Quality Management in Production
Electrical Temperature Measurement – Thermometers (TR/TC)

1 Scope

The Quality Management System in production of resistance thermometers is based on the general Quality Management System of WIKA, Alexander Wiegand SE & Co. KG.
This document is meant to give an overview of the major quality relevant processes used for production and control of thermometers. It should be referred to in combination with the Quality manual document as general information.

2 Documentation

Document	Definition
Data sheet (DS)	The data sheet defines technical features of a standard thermometer and can be downloaded from WIKA‘s website.
Operating Instruction (OI)	The OI describes requirements for safe handling, installation, operation and maintenance and can be downloaded from WIKA’s website.
Part Number	The part number of any part, component, or thermometer is unique; it is kept under control through revision management.
Drawing (DRW)	The drawing is used to record technical details of parts, components, or thermometers and always refers to a part number. It is kept under control through revision management.
Standard operating procedure (SOP)	The SOP defines how to perform each step of a process. The SOP document is kept under control through revision management and is for internal use at WIKA only.
Work instruction (WI)	The WI defines how to handle and test parts/production steps. The WI document is kept under control through revision management and is for internal use at WIKA only.
Production Work Plan (WP)	The WP is elaborated by the Process Engineering department and defines the different production steps. Every production step is signed by the skilled employee during the production process. The WP document is for internal use at WIKA only.
Bill of materials (BOM)	The BOM is a structured list of individual parts/materials needed for the assembly of a part or product. The BOM document is for internal use at WIKA only.

3 Quality Management Procedures in Production

3.1 Quality Management prior to Series Production

- New products and variation of existing products are developed and validated for series production capability according to the WP.
- Potential new suppliers are evaluated prior to series shipments.
- New parts have to pass the First Article Inspection (FAI) process according to the WIKA Global Guideline “Supplier Quality”.
- Preventive quality tools (like FMEA, QFD, Risk Assessments, Quality Workshops…) are used to define quality specification items.

3.2 Quality Management during Series Production

- Incoming inspection of purchased parts from certified suppliers according to a control plan is done to verify incoming quality.
- Production tests (leakage, accuracy, isolation…) are documented in the WP to verify the production steps. Completed production steps and product inspections are documented in the WP to ensure the product quality (construction, installation dimensions, identification, documentation, certificates).

Process step	Process	Specification
Mineral insulated (MI) cable	Processing of mineral insulated cable with semiautomatic machines	DRW, BOM, WP, SOP, WI
Assembly of sensor and mineral insulated cable (TR) [1)]	Assembly process with micro flame blow-torch, micro plasma welding or laser welding	DRW, BOM, WP, SOP, WI
Creation of measuring point (TC) [1)]	Creation of measuring point by micro flame blowtorch, micro plasma or laser welding	DRW, WP, SOP, WI
Sealing of the housing tube “Hot Junction”	Welding process of MI cable and end cap	WP, SOP, WI
Leakage test	100% leakage test of welded connection “Hot Junction”	WI, SOP, WP
Assembly of connection socket “Cold Junction”	Assembly with crimping tool and hard soldering with micro flame blowtorch	DRW, BOM, WP, SOP, WI
Sealing of wires to connection socket “Cold Junction”	Sealing with resin-compound	DRW, BOM, WP, SOP, WI
Functional test	100% accuracy test at one temperature point	WP, SOP, WI
Insulating resistance test	Insulation resistance test between each sensor connection and the housing	WP, SOP, WI
High voltage test	Test of electrical breakdown resistance for explosion prove thermometers	WP, SOP, WI
Accuracy test/ Certificate	100 % accuracy test at individually defined temperatures and documentation of the test-results done by quality inspector	Customer Spec., WP, SOP, WI
Assembly of mounting parts	Assembly of customer specific accessories	DRW, BOM, WP, SOP, WI
Identification marking	Identification marking of thermometer	DRW, BOM, WP, SOP, WI
In–process and final inspection	100% in-process and final inspection of following attributes: Order accuracy (construction, installation dimensions, identification, documentation, certificates, complete documentation in work plan)	DRW, WP, BOM, SOP, WI
Packing and shipping	Packaging of thermometers into a transport box and shipping thermometers to customer	WP, SOP, WI
Shipping audit	Random inspection of thermometer attributes	DS, OI, DRW

[1)] Alternative production steps

3.3 After sales service

Thermometers which are defective or out of calibration can be returned to WIKA for service. The procedure is described on the website of WIKA under “service” (product return form) and can be handled on an individual basis.

WIKA Alexander Wiegand SE & Co. KG
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Dr. Michael Glombitza

Head of Quality Management
Electrical Temperature Measurement