Super Low-Loss Multifiber Optical Connector

1. INTRODUCTION

MT connectors, which are representative of multifiber optical connectors have been used for a wide range of uses, including application products. Compared to single-fiber optical connectors, however, in which optical alignment is achieved for one fiber, there were technical difficulties in reducing insertion-loss, and about 0.3 dB was considered the limit. In the optical connector developed here, we have completely reduced the error factor attributable to the amount of optical fiber position that leads to insertion-loss, and have realized a maximum insertion-loss value of 0.15 dB or less, equivalent to a single-fiber optical connector. The accuracy of ferrule fabrication was also improved by a high-precision molding technique using an epoxy resin. Loss values equivalent to or better than that of single-fiber optical connectors having been realized, transmission equipment using 8-fiber and 12-fiber configurations can be dealt with collectively, bringing significant improvements in operation, mounting efficiency, and mounting density.

2. FEATURES

This time, our company realized the performance of super low-loss by MPO connector and LIGHTRAY MPX ™ connector of 8-fiber. Photo 1 shows the super low-loss 8-fiber MPO connector. The key technique for achieving super low-loss is in improving MT ferrule precision. Although Furukawa Electric has long used MT connector molding techniques of a sub-micron order, aiming at improved performance, it has in this program further developed these techniques to reduce insertion loss, specifically,

1) ferrule structure, and
2) improvement in mold precision.

In terms of ferrule structure, we have modified the size and position of the window used for adhesive injection, for the purpose of preventing deformation of the ferrule. To reduce the amount of positional error of the optical fiber, the size of guide holes and fiber holes was reexamined, and with respect to the amount of change of position error produced by the slide of the end-face, which is a characteristic problem in connectors that have oblique end-face, it was so arranged that a slide might be suppressed.

In terms of improvement in mold precision, we improved the mold design to secure the straightness of the fiber holes in order to reduce their position error changing in the depth direction. The degree to which the fiber tip is polished in becomes large when angled polishing is applied to the end-face as in MPO connectors. If the amount of position error of the fiber hole changes in the depth direction, any increase in the amount of polishing will change the amount of position error of the fiber. Accordingly the error factors were thoroughly eliminated so that the amount of position error of the fiber would not depend on the amount of polishing, and a satisfactory result was obtained.

3. INSERTION LOSS CHARACTERISTIC

In random connections, a maximum of 0.15 dB and an average of 0.065 dB was realized. Figure 1 shows the insertion-loss distribution. A reduction of -0.15 dB was attained in the maximum loss in comparison to a maximum of 0.30 dB and an average of 0.097 dB in the conventional low-loss type. These values are also supported by the improvement in end-face polishing technique, and are obtained by using a dry connection. Figure 2 shows the insertion-loss distribution in a conventional low-loss MPO8 connector. In reducing insertion-loss, improvement of polishing technique to increase the outer diameter

Photo 1 Super low-loss MPO8 optical connector.

† LIGHTRAY MPX ™ is a registered trademark of Tyco Corporation.

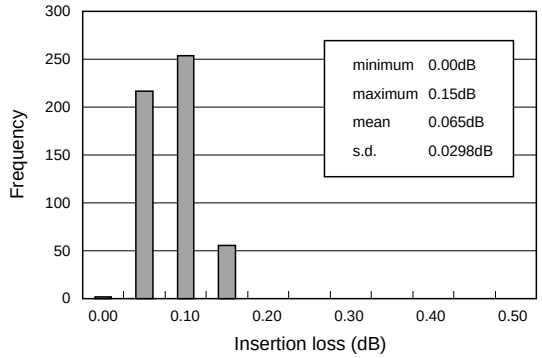

Figure 1 Insertion loss distribution for super low-loss MPO8.

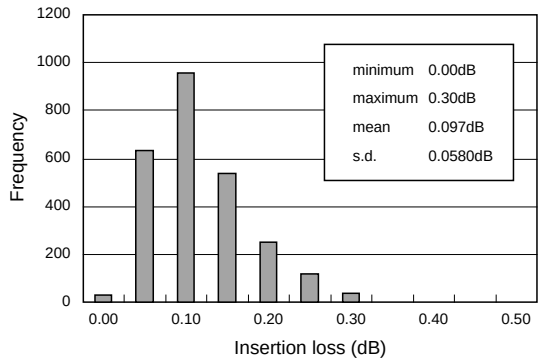

Figure 2 Insertion loss distribution for conventional low-loss MPO8.

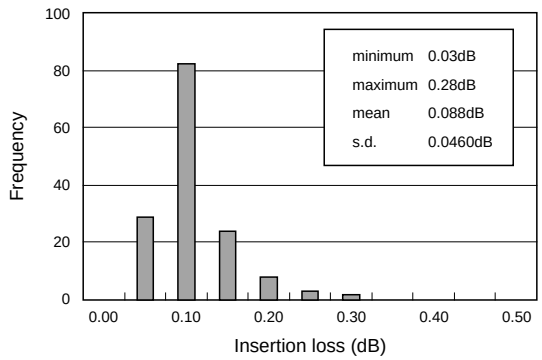

Figure 3 Insertion loss distribution for single-fiber connector.

accuracy of the optical fiber and reduce core eccentricity, and physical contact are indispensable, in addition to improvements in ferrule accuracy.

It was confirmed that the insertion-loss distribution shown in Figure 1 indicates performance that is completely equal to that of the insertion-loss distribution for a single-fiber optical connector shown in Figure 3.

4. CONCLUSION

By developing a multifiber optical connector with characteristics more than equivalent to single-fiber connectors, a full lineup of product such as an optical cord with a multifiber optical connector can be realized, satisfying the need to diversify transmission equipment as in optical parallel-transmission etc. To support reducing total insertion-loss, Furukawa Electric is focusing on supplying optical cords with multifiber connector, not only ferrules alone.

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