NTC Inrush Current Limiters

Quality and environment

Date: July 2019

Corporate goals

Our aim is to play a leading role among the world's most competitive companies in the sector of electronic components. This aim is shared by the TDK Electronics quality and environment management system:

1 TDK Electronics quality system

1.1 Our commitment to quality

The quality of our products and services is an essential part of our corporate strategy with the main objective of customer satisfaction. For us, quality means providing products and services that offer maximum benefit to our customers worldwide as well as to understand the needs and expectations of all our interested parties. Quality also means ensuring competitiveness and thus securing our future, by continuous maintenance of our growing organizational knowledge.

Consistent application of a quality management system results in flawless products and a high level of user benefit from our components. It creates excellent quality of logistics and services and guarantees attractive price/ performance ratios.

Our quality management system is always in line with the most stringent international standards.

1.2 Quality management system

The quality management system to IATF 16949 is applied throughout the company and is used to implement the TDK Electronics quality policy.

1.3 Certification

The TDK Electronics quality management system forms the basis for the certification to ISO 9001 and IATF 16949 that comprises the TDK Electronics plants and sales organizations. The company certificates are posted on the TDK Electronics Internet (www.tdk-electronics.tdk.com).

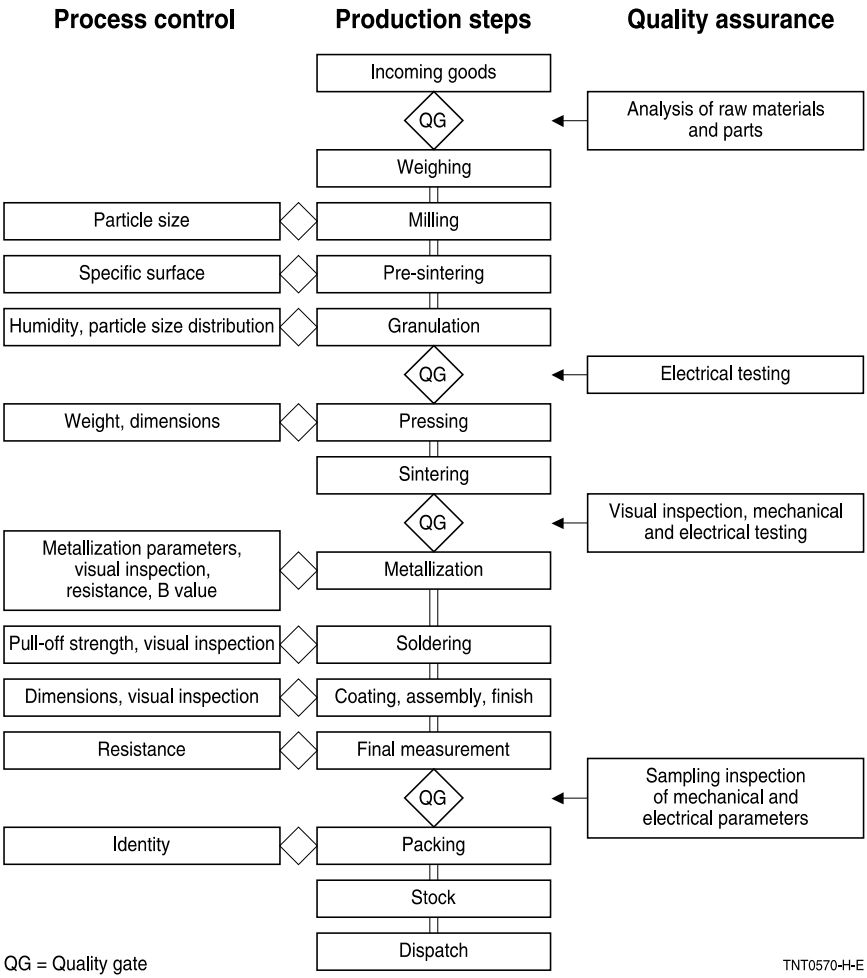
Our manufacturing sites serving the automotive business apply the IATF 16949 standard. The IATF certifications confirm our compliance with requirements regarding the quality management system in the automotive industry. Referring to customer requirements and customer specific requirements ("CSR") TDK always has and will continue to have the policy of respecting individual agreements. Even if IATF 16949 may appear to support the acceptance of unilateral requirements, we hereby like to emphasize that only requirements mutually agreed upon can and will be implemented in our Quality Management System. For clarification purposes we like to point out that obligations from IATF 16949 shall only become legally binding if individually agreed upon.

1.4 Production sequence and quality assurance

The business groups implement the corporate quality management guidelines in procedural and work instructions referred to products and processes.

The following example shows quality assurance applied to the production sequence of NTC inrush current limiters.

Production process and quality assurance for NTC inrush current limiters



1.5 Final inspection/approval for shipment

Final inspection verifies the major properties of the end products batch by batch, usually by means of fully automated selection tests.

Approval for shipment helps certify that products shipped comply with specifications. It includes:

- testing of principal parameters,
- identification check and visual assessment,
- examination of papers accompanying the batch.

1.6 Duration of use

The duration of use in terms of reliability is the time period during which random failures occur, i.e. the range in the product operating life in which the failure rate remains largely constant (early failures and end of operating life excepted). The value depends strongly on conditions of use.

1.7 Reliability

A variety of endurance tests and environmental tests are conducted to assure the reliability of NTC inrush current limiters. These tests are derived from the extremes of expected application conditions, with test conditions intensified to obtain authoritative results within a reasonable period.

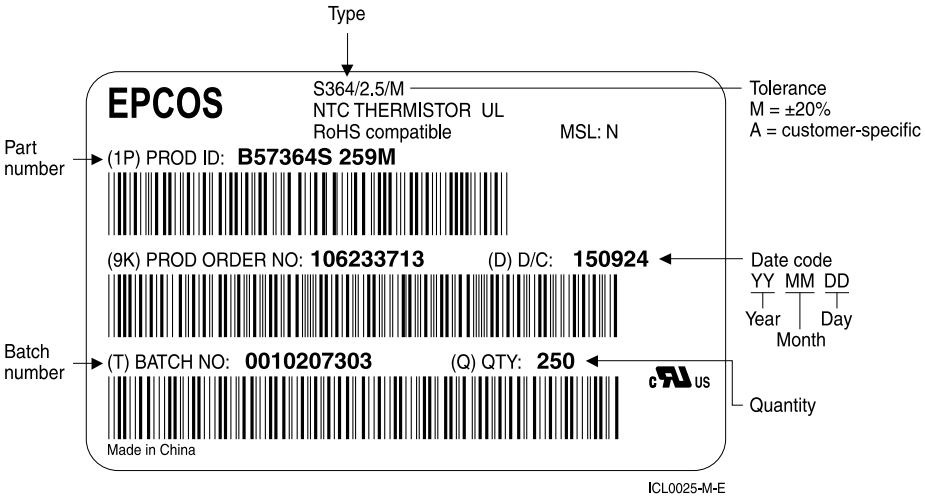
The reliability testing programs of TDK Electronics are based on the test plans of international standards and customer requirements.

TDK Electronics performs reliability tests to qualify new component families and for periodic requalification.

1.8 Bar code label/ traceability

The packing of all TDK Electronics components bears a bar code label stating the type, ordering code, quantity, date of manufacture and batch number. This enables a component to be traced back through the production process, together with its batch and test report.

The basic structure of the bar code label is pictured below. Actual bar code labels can vary slightly from type to type depending on e.g. certifications and manufacturing location.



1.9 Conditions of use

TDK Electronics products may only be used in line with the technical specifications and installation instructions and must comply with the state of the art. Non-observance of limits, operating conditions or handling guidelines can lead to disturbances in the circuit and other undesirable consequences such as a higher failure rate.

In this connection, please note the “Important notes” on page 2.

Should you have any application-referred questions, please contact our experts, who will be pleased to advise you.

1.10 Customer complaints

If a fault occurs in a product despite careful manufacture and testing, please contact your local sales organization. They will register your complaint and forward it to the relevant technical departments for rapid handling.

TDK Electronics treats technical complaints according to the 8D[1)] methodology; i.e. with the use of interdisciplinary teams who aim to implement rapid countermeasures and sustained corrections and answer all complaints with an 8D report.

In order to be able to deal quickly and smoothly with complaints, the following data are helpful:

- Number of components subject to complaint or returned
- Fault description (with photos if applicable)
- How and when was the fault detected?
- Logistics data (delivery note no., batch no., date code)
- Operating conditions
- Operating duration up to occurrence of the fault
- Measurement parameters in the case of divergent technical data

In the event of transport damage, we would ask you to describe this in more detail and if required to mark it so that it can be distinguished from any further damage sustained during the return shipment. The original package should also be checked and any damage to be described. In order to avoid further damage, the original packaging should also be used for the return shipment.
In case of receiving a damaged delivery, please document this damage with a signature of the forwarding company on the delivery papers.

1) 8D = 8 disciplines

2 Environmental management

2.1 Environmental, energy and occupational health and safety policy

We are committed to conserving the environment and treating natural sources and energy consumption in the sense of sustainability. This applies as much to our production processes as to our products. The assessment of the environmental effects of our products begins as early as the development stage. It is our aim to go beyond legal requirements to prevent environmental pollution or to reduce it to a minimum, as well as to reduce the consumption of energy in the frame of economical and technical feasibility. Health and safety at work are part of our corporate culture and expression of the responsibility for our employees.

Environmental, energy and occupational health and safety guidelines

1. We work continuously toward reducing the burden on the environment, toward minimizing associated risks and toward lowering the use of energy and resources, above and beyond the legal requirements.
2. We take appropriate precautions to avoid environmental hazards and to prevent damage to the environment.
3. Potential impact on the environment is assessed and incorporated in process and product planning at the earliest possible stage from a life cycle perspective.
4. By applying environmental, energy and occupational health and safety (OH&S) management, we ensure that this policy is implemented effectively. The technical and organizational procedures required to do this are monitored regularly and constantly further developed. We strive for continual improvement of our management systems by establishing objectives to improve the environmental, energy and OH&S performance.
5. Every employee is required to act in an environmental conscious manner and to regard the rules of labor safety. It is the constant duty of management to increase and encourage awareness of responsibility for environment, energy consumption and occupational health and safety at all levels.
6. We work with our business partners to promote conformity with similar objectives. We supply our stakeholders with information on ways to minimize any potentially adverse impacts of our products to the environment or occupational health and safety.
7. We work in a spirit of cooperation with the relevant authorities.
8. We inform the public of the impact on the environment caused by the company and our activities related to the environment and occupational health and safety.
9. We consider ensuring a safe, healthy and comfortable work environment as first priority to avoid work-related injury and ill health. We comply with all applicable legal requirements and with all requirements that relate to OH&S risks.
10. We take preventive measures to reduce risks for our employees and eliminate hazards. We involve our employees in OH&S-related processes.
11. We support the purchase of renewable energy and of energy efficient products, machines and services that improve our energy-related performance.

2.2 Environmental management system

The TDK Electronics ISO 14001 based environmental management system is applied company-wide for implementing the TDK Electronics environmental policy. It is posted on the TDK Electronics Intranet and is thus accessible to all employees.

2.3 Certification

The TDK Electronics Group operates an environmental management system that conforms to the requirements of ISO 14001 and is mandatory for all plants.
The company certificate is posted on the TDK Electronics Internet: www.tdk-electronics.tdk.com.

2.4 RoHS

The term "RoHS-compatible" shall mean the following:

Components defined as “RoHS-compatible” are compatible with the requirements of Art. 4 of Directive 2011/65/EU ("RoHS II") of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment of 8 June 2011 and with the requirements of the provisions which will result from transposition of RoHS II into national law to the extent such provisions reflect the directive.
"RoHS - compatible" components do not contain any of the following substances at a content exceeding the maximum concentration limits of 0.1% for lead, mercury, hexavalent chromium, PBB, PBDE, DEHP, BBP; DBP, DIBP and 0.01% for cadmium at a homogeneous material level, except the application is exempted by Annex III of "RoHS II".

2.5 REACH

According to Art. 33 we are obliged to inform our customers immediately or on request a consumer within 45 days if we get knowledge that a Substance of Very High Concern (SVHC) is contained in a product or it’s packaging with more than 0.1% w/w. Provided this substance is published by the European Chemical Agency via the candidates list. Respective information is provided via www.tdk-electronics.tdk.com (Link: REACH Candidates List and Information according REACH Art. 33, concerning TDK Electronics Products).

2.6 Banned and hazardous substances in components

As a manufacturer of passive components, we develop our products on the basis of sustainability.

In order to establish a standardized procedure for TDK Electronics worldwide, a material compliance management and a mandatory list of banned and declarable substances and substances of special interest (TDK Electronics BAD-SL) are part of our quality management system. The planning and development instructions include regulations and guidelines that aim to identify environmental aspects and to optimize products and processes with respect to material use and environmental compliance, to design them with sparing use of resources and to substitute hazardous substances as far as possible.

Consideration of the environmental aspects is checked and recorded in the design reviews: the environmental officer provides support in the assessment of the environmental impacts of a development project.

2.7 Material data sheets for product classes

TDK Electronics posts material data sheets on the Internet (www.tdk-electronics.tdk.com) that show typical compositions of product classes by selected representatives. The materials are listed with their percentage weight distribution referred to the respective component.

As per IEC/PAS 61906 (IEC 62474), all materials are listed, whose weight percentage exceeds 0.1% w/w or at least a given legal limit. All specifications are typical data and may vary slightly within a product class or production lot.

The material data sheets do not represent guaranteed properties, but are merely given for purposes of information.

Please note in this connection the "Important notes" on page 2.

2.8 Disposal

All NTC inrush current limiters can be disposed of, reused or recycled. However as disposal is regulated by national law, the respective national provisions have to be observed.