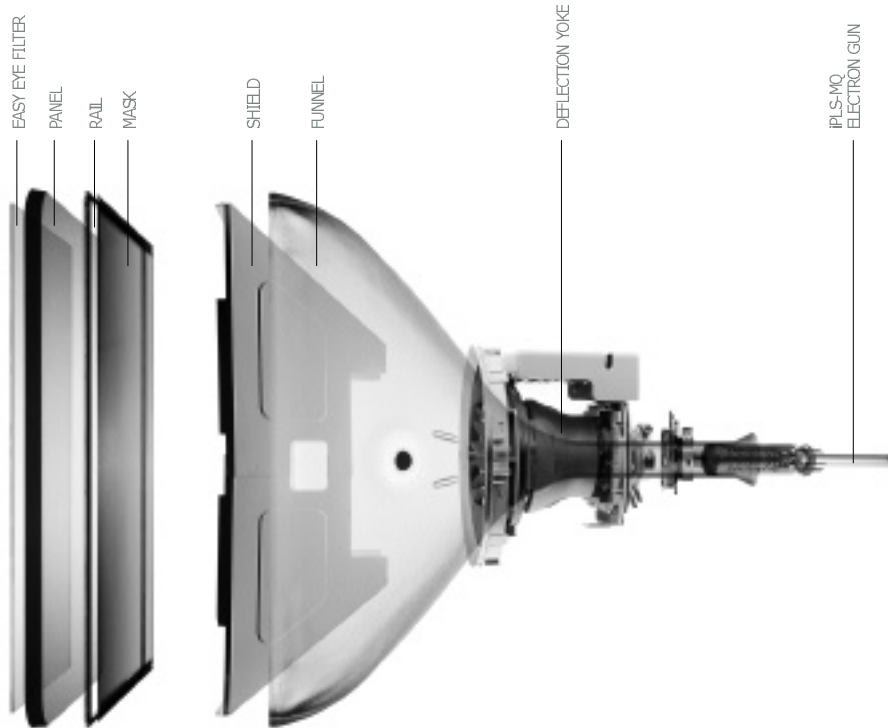
Improved focus via iPLS-MQ gun technology

#### **comfortable**

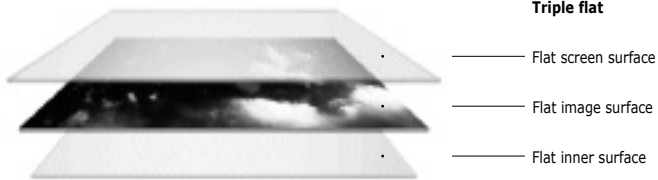
Optimized ergonomics with the Easy Eye Filter

Unique anti-glare system

Uniform brightness even under extreme viewing angles

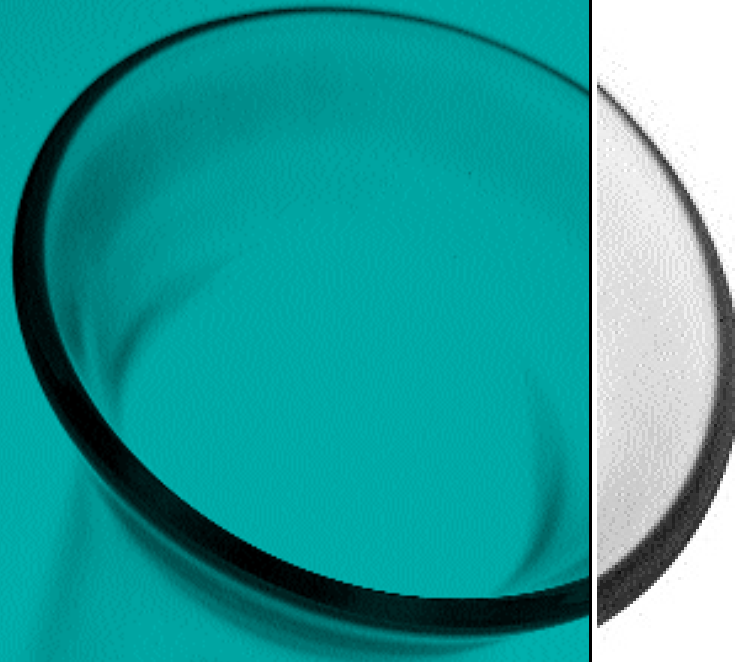


# perfect performance ●



# FLATRON

The cutting-edge technology  
**perfect flat, perfect performance**



Enhanced **color purity**

**Invisible** mask damping wire

Designed and manufactured with  
**care for the environment**



# clean

FLATRON is the ultimate evolution of CDT.

FLATRON uses a panel, which is perfectly flat at the inside as well as the outside. This cutting-edge technology differentiates FLATRON from other CDT's. Images are free of distortion, realizing perfect flat with perfect front of screen performances.

### Enhanced color purity

Doming, deformation or expansion of the mask caused by temperature fluctuations, is easily observed on perfectly flat screens. The resulting discoloration on part of the screen area disturbs an exact color representation of the image.

The tension mask of the FLATRON technology stabilizes the picture and neutralizes the doming effects.

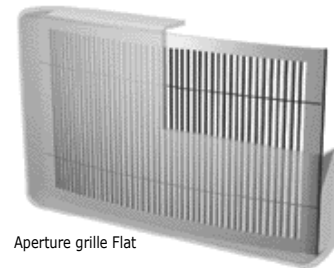
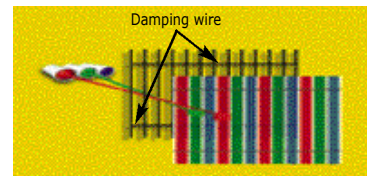
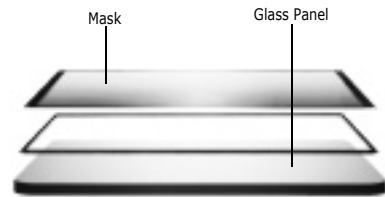
### Invisible mask damping wire

One of the drawbacks of the aperture grille technology are the horizontal damping wires, necessary to reduce the vibration of the mask. These damping wires mechanically obstruct the flow of the electron beams, creating two annoying horizontal shadow lines on the screen.

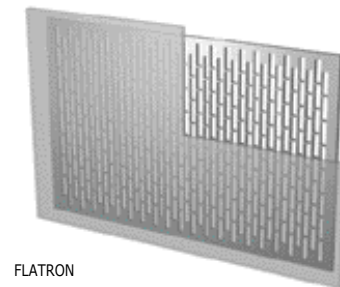
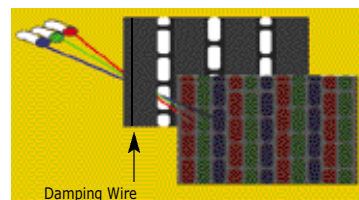
The slotted mask of the FLATRON is stretched in two direction and connected to a unique rail system. The vertical damping wires of the FLATRON are 'hidden' behind the tension mask, making them invisible for the monitor user.

### Design and manufactured with care for the environment

During the design and manufacturing of the FLATRON tube, special attention has been given to protect the environment. Components and processes are free of hazardous materials as cadmium, mercury and ozone layer depleting chemicals.



Aperture grille Flat



FLATRON



# FLATRON

The cutting-edge technology  
**perfect flat, perfect performance**

# clear

Crispy picture with **high brightness and contrast**

**0.24 mm fine pitch** with accurate phosphor dot positioning

Improved focus via **iPLS-MQ gun** technology



## Crispy picture with high brightness and contrast

Compared with the conventional dotted type shadow mask, the slotted tension mask of the FLATRON allows a 20% higher beam penetration, while maintaining a stable construction.

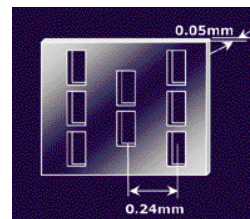
In combination with highly efficient pigmented phosphors and Super ART-coating (6 layers sputtered), a brighter and crispier picture can be enjoyed.



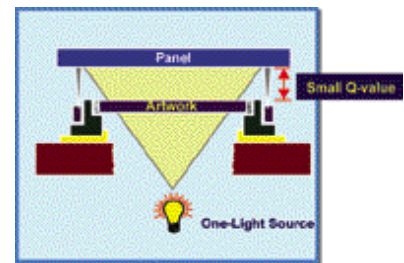
## 0.24 mm fine pitch with accurate phosphor dot positioning

The two-dimensional stretched, thin, slotted mask in the FLATRON makes it possible to create a fine pattern of holes (via an etching process). As a result, image details (small fonts) stand out better against the background, while separation of closely aligned vertical lines is still clear. Even a 0.21 mm pitch can be realized without deteriorating the quality of the images.

Slotted Mask Structure



The Near Contact Exposure (NCE) technology positions the phosphor dots very accurately on the glass panel (realized by very small distance between artwork and glass panel) increasing the color purity.



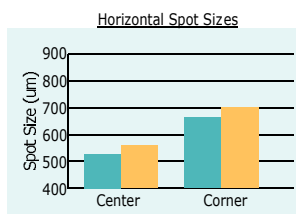
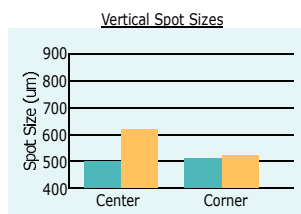
Near Contact Exposure (NCE)

Additional benefits are:

- One artwork for all panels, avoiding unnecessary mask handling (Interchangeable Mask System).
- Shorter processing time

## Improved focus via iPLS-MQ gun technology

The new iPLS-MQ electron gun technology improves the sharpness of the displayed images in all aspects. The optimized lens system of the iPLS gun platform gives a more uniform focus performance over the entire screen. Especially the small horizontal spot size in the corners contributes to a sharp image over the entire screen.



FLATRON  
A/G Competition

# FLATRON

The cutting-edge technology  
**perfect flat, perfect performance**



# comfortable

Optimized ergonomics with the **Easy Eye Filter**

Unique **anti-glare system**

**Uniform brightness** even under extreme viewing angles



**Easy Eye Filter**

Easy Eye Filter, the name of the thin glass plate in front of the FLATRON tube, provides crucial benefits for the end users. First of all, treated with the high ergonomic screen coating (Super-ART Coating), eyestrains as well as external light reflections are reduced. Secondly, the Easy Eye Filter controls the overall light transmission and provides extra implosion protection.

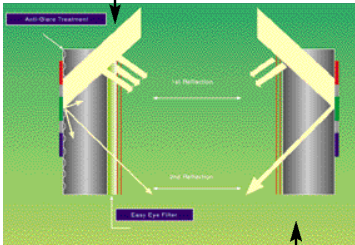
**Unique anti-glare system**

The special Anti-glare treatment at the inside of the glass panel reduces light reflection, visible as 2nd reflections on the monitor. The already improved glare management for Flat monitors is even further optimized. The system gives also an electro-magnetic wave reduction of more than 40%, contributing to best in class ergonomics.

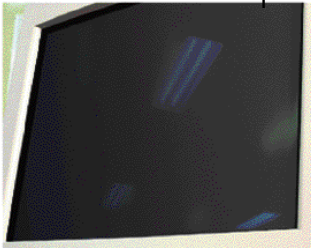
**Uniform brightness even under extreme viewing angles**

The glass thickness of all shadow mask flat tubes increases towards the edges. Because thicker glass absorbs more light than thinner glass, shadow mask flat tubes show loss of brightness at the edges of the screen. This may result in inconsistent brightness or purity of the color across the screen. Only the perfectly inside and outside flat panel of FLATRON shows uniform brightness from all viewing angles.

FLATRON



Competition



Conventional Shadow Mask



A/G and Shadow Mask Flat



FLATRON



# ezFLAT

## ● real flat,

### Key ezFLAT **benefits**

#### **Optimized flatness impression**

Double curved mask design

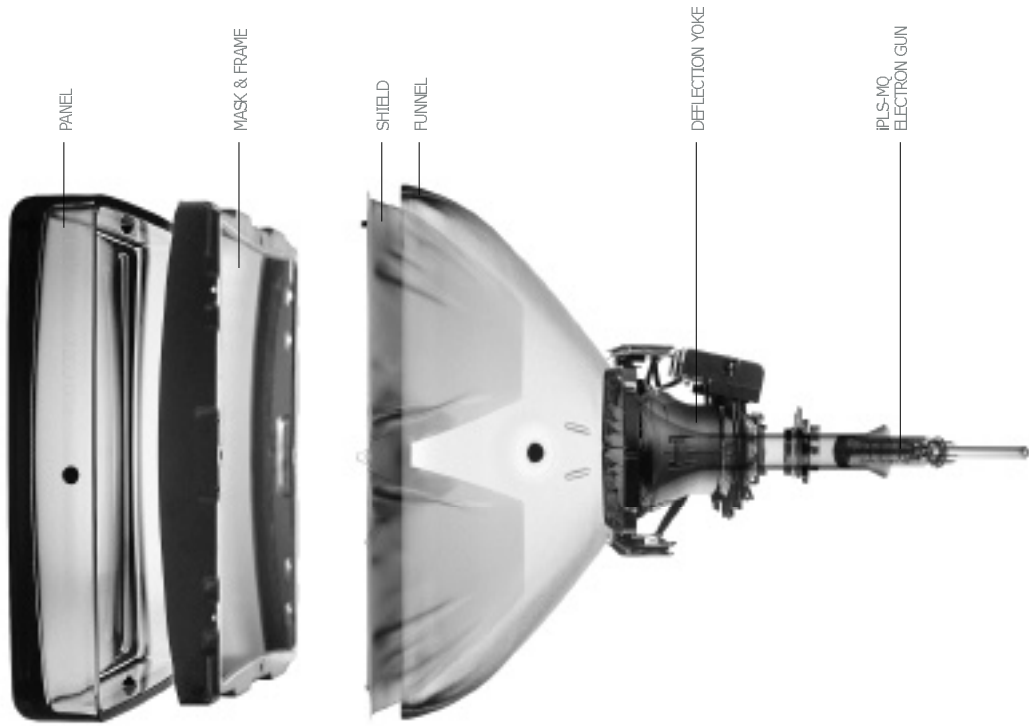
#### **Uniform high brightness**

Highly efficient pigmented phosphors

Graded transmission coating

#### **Outstanding sharpness performance**

Super high definition iPLS-MQ gun technology



**easy solution ●**

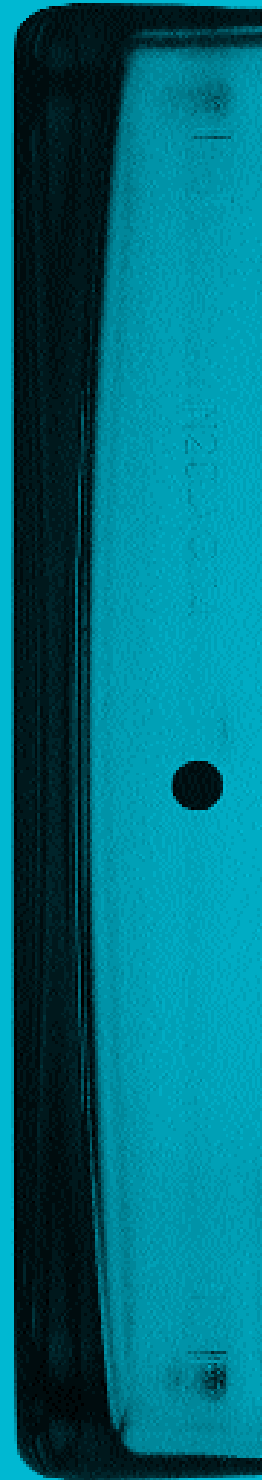
# ezFLAT

The cutting-edge technology  
**real flat, easy solution**

Optimized flatness impression

Uniform high brightness

Outstanding sharpness performance



### **Optimal flatness impression**

The combination of a flat outside screen surface with "Double Curved Mask design" gives a robust tube, optimal in drop test and doming behavior. In the efforts to design ezFlat, special attention has been given to the flatness impression of the image on the screen. Optimization of the mask design and the interaction with the Deflection Yoke / Electron Gun system creates a naturally flat visual impression.

### **Uniform high brightness across the entire screen**

The highly efficient pigmented phosphors create a brighter, crispier image, resulting in a picture, which shows clearer red, green and blue colors on a brighter screen. Compensation for the brightness decrease at the screen edges, caused by the glass wedge, has been achieved via a counteractive graded transmission coating. These technologies result in uniform brightness and optimal contrast across the entire screen, which are particular important for the demanding customer.

### **Outstanding Sharpness performance**

The new Super High Definition iPLS-MQ Gun technology improves the sharpness across the entire screen area. With optimized lenses, these guns achieve smaller spot sizes in the center and the corners of the screen. As a result, ezFlat is capable of displaying picture resolutions up to UXGA, and meets the highest standards for precision-required graphic applications.

- Graded transmission coating
- Highly efficient pigmented phosphors

Outer flat  
Panel glass



iPLS-MQ Electron Gun



# Conventional

The cutting-edge technology

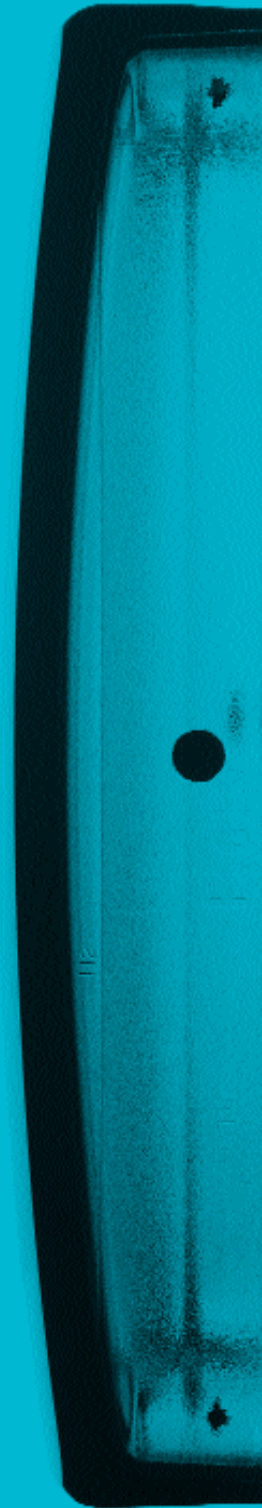
## **Perfect visual performance**

The conventional tubes of LG.Philips-Displays offer the most outstanding color gamut available for brilliant, vivid colors that maintain depth and richness, ranging from 14" to 19" large screen.

More workspace efficiency

Less power consumption

TCO99 compliance



### More workspace efficiency

Getting the best from Internet and multimedia applications requires a large screen area. The 19" platform gives extra square inches, making it possible to view more information without scrolling. Performance is guaranteed by making use of proven and mature technologies, resulting in an attractive cost and price position.

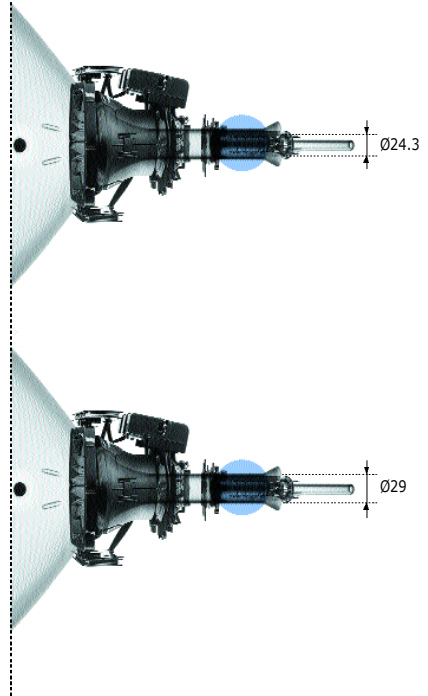
### Less power consumption

The 15" mini-neck tube operates with 25% less power consumption compared with conventional tubes. The ADAM gun provides sharp images and the ART coating improves further color rendering and readability.

### TCO99 compliance

The TCO99 requirements emphasizes mainly on improving the ergonomic performances, power saving and environmental aspects. By applying a variety of coating technologies, all types of larger size tubes are TCO99 compliant.

Power Saving: Mini-Neck Electron Gun



# Technical Specifications

## FLATRON

## ezFLAT

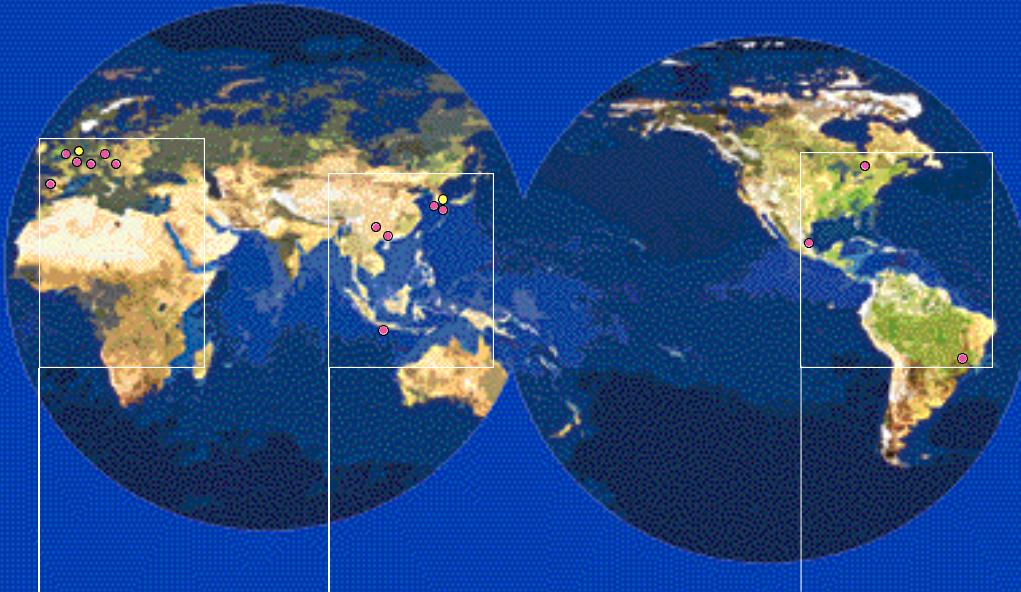
Model	M41QBF	M46QDG	M52QBF	M41FJB	M41QEE	M46QEE
Size	17"	19"	22"	17"	17"	19"
Pitch (mm)	0.24 Slot	0.24 Slot	0.24/0.21 Slot	0.25	0.25	0.25
Mask	AK	AK	AK	Invar	Invar	Invar
Transmission (%)	44	40	43	55	52.8	45
Coating	Super-ART	Super-ART	Super-ART	T-IRIS-HC <sup>2</sup>	G-ART	G-ART
H.Frequency (kHz)	70/96	110	135	84	85	95
Max.resolution	1280x1024	1600x1200	1800x1440	1280X1024	1280X1024	1600X1200
DY						
Lh(mH)	0.1	0.08	0.08	0.125	0.1	0.1
Rv( )	5.7	7.5	7.7	8.0	6.1	8.3
Deflection Angle (degree)	90	90	90	90	90	90
Neck diameter (mm)	29,1	29.1	29.1	29.4	29.1	29.1
Electron gun	iPLS-MQ	iPLS-MQ	iPLS-II	DAF/DBF	iPLS-MQ	iPLS-MQ
Ergonomics	TC099	TC099	TC099	MPR-II/TC099	MPR-II/TC099	TC099
Anode voltage (KV)	26	27	27	26	26	27
Focus voltage	25%	25%	26%	25%	25%	25%
G2 voltage (V)	600	600	600	575	600	600
Cut-off voltage (V)	110	110	110	110	110	110
Heater (V/mA)	6.3/340	6.3/340	6.3/340	6.1/309	6.3/330	6.3/340
Useful screen size (mm)						
Horizontal	325.4	366	412.5	325.1	325.1	365.8
Vertical	244.1	274.5	309.4	243.8	243.8	274.3
Diagonal	406.7	457.5	515.6	406.4	406.4	457.2
Overall length (mm)	385.1	414.9	445	380.8	376.5	416.5
Weight (Kg)	11.5	16	20.6	11.4	11.4	13.9

**conventional**

M34EDC	M36EDR	M36LBL	M36QBX	M41EHN	M41EJB	M41LFQ	M46QCG
14"	15"M/N	15"	15"M/N	17"	17"	17"	19"
0.28	0.28	0.28	0.28	0.27	0.25	0.27/0.25	0.26
AK	Invar	Invar	Invar	Invar	Invar	Invar	Invar
57	57	57	57	52	47	52/44	52
AGAS	IRIS	ART	ART	TRIS/IRIS-HC <sup>2</sup>	IRIS-HC <sup>2</sup>	ART/U-ART	ART/U-ART
64	57	48/54/69	48/57	72	95	70/87/95	85/95
1024X768	1024X768	1024X768	1024X768	1280X1024	1280X1024	1280X1025	1600X1200
0.18	0.18	0.18	0.25	0.125	0.1	0.1	0.1
6.6	5.6	6.8	10.0	6.3	6.3	7.3	7.5
90	90	90	90	90	90	90	90
29.1	29.4	29.1	24.3	29.4	29.4	29.1	29.1
Polygon	Polygon	EA-UB	ADAM	DAF/DBF	DAF/DBF	iPLS-MQ	iPLS-MQ
MPR-II	MPR-II/TCO	MPR-II/TCO	MPR-II/TCO	MPR-II/TCO	TC099	MPR-II/TC099	TC099
25	24	24	25	26	26	26	26
26%	27%	25%	25%	25%	25%	25%	25%
360	470	260	260	425	420	550	600
125	125	60	60	120	120	110	110
6.3/315	6.3/315	6.3/340	6.3/330	6.1/309	6.1/309	6.3/330	6.3/340
280.8	284.5	284.76	287.8	325.6	325.6	326.7	365.8
210	216.4	214.88	214.6	245.5	245.4	245.5	274.3
335.4	355.6	355.13	355.6	406.4	406.4	407.8	457.2
352	354	351.3	351	383.5	383.5	378.8	418.2
6.4	7.8	7.2	7.1	10	10	10.5	13

# Global network

- Manufacturing base
- R&D Centre



Spain (Barcelona)  
 UK (New port, Durham)  
 France (Dreux)  
 Netherlands (Eindhoven)  
 Austria (Lebring)  
 Germany (Aachen)  
 Czech Republic (Hranice)

Indonesia (Jakarta)  
 China (Changsha)  
 China (Nanjing)  
 Korea (Gumi, Changwon)

Mexico (Gomez Palacio)  
 USA (Ottawa)  
 Brazil (Sao Jose dos Campos)

## Global manufacturing base and R&D Centres

### Durham (UK) CPT

Products 17"/21"/25"FS, 21"Flat

### New port (UK) CPT/CDT

CPT: 21"FS, CDT: 15"/17"

### Dreux (France) CPT

Products 28"FS, 29"SF, 29"Flat, 24"WSSF,  
 24"WS Flat, 28"WSSF

### Aachen (Germany) CPT

Products 28"/32"WSSF, 28"/32"WS Flat

### Barcelona (Spain) CPT

Products 14"

### Lebring (Austria) CDT

Products 17"

### Hranice (Czech Republic) CPT

Products 28"FS, 28"/32" WSSF

### Sao Jose dos Campos (Brazil) CPT

Products 14", 20"

### Ottawa (USA) CPT

Products 27", 29"/34"FS, 34"Flat

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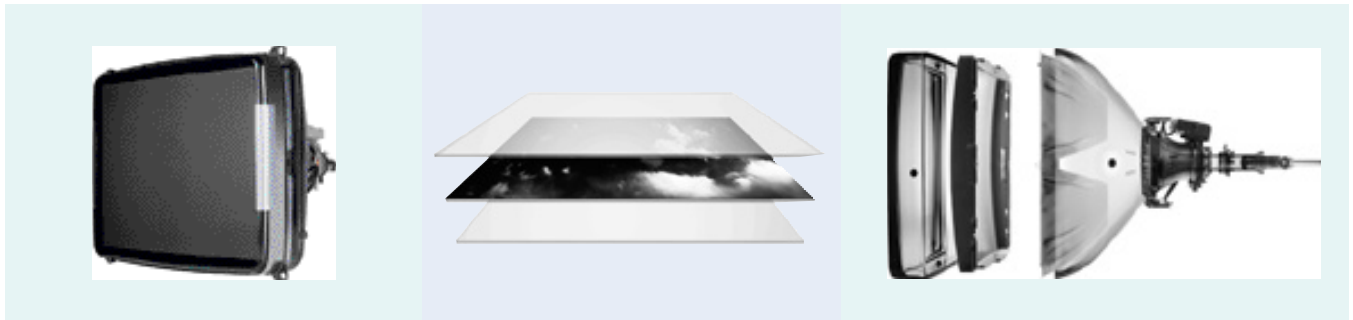
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[www.lgphilips-displays.com](http://www.lgphilips-displays.com)



### Gomez Palacio (Mexico) CPT

Products 29"FS, 29"Flat

### Nanjing (China) CPT/CDT

CPT Products: 21"/25"FS, 29"SF  
CDT Products: 14", 15", 17"

### Changsha (China) CPT/CDT

CPT Products: 21"/25"/34"FS, 29",  
28"/32"WSSF, 29"Flat  
CDT Products: 15", 17"

### Gumi (Korea) CPT/CDT

CPT Products: 29"FS, 28"/32"WSSF,  
25"/29"Flat, 28"/32"WS Flat  
CDT Products: 15"/17"/19"/17"F/19"F

### Changwon (Korea) CPT/CDT

CPT Products: 20", 21"FS, 15"/21"Flat  
CDT Products: 15"/17"

### Jakarta (Indonesia) CPT

CPT Products 14", 20", 21"FS

### Eindhoven (Netherlands)

R&D centre

### Gumi (Korea)

R&D centre