

# “Office Cool<sup>®</sup> EX Series” Featuring Unprecedented Weight/Size Reductions

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## Abstract

The need for a reduction in the corporate environment burden that results from the increased use of IT equipment is currently a topic of major importance. Aiming at improving the environmental performance of our enterprise-oriented LCD panels, NEC Display Solutions has developed the EX Series (Office Cool<sup>®</sup>) of environmentally friendly models that are marketed as “MultiSync+ECO.” This development places special importance on reductions in the weight and size of the products.

This paper describes our efforts for the development of the EX Series by reducing the weight and size compared to that of the previous EA Series.

## Keywords

Weight reduction, Size reduction, Ultra-thin bezel, Office Cool<sup>®</sup> EA Series, EX Series

## 1. Introduction

At NEC Display Solutions, we have developed the EX Series (Office Cool<sup>®</sup>) of environmentally friendly LCD panels aiming at improving environmental performance under the keywords “MultiSync+ECO.” The developed models feature improved awareness of environmental performance by setting weight reduction, bezel width and power consumption as the basic design concepts ( Fig. 1 ).

This paper introduces our efforts aimed at weight and size

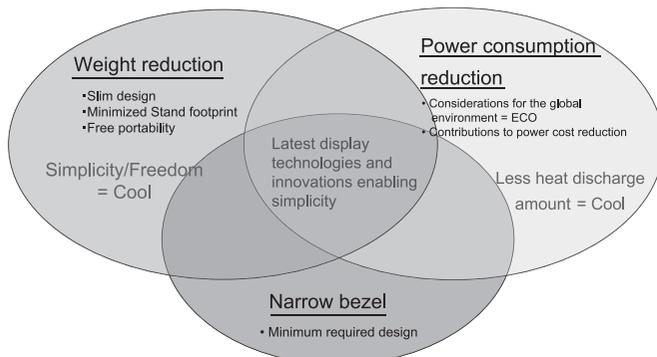


Fig. 1 Office Cool<sup>(R)</sup> concept.

reduction of the LCD panels that are employed in the development of the new EX Series.

## 2. State of the Enterprise-Oriented LCD Market

Since enterprise-oriented LCD products are already at the mature stage, the performance and functionality of the products of different manufacturers are currently almost identical. Brand differentiation is thereby rendered extremely difficult. In such a situation, enhancement of environmental specifications and performance are regarded as being important factors in product differentiation.

At NEC Display Solutions, we developed the EA Series of enterprise-oriented models in 2007 and since then we have continued to enhance environmental performance. However, from the viewpoints of weight and size reduction that can also lead to material saving, which is another factor in environmental performance enhancement, the specifications were not yet sufficiently high for us to defeat our competitors. The reason for this was that because our competitors had also begun to commercialize models that featured light weight from 2007.

In consideration of such a background, we judged that it was a matter of some urgency that we should reduce the weight and size of the LCD panels.

## “Office Cool® EX Series” Featuring Unprecedented Weight/Size Reductions

### 3. Premium Product Development Aiming at Weight/Size Reductions

In starting the development of the EX Series as a new series of enterprise-oriented LCD panels for the year 2010, we focused on halving the monitor head weight compared to previous models and in reducing the bezel width to an unprecedented level. We decided on the target weight for each part and took specific measures aimed at achieving the target values.

For the stand, the freedom of design was improved because the required strength was able to be minimized thanks to the setting of the target monitor head weight at 50% that of previous models. This strategy has also made it possible for us to implement the Office Cool® design concept for models yet to be developed.

### 4. Monitor Head

We achieved the targeted weight and bezel width reductions based on structural improvements by adopting measures as described below.

#### 4.1 Weight Reduction

To reduce the monitor head weight, we first set the target weight for the whole monitor head and we then defined the target weight for each individual part of each section and applied measures for achieving the individual weight targets ( Fig. 2 ).

The sheet metal interior parts and plastic exterior parts are the most critical factors that determine the weight of the mechanical parts. For the plastic exterior parts, we attempted weight reduction by reducing the thickness without applying special materials and techniques that would lead to an increase in the cost. For the sheet metal interior parts, a new design for the lightweight mounting structure enabled us to reduce the weight by about 55% compared to the previous model. This component thereby became the greatest factor contributing to the weight reduction of the structural parts of the EX Series ( Fig. 3 and Fig. 4 ).

#### 4.2 Bezel Width Reduction

Since the bezel width reduction belongs to the “Office Cool®” concept, it became one of the key contributory items for dif-

ferentiating the new model from the products of our competitors.

With the previous fitting structure, it had been required to reserve a distance of 5 mm or more from the outer edge of the LCD panel to that of the exterior cabinet on each side. However, we succeeded in reducing the size of the fitting structure on the exterior cabinet by reviewing the fitting method and by effectively utilizing the dead space. This strategy has achieved a reduction of 3.5 mm on each side, which led to a size reduction of 30% ( Fig. 5 ).

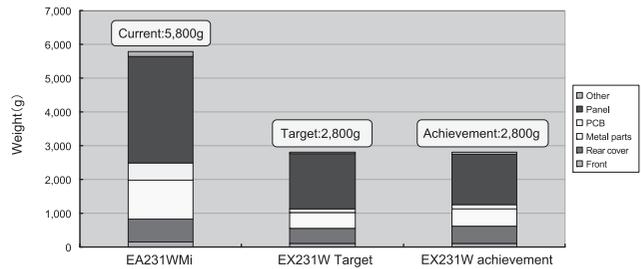


Fig. 2 Changes in the monitor head weight.

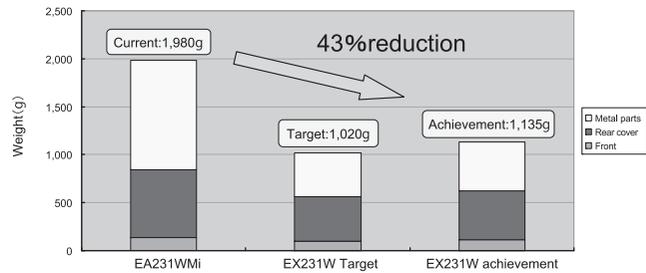


Fig. 3 Changes in the weights of mechanical parts.

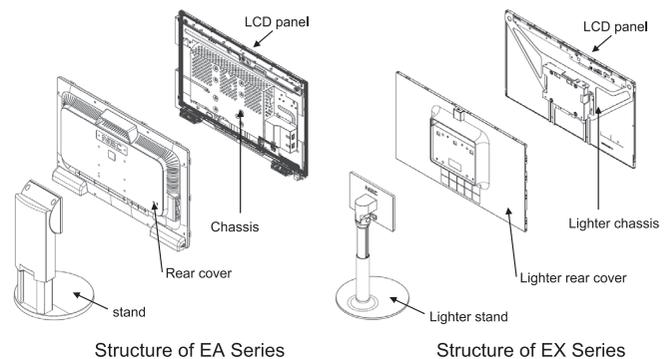


Fig. 4 Comparison of monitor head structures.

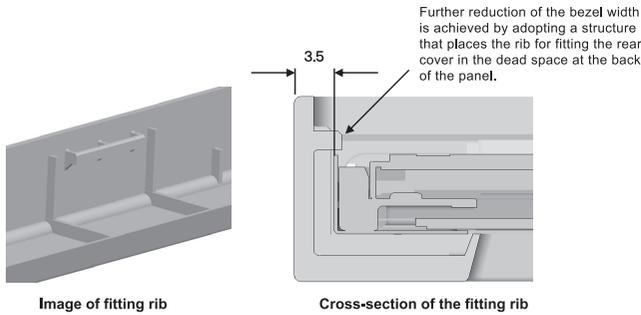


Fig. 5 Structure of the front fitting rib (Incl. panel).

## 5. Setting the Office Cool® Design Concept as our Objective

In order to develop a stand based on the Office Cool® design concept featuring reduced weight and size (see **Photo** of the EX Series), weight and size reductions were critical issues in its implementation. Of these issues, the most problematic one was how to implement a highly accurate adjustment function in a compact structure that matched the proposed Office Cool® design concept.

**Fig. 6** shows the comparison between external dimensions of the pillar sections of the previous EA Series and the EX Series. While the cross-section of the EA Series column is about 6,700 mm<sup>2</sup>, that of the EX Series column is about 1,150 mm<sup>2</sup>, which means about 83% reduction of the cross-sectional area. This size reduction was made possible by the applying the measures described in the following two sections.

### 5.1 Studio Size Reduction by Decreasing the Parts

In order to achieve a structural simplification, we eliminated as many plastic exterior parts as possible and adopted die-cast exterior parts. Specifically, the number of plastic exterior parts has been reduced from seven for the EA Series to one for the EA Series. In order to achieve the targets for both exterior appearance and strength, we adopted metallic parts for the exterior parts of the tilting, pillar and base sections (with the exception of the turntable part at the bottom)( **Fig. 7** ).

### 5.2 Size Reduction of the Height Adjustment Structure

The size reduction of the height adjustment structure contributes significantly to the stand size reduction. For the EA



Photo EX Series (Office Cool® design).

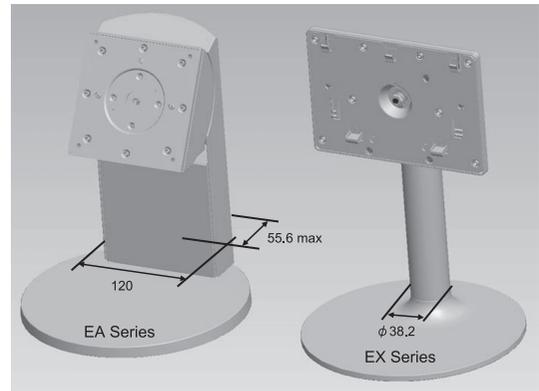


Fig. 6 Comparison of stands.

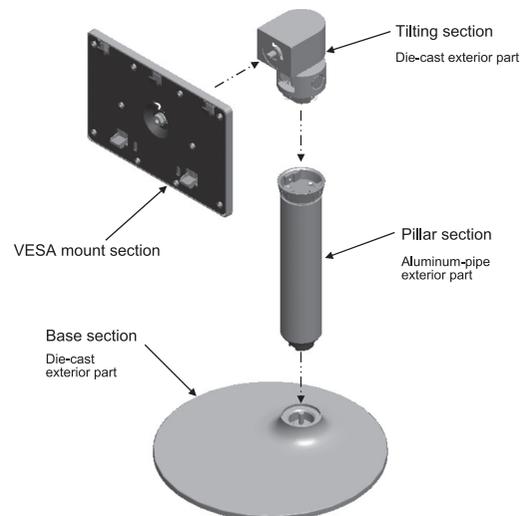


Fig. 7 Part configuration of the stand of the EX Series.

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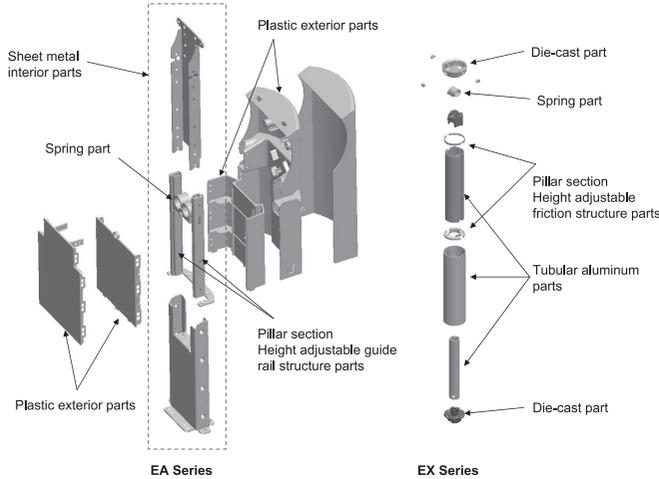


Fig. 8 Comparison of height adjustment structure parts.

Series, we enabled a height adjustment via a guide rail structure incorporating an internal spring. For the EX Series, we succeeded in reducing the height adjustment structure size by minimizing the size of the internal spring component and by removing the guide rail structure and newly adding a friction structure for supporting the internal spring ( Fig. 8 ).

6. Analysis of Stresses Caused by Weight Reduction at the Design Stage

As stresses were expected to be produced due to the weight reduction of the monitor head and the weight/size reductions of the stand unit, we modeled the expected stress analysis and performed an actual machine test before starting the mold fabrication. This prior clarification of the technical issues of the sheet metal part weight reduction and stand structure size reduction ahead of the mold fabrication made it possible to advance the model development more smoothly.

7. Results of EX Series Development

As described up to the present, the EX Series has been developed based on a structural review based on the Office Cool® concept and improvements have been achieved compared to the previous EA Series as shown in Fig. 9 and in Table (In

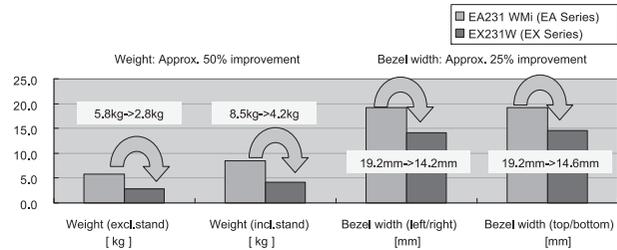


Fig. 9 Results of improvements from the EA Series to the EX Series.

Table Comparison of the EA Series (Left) and the EX Series (Right) specifications.

Model	EA231 WMi	EX231W
Monitor size (in.)	23	23
External dimensions (mm)	550.1×379.1×220	540.2×401.3×215
Weight (excl. stand)	5.8kg	2.8kg
Weight (incl. stand)	8.5kg	4.2kg
Bezel width	19.2mm	14.2mm/14.6mm
Monitor depth (side)	34mm	16.4mm
Pivoting function	Provided	Provided
Height adjustment	110mm	110mm
Built-in speakers	Provided	Not provided
USB function	1up/4down	1 pass through

particular, the bezel width is less than 15 mm, which is lower than that of our competitors).

The product size reduction and the use of a detachable stand base structure have also made it possible to reduce the package size. The load capacity of a 40-foot container has been increased from 576 units to 1,100 units, which means an improvement by 91% in the transportation efficiency.

8. Future Perspectives

In order to differentiate the enterprise-oriented LCD panels by weight and size reductions, a matter that is also relevant to the environmental specifications, and to provide customers with a new concept, we will continue to perform structural reviews by focusing on the following items.

- (1) More challenges for the monitor head weight/size reductions.
- (2) More challenges for the stand unit size reduction.
- (3) Proposals for new usage scenarios (concepts) by further weight/size reductions.

## 9. Conclusion

In the above, we introduce details of the development of the EX Series of NEC Display Solutions. Since the weight/size reductions of IT equipment are some of the environmental factors enabling saving of materials, these issues should be tackled continually in the future. In addition, they are also some of the important issues that enable us to make new proposals to the market.

It is expected that the competitive differentiation of enterprise-oriented LCD display panels will become more severe in the future. In order to enable brand differentiation in such a competitive market, we are determined to robustly challenge our competitors by continuing to develop new products. We are also planning to collaborate with other companies of the NEC Group in sharing related technologies and improving development efficiencies.

### Author's Profile

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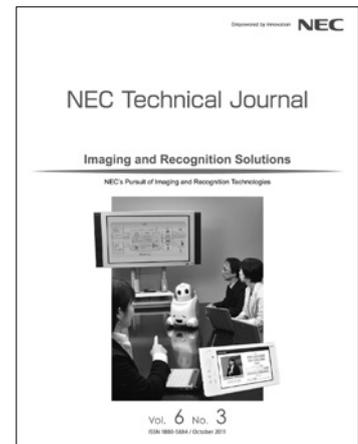
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