makes a difference

Supplement to the Quality Assurance Agreement*

Quality Guideline for Electronics Assemblies

between

Alfred Kärcher GmbH & Co. KG,
Alfred-Kärcher-Str. 28-40
71364 Winnenden

- referred to as “Kärcher“ in the following -

and

Supplier
Road
Postal Code and City
Country

Including the respective production sites

- referred to as “Supplier” in the following –

Initial Note

The quality guidelines for electronics assemblies are intended to ensure that electronic assemblies are manufactured for Kärcher in a reliable, best and steady quality. Furthermore, they are to ensure that processes at the suppliers‘ as well as processes between Kärcher and suppliers support the quality of these assemblies and that any faults are alleviated as promptly as possible.

Therefore, the parties to this agreement agree on the following points that supplement the general quality assurance agreement (QSV):

1 Validity:

These guidelines apply to all electronics assemblies produced for Kärcher, regardless who developped them and where they were manufactured.

2 Measures for Quality Assurance on the Part of the Supplier

The following describes process steps that are to ensure a continuous and high quality of the assemblies.
To evaluate the qualitative construction of individual assemblies, we use the currently valid version of the **IPC-A-610**. (Approval criteria for electronic assemblies)

Technical devices, equipment and methods for PCB assembly are subject to rapidly changing technical conditions.
Therefore Kärcher advises its suppliers to use the constantly marketed technical possibilities as a guideline and to possible implement these.

The goal must be the optimization of quality in series production and to keep it at a high level.

Independent of this factor, Kärcher demands the following process steps and measures from its suppliers. If any of these steps cannot be fulfilled as stated, the future process must be discussed with Kärcher QM.

2.0 Cleaning and ionizing the PCB

New boards are often dirty and also electrostatically charged.
So smallest dust particles are attracted.
Thus, the quality of the soldered boards (shorts, bad soldering) is affected.
Therefore Kärcher requests to clean and ionize the boards before solder past printing.

2.1 Checking the soldering paste application

In order to ensure a constant soldering quality, the application of soldering paste must be warranted at a sufficient quality.
Therefore, Kärcher demands a 100% inspection of the soldering paste application via an AOI (automatic optical inspection).

2.2 Cleaning the stencils for the soldering paste application

As the stencils for the application of the solder paste (with assemblies that keep getting smaller) plug up easily, they have to be cleaned automatically at fixed adequate intervals.

2.3 Set up inspection for SMD mounting

In order to avoid mistakes during the SMD mounting, a setup inspection according the 4 eyes principle is required.
A setup inspection via barcode scanning is desired. However, this requires a complete stock control with this system.

2.4 Checking the soldering temperature

In order to avoid damages of components by excessive soldering temperatures or poor soldering quality by soldering temperatures that are too low, Kärcher is demanding an inspection of the soldering temperatures on the assemblies.
This inspection applies to reflow soldering systems as well as to wave soldering systems.

Procedure:
At the start of every series production, the soldering profile must be defined for every assembly; it must be measured and documented in the manufacturing log.

Here, the temperature of at least two components on the PCB has to be measured. The measurements must be performed at temperature-critical locations or components.

In the course of the series production, this measurement has to be repeated continuously.
The measurement must be performed at least at the start of each production batch or once per day.

2.5 AOI (automatic optical inspection)

To inspect the mounting and the soldering quality, Kärcher requests his suppliers to inspect 100% of the assemblies via an AOI.

2.6 Hand mounting

The hand mounting of certain components can still not be omitted.
In order to avoid mistakes, a setup inspection according the 4 eyes principle is required.

Furthermore, the work stations must be designed to prevent errors and to avoid mistakes like “mix-up”, “reverse polarity” etc.

A working instructions that is clearly and easy to understand (visualisation) is required for every hand mounting station.

2.7 ICT (In Circuit Test)

Before the function of an electronic assembly is tested using nominal voltage, Kärcher requests an ICT for all assemblies.
The following items have to be tested:

- conductor tracks of the PCBs for conductivity and short circuit
- resistors, capacitors
- diodes, voltage regulator diodes, suppressor diodes, transistors
- Microcontrollers (internal ESD diodes) and ICs
- transducers, inductivities

The result of the ICT must be documented on the basis of the serial number.

A list with all components that cannot be tested by the ICT has to be discussed with Kärcher QM at the start of the series.

The ICT can only be omitted if it is not required in the Kärcher manufacturing documentation (EBB).

2.8 Function test

The requested function test is described in the Kärcher technical documentation.
Function test and ICT can be performed with one test setup and on one tester.

What is important is that the test sequence runs automatically.
That means that the test steps are not controlled by an operator but by a computer with the corresponding test programme.

The results of all required test steps or test points must be documented based on the serial numbers. This includes especially all measured voltages and currents of the test run.

2.9 Stress Test

If in the manufacturing documents from Kärcher (EBB) a stress test is required, then this has to be carried out accordingly.
The results of the stress test must be documented on the basis of serial number and date.

2.10 Yield

The documentation of the failure rate (yield) of ICT, AOI and function test must be maintained and presented to Kärcher QM every quarter.

The limits of the yield are defined with Kärcher QM.
If the determined value is below the limit, appropriate measures for process optimisation must be initiated immediately and Kärcher QM has to be informed.

2.11 Coating

The requested coating is defined in the Kärcher technical documentation.
This documentation contains a painting schedule which shows the areas that are to be painted.

In order to ensure a proper coating job, Kärcher demands that all assemblies are painted by means of automatic systems (robots or submersion coating).

Special attention must be paid to the protection of areas that are not to be coated (plugs, relays, etc.).

2.12 Faults

For all process steps 2.1.1 to 2.1.11, the supplier has to define how to handle the bad parts in case of a fault.

It must be clear how these parts are sorted out, marked, repaired and reintroduced into the process.

Delivering parts to Kärcher that did not pass one or more of the process steps must be avoided at all circumstances.

In case of manufacturing problems with new assemblies, Kärcher (purchasing, development or QM) expects supportive improvement suggestions by the supplier.

2.13 Packaging

All modules have to be packaged according the packaging instructions from Kärcher (KäN 050.004)
This Kärcher Standard can be downloaded from "https://supplierinfo.kaercher.com".

2.14 Servicing machines and systems

Manufacturing and testing electronic assemblies requires a multitude of complex systems.

Kärcher expects these systems to be in a well-maintained and serviced state, so that the quality of the products manufactured for Kärcher is not compromised.

Logs about the maintenance and service of these systems must be available during the respective audits and must be presented to Kärcher upon request.

2.15 ESD Measures

As semiconductors must principally be protected against ESD, ESD measures are a "must" in all areas of manufacturing of electronic assemblies.

- Wearing ESD shoes
- Checking the ESD shoes at least once a week
- ESD appropriate floors or floor mats
- ESD mats on the respective tables
- ESD appropriate shelves, tables and chairs

- If needed, ESD bands at the hand mounting stations

The regular control and maintenance of the ESD systems must be documented!

3 Release

3.1 New products

Prior to series delivery of new products, the supplier will need a written approval issued by Kärcher.

This approval always takes place on the basis of an EMPB (initial sample test report) for electronics.
Approvals by e-mail or telephone are not permitted.

The respective form can be downloaded from "https://supplierinfo.kaercher.com".

As far as possible in the individual cases, the samples for approval must be manufactured under the conditions of series production.

In order to issue an approval, it is also required that the items listed in “2. Measures for quality assurance by the supplier" have been clarified between Kärcher and the supplier.

3.2 Modifications:

Product and process specific changes must be reported to Kärcher and must be approved by Kärcher by means of an EMPB.
This includes:

- Changes in the test procedures
- Changes in the manufacturing process
- Changes in the software
- Changes in the hardware (mounting or PCB)
- Relocation of the production site

4 Received product checks and returns

In case of defects, the products will be returned to the supplier.
The supplier is obligated to immediately remove the defects and to send Kärcher goods as agreed in the contract.

If Kärcher requests this, the supplier will make a statement in an 8 D report regarding the faults and the measures that were initiated.

4.1 Marking returned assemblies

If the supplier notes during the check of returned assemblies that these do not have any defects, these items must be labelled with a green label listing the complaint number before they can be sent to Kärcher once again.

If a repair of the returned assemblies is necessary, these items must be labelled with a yellow label listing the complaint number before they can be sent to Kärcher once again.

5 Traceability

The supplier agrees to guarantee a system of tracking and tracing his products and their components.

This system should show when which product or component was manufactured or processed and delivered.
You should also be able to determine which production materials were used, which process parameters were set and which lots were used.

This applies to all integrated circuits and special semiconductors.

6 Validity of the agreement

This agreement becomes valid with the signature of both parties to the contract and can be terminated by both parties with a notice period of 3 months to the end of the quarter.

7 Deviations and comments

Winnenden,

Date …..... ....
(Alfred Kärcher GmbH & Co. KG Sourcing & Procurement Management)
Heiko Braitmaier

(Alfred Kärcher GmbH & Co. KG Quality Management)
Harry Bender

……,

Date …..... .....
(legally binding signature of supplier, stamp)

Printed name	Function	Telephone