



Efforts in Automotive Crystal Unit

1. Introduction

Crystal unit is one of the unique electronic components for controlling and selecting frequencies with high accuracy and stability by its high Quality factor. And it is widely used not only as a "frequency standard" but also as a reference for "time".

The applications in which crystal unit is used include watches, smartphones, TVs, audio appliances, and cars. In recent years, cars use more electronics, and more crystal unit are being used. Compared with consumer crystal unit, automotive crystal unit requires higher quality and reliability. In order to satisfy high quality and high reliability, not only advanced design technologies, but also high level of technical skill and awareness in manufacturing are required, ranging from the construction of production lines for automotive use to workers engaged in operations.

In this section, we introduce Nihon Dempa Kogyo Co., Ltd. (hereinafter NDK)'s efforts in automotive crystal unit, which maintains an industry-market share of 50% or more in automotive crystal unit.

2. Efforts in automotive crystal unit (1)-Compliance with automotive standards

Speaking of automotive products (qualities) in electronic components, many people think about the quality management system IATF16949 (former ISO/TS16949) and automotive requirements standard AEC-Q200 (passive components: crystal unit is in this category) defined by Automotive Electronics Council (AEC).

NDK's automotive crystal unit meets automotive standards mainly from the following three aspects.

1) Product design

We design products that satisfy the AEC-Q200. In order to ensure high quality and reliability from the design stage, experts review and confirm the validity of the verification results using DRBFM (Design Review Based on Failure Mode) at the Design Review

Committee.

In addition to considering the operating environment (extreme cold and hot) of the automobiles, we have designed the system to accommodate temperatures ranging from -40 °C to +150 °C, assuming even higher temperatures, such as near engines. NDK is considering even if it is outside this temperature range, so please contact us if necessary.

2) Product assessment






In product quality and reliability assessments, we verify not only the mass production line but also the production facility capacity and the reliability of measurement equipment for design verification at each design and development stage. Even after the start of mass production, we periodically evaluate and verify the quality and reliability of our products.

As a specialized organization that evaluates and verifies quality and reliability, NDK has established in-house quality assurance laboratories that have acquired ISO/IEC 17025 (*1) certification, and continually evaluate and verifies the quality and reliability of its products.

(*1): ISO/IEC17025 is an international standard that certifies that the laboratory is capable of producing accurate measurement/calibration results.

3) Production plant

In addition to IATF16949 certification, NDK has acquired ISO14001 certification at all of its domestic and overseas plants that produce automotive products.

Furukawa NDK Co., Ltd. (Japan)		— ISO9001:2015 ISO14001:2015 IATF16949:2016	Asian NDK Crystal Sdn. Bhd. NDK Quartz Malaysia Sdn. Bhd. (Malaysia)		— ISO9001:2015 ISO14001:2015 IATF16949:2016
Hakodate NDK Co., Ltd. (Japan)		— ISO9001:2015 ISO14001:2015 IATF16949:2016	Suzhou NDK Co., Ltd. (China)		— ISO9001:2015 ISO14001:2015 IATF16949:2016
Niigata NDK Co., Ltd. (Japan)		— ISO9001:2015 ISO14001:2015 IATF16949:2016			

3. Efforts in automotive crystal unit (2)-NDK's unique actual examples

In order to provide high-quality, high-reliability automotive crystal unit that cannot be determined solely by product performance, we would like to introduce how NDK is taking this initiative.

1) Production line

The production line for automotive products is a dedicated line separated from general products. Plates and labels clearly indicate that the line is an automotive line to distinguish it from a general line (Fig. 1).

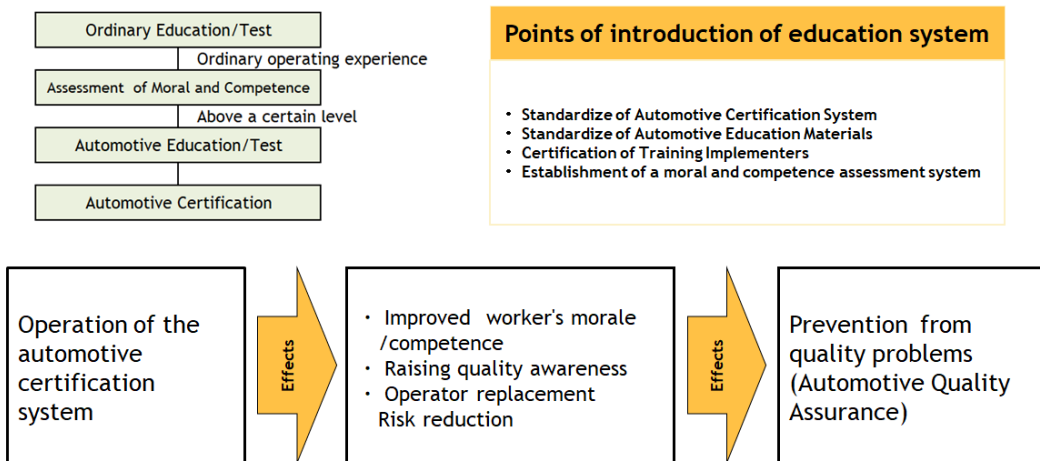


Fig. 1 Plates and labels of automotive exclusive line

2) Operator

Automotive product operators conduct automotive education, and those who pass the tests are certified as product operators for automotive use. This system has been introduced not separately for each production plant, but as a company-wide system for the NDK Group. Only highly quality-conscious and competent workers are involved in the production of automotive crystal unit.

<Operator Certification Flow>



3) Inspection

Automotive crystal unit inspections, unlike inspections of general products, are conducted not only to satisfy the customer's requirements, but also to inspect the critical characteristics of a product based on the actual performance values of the product design capability, so that there is small variation in product performance and quality, and high quality and reliability can be maintained.

In this way, NDK's automotive crystal unit is designed from the product design stage as an automotive product, even if it has the same appearance as a general used crystal unit, and manufactures the products at mass production plants that conform to the automotive quality management system. In addition, all of our products, from production equipment and production lines to workers, are manufactured using processes that are exclusively controlled for use in automotive. After mass production begins, the Quality Assurance Laboratory regularly conducts quality and reliability assessments of products to maintain and improve high quality, and as a leading company in automotive crystal unit, we provide products that customers can use with confidence.