SUPPLIER HANDBOOK

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About this document

Inmotion is part of the Zapi group. The Zapi group designs, manufactures, markets and sells motion control products to a variety of markets including vehicles.

The purpose of this document is to communicate to current and future suppliers, Inmotion culture, expectations and requirements. The target readers are supplier's employees who are responsible for or work with Inmotion in key positions. This document describes in short form the Inmotion way of working and its expectations for supplier processes, performance and improvement targets. For a long term successful relationship with Inmotion, the supplier must meet these expectations.

This document is an enclosure to the Inmotion supplier agreements. If any contradiction occurs between this document and an agreement between the parties, the agreement will always have precedence.

This revision replaces all previous revisions of this document. Inmotion has made every effort to ensure that this document is complete and accurate at the time of printing. In accordance with our policy of continuous product improvement, all data in this document is subject to change or correction without prior notice.

1 General Requirements

1.1 Basic Expectations

1.1.1 QDC – Quality, Delivery and Cost

Quality, Delivery and Cost targets must always be met. However, Quality is first! Lack of Quality jeopardizes Delivery and increases Costs.

A Zero defect attitude is required! The principle of zero defect is a culture of not accepting any fault and continuously striving for perfect results.

1.1.2 Kaizen and Continuous Improvements

To maintain both parties' competitive market positions, continuous improvement (Kaizen) is a must and has no end. Therefore the supplier should have both long and short term plans to continuously improve Q, D and C, and implement the improvements without unnecessary delay.

1.1.3 Problem Solving

When problems occur the following steps must be completed and documented with sense of urgency to quickly correct issues and enable Inmotion to meet its customers' requirements:

1. Initiate immediate **Interim Containment** to prevent more defects from escaping out of the process and identify any suspect material in transit. Containment must be completed and reported within 24 hours.
2. Determine why the defect was made, **Root Cause (RC) of Occurrence**.
3. Determine how the defect escaped detection, **Root Cause of Escape**.
4. Develop, implement, validate and report a **Permanent Countermeasure** (CM) (for the occurrence and for the escape).
5. Determine where else the countermeasure should be implemented to avoid recurrence of the issue in other processes or products (**Yokoten/Deploy everywhere**).

[Ref 10] describes how problem solving can be documented and tracked.

Effective root cause analysis leading to sustainable countermeasures requires appropriate quality methods and tools (e.g., 5 Whys, SPC, Pareto charts, design of experiments and etc.) performed with cross functional teams and creative thinking.

1.1.4 Lean Principles

Inmotion believes it is mutually beneficial for all parties to utilize the following lean principles:

- The ultimate supply chain uses one piece flow from point of origin to the end user.
- Waste should be eliminated in all processes. The 8 forms of waste are Defects, Waiting, Excess Motion, Transportation, Overproduction, Non value-added processing, Excess Inventory and Underutilized creativity.
- Visual management should be used to monitor performance, demonstrate the ability of processes to achieve planned results and support communication among employees and management.
- Inventory should be minimized because it negatively affects both Quality and Cost. Excess inventory hides the root cause of Delivery problems.
- Orders should be based on a pull system (Kanban).
- Lead times and order quantities should be minimized.
- Use 5S. Keep work areas clean. Visual management should be used to assure that only needed parts and tools are in work places.
- Use Poka yoke (mistake-proof).

When selecting a lean solution, all decisions should be based on Quality, Delivery and Cost, in that order.

1.1.5 Key Performance Indicators

The supplier should measure performance to a level where prioritized improvement areas can be identified. Examples:

- First pass yield (FPY), per operation when applicable
- Out of box quality (OOB)
- On time delivery (OTD) versus request date
- Paynter charts, i.e., CM implementation and defective part production dates on a time axis
- CpK monitoring of test parameters (in conjunction with SPC)
- Pareto diagrams of major issues
- Run charts for KPI's to monitor trends

The supplier should utilize visual management of KPI's for involved employees and be willing to share these performance indicators with Inmotion whenever requested.

1.1.6 Counterfeit – Pirated/Imitation Parts

The supplier shall not deliver any products to Inmotion that contain any "counterfeit part". As a rule of thumb any part bought from other sources than the manufacturers official distributors should be handled as "counterfeit part" until the opposite proven.

1.1.7 Contingency Plan

The supplier is required to have a valid contingency plan.

1.1.8 Inmotion Owned Equipment

The supplier may from time to time use and keep product-specific equipment owned or leased by Inmotion. Such equipment shall be kept on behalf of Inmotion and, in order to be protected from claims by any third party, it shall be clearly and satisfactorily marked that the equipment is owned by Inmotion. The equipment shall be kept safely and properly. The supplier shall maintain, service and insure the equipment. The supplier should keep a register of the equipment and regularly report to Inmotion.

1.2 Safety and Environment

1.2.1 Inmotion Corporate Safety and Health Policy

Safety comes first. Health and Safety is an integral part of our business and is encouraged in all stages to ensure the wellbeing of people.

1.2.2 Environmental Requirements and Substances Of Concern

Inmotion aims to minimize its environmental impact by focusing on the material content of its products and CO_2 emissions, therefore Inmotion expects suppliers to:

- Understand how their businesses and products impact the environment.
- Know and comply with federal, state, and local regulatory requirements.
- Notify Inmotion of any significant environmental compliance violations.
- Stay current with global classifications of hazardous substances.
- Understand the requirements for registration of substances and how these requirements apply to your products.

- Complete full Materials Declaration, which includes reporting chemical and material content of component parts in the International Material Data System (IMDS). For more information see: http://www.mdsystem.com/
- Provide information on substances on the Substances of Very High Concern (SVHC) "Candidate List" inside products supplied to Inmotion. For more information about the REACH regulation see: http://echa.europa.eu/home_en.asp
- Notify Inmotion immediately if SVHCs are discovered in your products. Note; the SVHC list is updated regularly.
- Supplier shall not deliver any products containing substances with higher weight-percent, defined by RoHS, REACH and GADSL, unless agreed with Inmotion.
- Inmotion shall not be regarded and will not act as an importer under REACH. Therefore suppliers outside of EU who deliver to Inmotion within EU shall point out an Only Representative within EU.
- Suppliers are responsible to assure implementation of these requirements through their supply chain.
- Suppliers must be able to report on their environmental work, including organization, fulfillment of legal demands, and environmental results.
- Environmental-related data from production, products and transport and must be available upon request for Inmotion to enable environmental assessments (for example Life Cycle Assessment).
- Suppliers should consider recycled/recyclable materials when selecting materials and design solutions.
- Any deviation must be documented by the supplier and reported to Inmotion for approval.
- Suppliers are requested to have a conflict minerals program in place.

1.3 Quality

1.3.1 Quality Targets

Zero defect attitude is required! Lack of Quality is a Delivery risk and a Cost driver. Targets should be set in cooperation with Inmotion. The supplier should create an improvement plan to reach and sustain performance at or better than the target levels. Default targets:

- First pass yield >98%
- Out of box failures <100 dpm (defects per million)
- Field failures 0 dpm

1.3.2 Certification Requirements

The supplier shall have and maintain a quality system conforming to at least the requirements set out in ISO 9001 latest version or an equivalent quality system. The supplier should be developing processes consistent with the basic philosophies in IATF 16949.

The supplier should have and maintain an environment management system, conforming to at least the requirements set out in ISO 14001 latest version or an equivalent quality system.

1.4 Delivery

Logistics parameters are key enablers for growth and profitability, and continuous improvements are expected in the following areas:

- World class On Time Delivery
- Low cost of capital through low inventory levels
- Minimized cost and waste by being lean throughout all processes

1.4.1 Delivery Performance Targets

- On time delivery target >98% versus request date.
- On time delivery target =100% versus confirmed date.
- Lead time, for volume deliveries < 5 days from order to shipping.

1.4.2 General Requirements

- Minimum order quantity equivalent to one week demand
- On time deliveries from our suppliers are essential to avoid production disturbances and to meet commitments towards customers.
- Every month Inmotion will provide the supplier with a rolling forecast for the following 12-month period,
- Our customers expect us to always be flexible to volume changes and aim at 100% OTD (On Time Delivery, requested date) and we have the same expectation on our suppliers.
- To be able to meet our customer demands, flexibility is required to meet fluctuation in volumes due to additional sales etc. Additional sales should be seen as progress and if purchase volume is significantly higher than forecast or the order is within lead time Inmotion expects an engagement to reach 100% versus request date.
- The request-date on Inmotion purchase order is the date when the goods shall be delivered at Inmotion facility (also called the dock-date)
- Keeping information available and transparent is a key task so that all actors in the supply chain share the same picture without delays and can plan accordingly for i.e. seasonal variations or even production pace.
- Early warnings regarding delays or risks in the supply chain need to be communicated to the appropriate contacts so that necessary actions can be taken.
- If the supplier cannot meet its obligations concerning deliveries, the supplier is responsible to make express deliveries at its own cost to minimize the impact of the delay.
- Long lead time parts or raw material, need to be identified by the supplier that also needs to make a proposal on how to secure this material based on the forecast.
- Information about last time buy (LTB) for parts should be forwarded to Inmotion without delay by sending an e-mail to qbox.sth@evs-inmotion.com.

1.4.3 Supplier Questionnaire

Inmotion expectations on logistics parameters are listed in a supplier logistics questionnaire that can be reviewed in association with a supplier audit (on-site or self-assessment), see [Ref 4].

1.5 Cost

1.5.1 Cost Improvement Target

Year-over-year total cost improvements of 5% or higher. Cost improvements can be in any area associated with the fulfilment of the requirements including design, raw materials, freight, etc. If year-over-year cost improvements equal less on average, the supplier will participate, as requested, in a value analysis process with Inmotion.

1.5.2 Price Model

- Open-book calculation with full disclosure of direct material with specified prices on component level, material overheads, assembly cost, cost for test, other overhead cost, gross profit, etc;
- Shipping cost to be stated separately if applicable;
- The currency content (%) per part defined;
- Raw material content (%) per part defined;
- Packaging: All prices must include all product packaging based on product requirements and all packaging for shipping product to the requested ship to location;
- Price effect due to different ranges of annual volume (rolling 12 months) should be stated on request ("volume pricing");
- Regarding currency fluctuations and raw material surcharges, base prices are calculated yearly using rates set by an independent source selected by both parties. Purchase order prices do not change during the year due to FX or raw material. Variations shall be handled separately each month. See an example of currency fluctuation model in Figure 1;

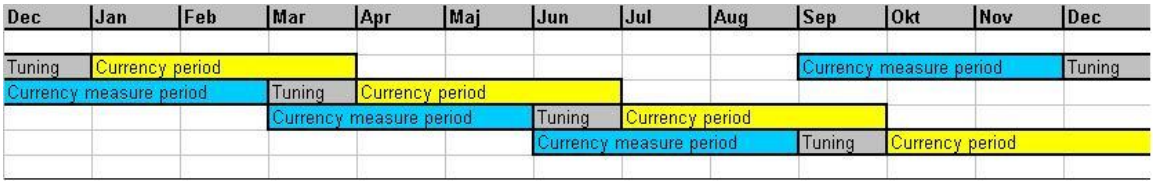

Figure 1 – Example of currency fluctuation model

- We often have significant volume on a product family and limited volume on some products in the family. Since the most of the product content is the same, price leverage is expected also on the low volume products;

To maintain both parties' competitive market positions, continuous improvement (Kaizen) is a must and has no end. Therefore the supplier should have both short-term and long-term plans to continuously improve Q, D and C, and implement the improvements without unnecessary delay.

1.5.3 Cost Of Poor Quality

The Inmotion requirement for suppliers regarding quality is to have a zero defect mindset but when defects occur, the supplier shall have the sense of urgency and act with speed to make the necessary containments, to find root cause and to implement sustainable counter measure.

The ZAPI Cost Of Poor Quality policy stipulates that for all quality issues under the supplier responsibility, the final total costs generated by non-compliance items will be reported periodically in detail for each individual claim.

The RMA-process remains unchanged (see chapter 5.3).

The ZAPI Cost Of Poor Quality policy applies if there is no specific Inmotion supplier agreement.

2 Sourcing

2.1 Co-operation

Before any kind of co-operation is started, a Non-Disclosure Agreement shall be signed.

Keeping information available and transparent is a key task so that all parties in the supply chain have access to the information without delay and can coordinate plans. Also risks should be communicated actively and without delay to ensure no opportunities to mitigate risk are lost.

Inmotion and the supplier should have continuous joint activities to share performance, ideas, solve problems and drive Quality, Delivery and Cost improvements. Examples: weekly meetings, workshops, design reviews, quarterly business reviews, audits, and etc.

A list defining contact persons and their roles should be established, preferably in an enclosure to the agreement.

A target of the cooperation is a formal agreement between Inmotion and the supplier, based on ZAPI General Terms and Conditions [Ref 3].

2.2 Supplier Selection

2.2.1 Evaluation of New Supplier

To be able to be a serial supplier of Inmotion, the supplier must be approved with the following non-exhaustive list of approval criteria:

- Signed Non-Disclosure Agreement;
- Signed Supplier Code of Conduct;
- ISO9001 certification (preferably IATF 16949);
- Solid financials;
- Inmotion audit pass result;
- Acceptance of this present Supplier Handbook;

2.2.2 Supplier Selection and Contract

To be selected as the serial supplier for a specific part, the supplier must submit the best total quotation. The decision to award the contract is based on the following non-exhaustive list of criteria:

- Current Q, D, C performances;
- Part design feedback;
- Production process capability;
- Delivery and payment terms;
- Unit price and tooling cost;

2.3 Supplier Development

2.3.1 Supplier Monitoring

- A risk assessment of all suppliers is performed yearly to select the top priority mitigation activities;
- Each month, Inmotion communicates the list of defects and delivery misses.
- Quarterly a Score Card is communicated to suppliers summarizing the supplier performance in terms of Quality and Service, including Defective Parts Per Million, Non-conformance reports and Response Time, Cooperation and OTD.

2.3.2 Supplier Improvement/Audit Plan

Supplier is required to perform development activities whose purpose is to improve supplier performance. The ultimate goal is to have suppliers to be certified according to IATF 16949. Based on Supplier Monitoring results (QDC performance, Risk Assessment), Inmotion plans also supplier development action in Inmotion Supplier Audit and Improvement Plan.

2.4 Sub-suppliers

The supplier is fully responsible for sub-suppliers, even if they have been originally selected by Inmotion.

Early in the design phase Inmotion must select critical components and/or sub-suppliers to be able to verify the product's QDC. Inmotion evaluates the sub-supplier's ability to supply parts according to QDC and set up a price agreement. But the buying party, i.e., the supplier, must take the full responsibility for the sub-supplier. When needed, the supplier receives help from Inmotion according to the Co-operation chapter above. The supplier can suggest sub-supplier changes.

3 Product Development Process

3.1 Advanced Product Quality Planning

3.1.1 Design Review, Feasibility Study and Design For Manufacture

The supplier is expected to actively participate in design reviews and use its knowledge (in any possible way and on own initiative) to prevent quality problems and cost drivers; i.e., to contribute to optimization of the design for manufacture.

In the quotation process, the supplier once having taken into account all the requirements and information provided by Inmotion, must guarantee the full feasibility of requirements. In case of any risk of deviation, the supplier has to inform Inmotion immediately and provide alternative solution.

3.1.2 Special Characteristics

3.1.2.1 Critical Characteristic

Critical Characteristic is a product feature or dimension, where reasonably anticipated variation could directly affect compliance with Government regulations or safe operation of the equipment. Any of those characteristics that affect a failure mode (see below criticality analysis) with a severity of 9 or 10 shall be reviewed to determine if they should become a critical characteristic.

- Critical Characteristic shall be denoted with /C\.

3.1.2.2 Significant Characteristic

Significant Characteristic is a product feature or dimension, where reasonably anticipated variation could affect principal fit, function, durability, customer satisfaction, or manufacturability. Any of those characteristics that affect a failure mode (see below criticality analysis) with a severity of 5 to 8 and an occurrence of 4 or higher must be reviewed to determine if they should become a significant characteristic.

- Significant Characteristic shall be denoted with /S\.

3.1.2.3 Requirements

Table 1 lists the Inmotion process requirements for Special Characteristics.

	Critical characteristics	**Significant characteristics**
Identification	/C\	/S\
Description	Regulation or safety Failure mode Severity 9-10	Functionality Failure mode Severity 5-8 with occurrence over 4
Process under statistical control Normally distributed	Cpk > 1,67 Electronic components Cpk > 1,67 Reported on control plan including appropriate frequency On-going Statistical Process Control Recorded & traceability request for 10Y GR&R <10%	Cpk > 1,33 Electronic components Cpk > 1,33 Reported on control plan including appropriate frequency On-going Statistical Process Control Recorded GR&R <30%
Process not under Statistical Control or Capability not achieved	100% Inspection or Automated Poka Yoke Inmotion approved action plan for achieving Process Control and Capability Recorded & traceability request for 10Y GR&R <10%	100% Inspection Action plan for achieving Process Control and Capability Recorded GR&R <30%

Table 1 – Process requirements for Special Characteristics

Supplier has to identify additional Special Characteristics beyond those defined by Inmotion coming from PFMEA or similar process risk analysis and must fulfill the above requirements.

3.1.3 Sample Status

The status level of sample is related to the maturity of the product development. Depending on the Development Readiness Level, expectations are different as indicated in Table 2: for A-sample and B-sample, evidence of fulfillment of dimension and function requirements is usually sufficient, while PPAP is required for C-sample and the production process is locked for D-sample and P-sample. All deliveries must be clearly identified with sample status.

Development Readiness Level	**Status**	**Purpose**
A-sample	Prototype	Key supplier evaluation
B-sample	Complete form, fit and function	Supplier Selection and tooling
C-sample	Parts from final tooling/process	Qualification of final tooling/process
D-sample	Qualified parts	Run at rate
P-sample	No changes without customer approval	Serial production

Table 2 – Sample status

3.2 Production Part Approval Process

Inmotion requires suppliers to complete our Production Part Approval Process (PPAP) prior to the serial production and serial delivery of new product, or any existing product subject to manufacturing/tooling, design, or process changes. The Inmotion qualification process mirrors the PPAP as published by AIAG. For more information please refer to the AIAG reference manuals in .

The purpose of the Production Part Approval Process is to demonstrate that all specifications and requirements are properly understood and that the supplier production process has the capability to sustain production of parts that always meet Inmotion requirements during an actual production run at the rate quoted to provide required volumes. All requested PQP documentation must be provided. The supplier shall demonstrate that the implementation and the sustainable use of these standard quality tools are part of the supplier normal operating processes

3.2.1 Supplier PPAP Process

- During the Request For Quotation, Inmotion presents the PPAP requirements;
- The PPAP submission is included in the supplier quotation, including lead-time for work products (e.g. documents) and deliveries;
- Inmotion orders the PPAP set to a target date for and eventual document partial delivery and final completion;
- Supplier submits PPAP documentation;
- Inmotion eventually approves the PPAP;

3.2.2 PPAP Requirements

The PPAP level shall be specified by the PO issued for samples, or tooling purchase. If the PPAP level is not specified, the supplier is to default to a Level 3 PPAP, or seek further clarification from the Supplier Quality Engineer (SQE). An example of the list of all required documentation for each PPAP level is shown in Figure 2. All Requested documentation must be submitted by the supplier and all labeling instructions are to be followed to ensure timely response on submitted samples.

	PPAP Submission Level Requirements	Level 1	Level 2	Level 3	Level 4	Level 5
1	Design Record	R	S	S	*	S
2	Engineering Change Documents	R	R	S	*	S
3	Customer Engineering Approval	R	R	S	*	S
4	Design FMEA	R	R	S	*	S
5	Process Flow Diagram	R	R	S	*	S
6	Process FMEA	R	R	S	*	S
7	Control Plan	R	R	S	*	S
8	MSA Studies	R	R	S	*	S
9	Dimensional Results	R	S	S	S	S
10	Material, Performance Test Results	R	S	S	S	S
11	Initial Process Studies	R	R	S	S	S
12	Qualified Laboratory Documentation	R	S	S	*	S
13	Appearance Approval Report	S	S	S	*	S
14	Sample Product	R	S	S	S	S
15	Master Sample	R	R	R	*	R
16	Checking Aids	R	R	R	*	R
17	Compliance with Customer Requirements	R	R	S	S	S
18	Part Submission Warrant	S	S	S	S	S

Level 1	Warrant and Dimensional Data (and for designated appearance items, an AAR) submitted to InMotion US
Level 2	Warrant with product samples and limited supporting data submitted to InMotion US
Level 3	Warrant with product samples and complete supporting data submitted to InMotion US
Level 4	Warrant and other requirements as defined by InMotion US
Level 5	Warrant with product samples and complete supporting data reviewed at the supplier's manufacturing location

R	The organization shall retain at appropriate location and make available to customer on request
S	The organization shall submit to the customer and retain a copy of records or documentation items at appropriate locations
*	The organization shall retain at appropriate location and submit to the customer upon request
	Supplier SHALL use InMotion US format for PPAP submissions

Figure 2 – PPAP requirement template from Inmotion US

The PPAP requirement template can differ from the Inmotion sites, but the PPAP requirements usually include:

- Process Flow Diagram;
- Process Failure Mode and Effects Analysis (FMEA);
- Control Plan;
- Measurement System Analysis Study/ Gauge Repeatability and Reproducibility;
- Dimensional results
- Material, performance test results
- Samples
- Initial Process Study;
- Material declaration
- Part Submission Warrant (PSW)

3.2.3 PPAP Approval

Serial production and serial delivery is not authorized before Inmotion PPAP approval. Upon supplier PPAP submission, Inmotion approves or rejects the PPAP by completing and signing the PSW:

- APPROVAL

Evidences of the fulfillment of Inmotion product and process requirements have been accepted and Inmotion authorizes the serial production and the serial delivery of the part.

- INTERIM APPROVAL (WITH DEVIATION)

The submission of evidences of the fulfillment of Inmotion product and process requirements has shown non-conformity which has been accepted and Inmotion authorizes the serial production and the serial delivery of the part only under the following conditions:

  - The non-conformity is defined, limited, understood and contained/mitigated;
  - An action plan to correct the non-conformity has been agreed between Inmotion and supplier, including a time schedule;
  - After the time limit or a maximum quantity, the supplier has to submit a new PPAP

- REJECTION

The requirement non-conformity, its mitigation or the corrective action plan is not accepted. Serial production and serial delivery is not authorized. New PPAP submission is required.

If further development or improvement is needed (improving Cpk, SPC, etc) additional action items will be documented when the PSW is returned to the supplier. It is the supplier's responsibility to complete action items and implement process improvements.

4 Inmotion Customer Specific Requirements

In addition to the specific product and process requirements (called "Part Specification") presented in the Request For Quotation or ECO Supplier, the following generic requirements apply.

4.1 Cleanliness

The parts shall be free from dust, production residues and other contamination. This requirement also includes the packaging.

4.2 Packaging

The inbound material packaging requirements are specified in [Ref 5].

4.3 Mechanics

4.3.1 Traceability and Labelling

- Process setup (e.g., machine parameters and programs) should be managed with change control (revisions).
- Traceability should exist for raw material batches.
- Recycling of raw material is only allowed if stated on Inmotion drawing.
- Tool revision, cavity number and manufacturing month should be visible on parts when applicable.

4.3.2 Test, Tools and Fixtures

- Test results should be logged and should be used in a process control system.
- The supplier shall maintain and calibrate the equipment, independent if Inmotion owns it or not.
- Independent of ownership, it's the supplier's responsibility to take appropriate measures if, for example, a tool is close to end of life or a fixture become a capacity bottleneck.

4.3.3 Handling of Parts and Products

- Gloves should always be used when handling mechanical parts that will conduct current (typically all surface treated parts, some pure aluminum parts).
- The parts and products should only by handled in an environment that is in good order and tidy, free from any risk of mechanical damage

4.4 PCB

- Inmotion requirements for PCB are defined in [Ref 8].
- Engineering Questions shall be submitted to Inmotion Supplier Quality Engineer.

4.5 PCBA

- Inmotion requirements for PCBA are defined in [Ref 7].
- The soldering processes shall fulfill acceptance criteria according to IPC 610 class 2 if nothing else is specified.

4.5.1 Process Control and Traceability

- Process setup (solder paste machine parameters, solder profile, AOI setup, fixtures, test parameters, etc) shall be managed with change control (revisions).
- Verification of incoming components must be based on original labels when assigning in-house part numbers to component reels.
- Bar Code Reading should be used when loading assembly machines to verify correct setup.
- Traceability should exist for components so e.g., reels can be traced to serial numbers on PCBA. This is especially important for critical components as e.g., processors and power transistors.
- Individual serial numbers should be assigned to each board as early as possible, preferably at the first operation (screen print). Each serial number should be tracked on the assembly line (manufacturing time stamp).
- Process steps as AOI, X-ray and other tests, should have test results logged by serial number. It should not be possible to start the next process step on a unit that has not passed the previous step.
- Touch up and repair work should be tracked by serial number and actions.
- In-line Solder Paste Inspection (SPI) is mandatory
- Automated Optical Inspection (AOI) is mandatory, including:
- Active analysis and improvement of AOI process/program
    - 100% of the PCBA and 100% of the SMT positions shall be inspected in 3D-type AOI able to detect presence, orientation and alignment of component, open and short circuits, as well as quality of solder joint
    - 100% of the PCBA and 100% of the THD positions shall be inspected in AOI able to detect component orientation and quality of solder joint
    - An AOI test coverage report is required. The report shall contain for each component position a status for each detection mode (i.e. presence, orientation, alignment etc.)
    - The AOI should be regularly re-validated
- Repair work shall be performed by trained personnel and with controlled soldering temperatures.

4.5.2 Test and Fixtures

- Generally, an in circuit test (ICT) and a functional test (FCT) is designed by the supplier, based on a test specification from Inmotion and a P-FMEA done by the supplier.
- The supplier shall provide evidence that the test equipment fulfils the test specification.
- Test results shall be logged by serial number and should be used in a process control system.
- Inmotion shall have access to "serial number tested and passed"-data updated daily to preclude defective or non-tested PCBA from being used in its own production, according to REF
- The supplier shall maintain and calibrate equipment according to an agreed plan, independent of whether Inmotion owns it or not.
- The test equipment including software must be documented to enable maintenance and improvements.
- Independently of ownership, it's the supplier's responsibility to take appropriate measures if, for example, a tool is close to end of life or a fixture become a capacity bottleneck.

4.5.3 Handling of Parts and Products

- The facility shall have an ESD protection and a process to regularly ensure adequate ESD protection.
- Gloves should always be used when handling PCBA's and PCBA components.
- The parts and products should only by handled in an environment that is in good order and tidy, free from any risk of mechanical damage
- Lesson learned: some chemicals used by some PCBA manufacturers are aggressive on some PCBA components. E.g., it is forbidden to use Miele Neodisher Protech 9 and Miele Neodisher N

4.5.4 Bill of Material and Part Specifications

- The Supplier BOM should be verified with Inmotion original BOM before production starts.
- How to interpret Inmotion BOM's: see [Ref 1].
- Where an "open source" component is specified (no specific manufacturer, to be selected by supplier), the RoHS, REACH and SVHC requirements shall still be fulfilled
- Spot market components: Inmotion requires specific procedure for spot market components as defined in [Ref 6].

4.5.5 Key Performance Indicators

- Inmotion requires from EMS monthly Yield report (information about yield and defects from EMS factory).
- Supplier should use DPMO according to IPC 7912A/9261A

5 Serial Production Quality Assurance

5.1 Change Control

Improvements are changes. Improvements should be implemented without unnecessary delay, but without losing traceability. Therefore the supplier is expected to have an efficient process to handle improvements and changes.

Depending on the type of change the supplier is expected to request approval (before implementing), inform (before implementing) and maintain traceability on when the change was implemented. Inmotion can only give an acceptance to verified changes. A guideline to when approval is requested and when informing is sufficient is provided in Table 3.

TYPE OF CHANGE (list non-exhaustive)	Request Approval	Inform	Maintain Traceability	Do nothing
Change of raw material	X		X	
Location of manufacturing equipment (within facility)		X	X	
Location of manufacturing equipment (different facility)	X		X	
Type of machine, tool or process used to manufacture or assemble the product	X		X	
Change of supplier		X	X	
Change in the process at your supplier (supplier/manufacturer specified by Inmotion)		X	X	
Change in the process at your supplier (open source)			X	
Changes in staff rotation				X
Additional tooling/Complete replacement/Complete refurbishment of existing tooling	X		X	
Change of revision of software in production equipment			X	
Change of process parameters			X	
Change in product specification	X		X	

Table 3 – Inmotion approval requirement for changes

Inmotion or the supplier can initiate an Engineering Change Request (ECR) at any time. When an ECR is issued by Inmotion, the supplier will review the request and report the impact of the requested change to Inmotion within 5 business days. A possible Engineering Change will be negotiated between the supplier and Inmotion. If accepted by both parties, an Engineering Change Order (ECO) will be issued by Inmotion prior to implementation of the change.

Claims on cost for excess material caused by ECO shall be solved within a month after implementation.

All supplier initiated changes shall be communicated by sending an e-mail to qbox.sth@evs-inmotion.com.

Any change will imply a new Production Part Approval Process, see chapter 3.2.

5.2 Request For Deviation

A supplier may, if absolutely needed, request an approval for deviation from the specification by sending a well-motivated "Request for deviation" to Inmotion. A time-limited approval may be given if the customer is protected.

5.3 Defective Parts

All defective parts will be registered and returned to the supply chain in order to define problem, investigate root-cause and implement sustainable countermeasure, according to following process:

1. A defective part, independent of where it is detected (receiving inspection, production line or in the field), is registered in Inmotion PLM system "RMA Central" as a RMA-line in order to track individual units, connect them to a problem description (PD), root cause (RC) and a counter measure (CM). Quality statistics are extracted from "RMA Central" (see supplier score card);
2. If the Problem Description is new, a Quality Issue is opened in order to collect data and track progress (PD, RC, CM). If the Root-Cause may have occurred at a supplier, the supplier is requested to participate in the PDRCCM work. Preferred format for supplier's documentation is called a Supplier Investigation Report (SIR), see appendix A.
3. Inmotion sends an RMA-request to return the defective part for analysis and credit;
4. The supplier issues a RMA reference to track the return of the defective part;
5. The defective part is returned to the supplier to enable PDRCCM;
6. The supplier issues a credit note referring to the RMA-number;
7. Inmotion Supplier Quality Engineer monitors progress of each issue daily at Q-pulse (Asa-Ichi) meeting, with management participation;
8. The Quality Issue is closed when RC is identified & CM is implemented and verified – not before. If RCCM cannot be found and implemented within a reasonable period of time, samples of defects must be stored for future investigation. A Quality Issue can never be closed without RCCM.

Notes:

- If a defect is caused by a third party component (especially for electronic components on PCBA) the components should be returned to manufacturer for analysis.
- The ZAPI Cost Of Poor Quality policy stipulates that for all quality issues under the supplier responsibility, the final total costs generated by non-compliance items will be reported periodically in detail for each individual claim, see chapter 1.5.3.

6 List references

Reference		Number/link
[Ref 1]	How to interpret PCBA BOMs	1P129121
[Ref 2]	The Automotive Industry Action Group (AIAG) PPAP manual	Available at http://www.iatfglobaloversight.org
[Ref 3]	Zapi General Terms and Conditions	
[Ref 4]	Logistics questionnaire	
[Ref 5]	Packaging requirements	1P128398
[Ref 6]	ZPSF-2014-0002 - Incoming Inspection for spot market supplied elettronic material - REV02.pdf	
[Ref 7]	ZPSF-2017-0006 - Technical Specification PCBA - Rev01.docx	
[Ref 8]	ZPSF-2017-0007 - Technical Specification PCB - Rev01.docx	
[Ref 9]	ZAPI Quarterly Score Card	
[Ref 10]	Supplier Investigation Report	

Table 4 – References