Supplier Handbook

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Supplier Handbook

About this document

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

This document is an enclosure to the organizations supplier agreements. If any contradictions occur between this document and an agreement between the parties, the agreement will always have precedence.

Content

1 General

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 defects is a culture of not accepting any faults and continuously striving for perfect results.

1.2 Kaizen

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.

1.3 Problem solving

When problems occur the following steps must be completed and documented with sense of urgency to quickly correct issues and enable the organization 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)**.

Appendix A 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.

1.4 Lean

1. The organization believes it is mutually beneficial for all parties to utilize the following lean principles.
2. The ultimate supply chain uses one piece flow from point of origin to the end user.
3. 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.
4. Visual management should be used to monitor performance, demonstrate the ability of processes to achieve planned results and support communication among employees and management.
5. Inventory should be minimized because it negatively affects both Quality and Cost. Excess inventory hides the root cause of Delivery problems.
6. Orders should be based on a pull system (kanban).
7. Lead times and order quantities should be minimized.
8. Use 5S. Keep work areas clean. Visual management should be used to assure that only needed parts and tools are in work places.
9. Use Poka yoke (mistake-proof).

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

1.5 Key performance indicators

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

1. First pass yield (FPY), per operation when applicable
2. Out of box quality (OOB)
3. On time delivery (OTD) versus request date
4. Paynter charts, i.e., CM implementation and Defective part production dates on a time axis
5. CpK monitoring of Test parameters (in conjunction with SPC)
6. DPMO according to IPC 7912A/9261A (for PCBA)
7. Pareto diagrams of major issues
8. 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 the organization whenever requested.

The organization measures supplier Quality, Delivery and Cost performance and shares it with suppliers.

1.6 Co-operation

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.

The organization 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.

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

1.7 Supplier portal

In the Supplier portal, the organization communicates documentation for part-design and manufacturing-process control. All suppliers that receive login information from the organization shall use the portal to communicate these critical documents. These suppliers are expected to log into the portal and update the currently active documents. All documents uses life cycle management, which makes is possible to release documents (active) and make them obsolete (inactive). The supplier will find the following information in the Supplier portal:

1. **Process requirements –** Includes all documents with specific manufacturing process requirements that are requested to be active at supplier. The supplier is requested to publish evidence of process implementation, within the supplier portal. The evidence should be kept together with the active control document with the same document number.
2. **ECR/ECO –** Includes all documents with specific product requirements changes that are requested to be active at supplier. The supplier is requested to publish evidence of process implementation that fulfills the requirement. The evidence should be kept together with the active control document with the same document number.
3. **FMEA/control-plan/Flow-chart –** Includes all documents with specific product requirements that are requested to be active at supplier.
4. **SIR –** Includes all corrective action reports communicated with supplier. The supplier is requested to upload a SIR document on the communicated document number.
5. **Meeting Action list –** Share place for meeting minutes between organization and supplier.

Prerequisite to log into the supplier portal is an agreed VPN access and Enovia user account. This is requested and communicated by the organizations supplier quality engineer.

Suppliers without access to supplier portal, shall communicate all changes by sending an e-mail to qbox.sth@evs-inmotion.com.

2 Quality

2.1 Quality targets

Zero defect attitudes! Lack of Quality is a Delivery risk and a Cost driver. Targets should be set in cooperation with the organization. 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

2.2 General and other standards

The Supplier shall have and maintain a quality system conforming to at least the requirements set out in ISO 9001:2008 or an equivalent quality system. The supplier should be developing processes consistent with the basic philosophies in ISO/TS 16949.

The Supplier should have and maintain an environment management system, conforming to at least the requirements set out in ISO 14001:2004 or an equivalent quality system.

2.3 Part qualification

Before the first delivery after a new or changed product specification or manufacturing process, a first article inspection report (FAIR) should be submitted by the supplier. The purpose is to demonstrate that all engineering, design and specification requirements are correctly understood, accounted for, verified and documented *prior* to delivery of parts.

The purpose of the Part Qualification Process (PQP) is to demonstrate that all specifications and requirements are properly understood and that the process has the capability to sustain production of parts that meet requirements during an actual production run at the rate quoted to provide required volumes. All requested PQP documentation must be provided. (More information about the tools can be found in [Ref 3]). The following are examples of documentation that can be required:

- Process Flow Diagrams;
- Process FMEA;
- Control Plan;
- Measurement System Analysis Study/ Gauge Repeatability and Reproducibility;
- Initial Process Study;
- Part Submission Warrant (PSW)

The PQP process can be seen as a formalized process for the obvious need: it must be demonstrated that the supplier can implement and sustain use of these standard quality tools as part of their normal operating process.

The organization and supplier will work together to create a part qualification schedule identifying when work products (e.g. documents) and deliveries are to be completed.

After a part is qualified for use in volume production, additional activities may be required to validate stable capable processes (e.g., SPC, adequate Cpk values). The underlying philosophy is to reduce dependence upon final inspection through process control.

2.4 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. The organization can only give an acceptance to verified changes. A guideline to when approval is requested and when information is enough is provided in the Table 1 below.

TYPE OF CHANGE	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 1 Organizations approval requirement for changes.

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

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

For suppliers subscribed to the organizations supplier portal, changes proposed by the organization are communicated through the Supplier portal, see 1.7.

2.5 Defective parts

All defective parts should be registered, returned to the source of the defect, root cause defined and countermeasure implemented.

The organization's process in general (suppliers should have a corresponding process):

1. A defective part, independent of where it is found (receiving inspection, production or in the field), is registered in our "RMA Central".
2. "RMA Central" is used to track individual units, connect them to a problem description (PD), root cause (RC) and a counter measure (CM). Quality statistics for the frequency of defects and the timeliness of responses are maintained (e.g., a Paynter chart with production dates, return dates, CM implementation dates, etc.).
3. If the PD is new, an issue is opened in Mantis (issue handling system) to assign an owner, collect all data, track progress (RCCM), and etc.
4. If the RC may be at a supplier, the supplier is requested to participate in the RCCM work. Preferred format for supplier's documentation is called a Supplier Investigation Report (SIR), see appendix A. SIR will be communicated through the "Supplier portal", see 1.7
5. The defective part is returned to the source to enable RCCM
6. Ensure defective part is paid by the source, normally done by deducting payment upon receipt of RMA-number from the supplier
7. Monitor progress of each issue daily at Q-puls (Asa-Ichi) meeting, with management participation.
8. Close issue when RC is identified & CM is implemented and verified – not before.

Note:

1. If RCCM can't be found and implemented within a reasonable period of time, samples of defects must be stored for future investigations – "BAG &TAG". A Q-issue can never be closed without RCCM.
2. The supplier should inform the organization about problems, even if the organization is not directly affected, e.g., perhaps a similar problem has been solved at another production location.
3. If a defect is caused by a third party component (especially for PCBA components) the components should be sent to manufacturer for analysis.

2.6 Environmental requirements and substances of concern

The organization aims to minimize its environmental impact by focusing on the material content of its products and CO_2 emissions.

In support of this aim; the organization expects suppliers, to:

1. Understand how their businesses and products impact the environment.
2. Know and comply with federal, state, and local regulatory requirements.
3. Notify the organization of any significant environmental compliance violations.
4. Stay current with global classifications of hazardous substances.
5. Understand the requirements for registration of substances and how these requirements apply to your products.
6. 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/
7. Provide information on substances on the Substances of Very High Concern (SVHC) "Candidate List" within products supplied to the organization.
   For more information about the REACH regulation see: http://echa.europa.eu/home_en.asp
8. Notify the organization immediately if SVHCs are discovered in your products.
   Note; the SVHC list is updated regularly.
9. Supplier shall not deliver any products containing substances with higher weight-percent, defined by RoHS, REACH and GADSL, unless agreed with the organization.

10. The organization shall not be regarded and will not act as an importer under REACH. Therefore suppliers outside of EU who deliver to the organization within EU shall point out an Only Representative within EU.
11. Suppliers are responsible to assure implementation of theses requirements through their supply chain.
12. Suppliers must be able to report on their environmental work, including organization, fulfillment of legal demands, and environmental results.
13. Environmental-related data from production, products and transport and must be available upon request for the organization to enable environmental assessments (for example Life Cycle Assessment).
14. Suppliers should consider recycled/recyclable materials when selecting materials and design solutions.
15. Any deviations must be documented by the supplier and reported to the organization for approval.
16. Suppliers are requested to have a conflict minerals program in place.

2.7 The organization's 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.

3 Delivery

We believe that improvement in logistics is an enabler for growth and profitability. Profitability and increased revenue are enabled by:

- World class on time delivery
- Low cost of capital through low inventory levels
- Minimized cost and waste by being lean throughout our processes

1. On time delivery target >98% versus request date.
2. On time delivery target =100% versus commit date.
3. Lead time, for volume deliveries < 5 days from order to shipping.
4. Minimum order quantity equivalent to one week demand
5. On time deliveries from our suppliers are essential to avoid production disturbances and to meet commitments towards customers.
6. Each month the organization will provide the Supplier with a rolling forecast for the following 12-month period,
7. 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 expectations on our suppliers.
8. 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 the organization expects an engagement to reach 100% versus request date.
9. The request-date on the Organization's purchase order is the date when the goods shall be delivered at the Organization's facility (also called the dock-date)
10. 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.
11. 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.
12. If the Supplier can not meet it's obligations concerning deliveries, the Supplier is responsible to make express deliveries at its own cost to minimize the impact of the delay.
13. 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.
14. Information about last time buy (LTB) for parts should be forwarded to the organization without delay by sending an e-mail to qbox.sth@evs-inmotion.com.

3.1 Packaging

1. Preferred transport packaging: EUR-pallets, not higher than 75cm or three collars, max weight 700kg, easy to remove and can be unpacked in production area without re-packing.
2. The packaging should be mutually agreed upon in a similar manner as the part itself
3. Packaging must take into account the part characteristics and protect the part from being damaged during transportation.
4. For parts that are unpacked in the organization's production cell, e.g., PCBA, the packaging must be suitable for the production cell.
5. Packaging material that can generate ESD should in general be avoided. For parts that are to be stored in an ESD protected area, that kind of material cannot be used. E.g., plastic and Styrofoam generate ESD, and Cardboard packing material must be non ESD-generating.
6. For PCBA: All plastic bags inside box must at least be non ESD generating material ("pink polly"). Outer plastic bag must be a metallic shielding ESD-bag.
7. A supplier that is responsible for planning and choosing packing materials for products delivered to the organization should do it in such a way that the total environmental impact is minimized.

4 Cost

Cost improvement target:

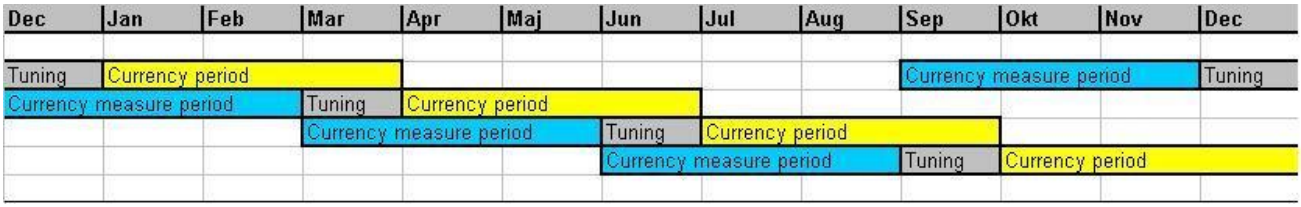
- Year-over-year total cost improvements of 5% or higher. Cost improvements can be in any area associated with the fulfillment of the requirements including design, raw materials, freight, etc. If year-over-year cost improvements equal less on average, the supplier will participate, as requested, in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

Pricing, preferred principals

1. "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 and gross profit, etc.
2. Shipping cost to the organization's plant to be stated separately.
3. The currency content (%) per part defined
4. Raw material content (%) per part defined
5. Packaging: All prices must include all product packaging based on product requirements and all packaging for shipping product to the requested ship to location.
6. Price effect due to different ranges of annual volume (Rolling12 months) should be stated on request.

Currency fluctuations and Raw material surcharges

1. Base prices are calculated yearly using rates set by an independent source selected by both parties. Purchase order price does not change during the year due to FX or raw material. Fluctuations shall be handled separately each month.
2. Example of model to use:



Other

1. We often have significant volume on a product family, but limited volume on some products in the family. Since the products mainly are equal, price leverage is expected also on the low volume products.
2. Claims on cost for excess material caused by ECR/ECO shall be solved within a month after implementation.

5 Specific expectations and requirements

5.1 Design reviews 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.

5.2 Mechanics

5.2.1 Traceability and labelling

1. Process setup (e.g., machine parameters and programs) should be managed with change control (revisions).
2. Tool revision, cavity number and manufacturing month should be visible on parts when applicable.
3. Traceability should exist for raw material batches.

5.2.2 Test, tools and fixtures

1. Test results should be logged and should be used in a process control system.
2. The supplier shall maintain and calibrate the equipment, independent if the organization owns it or not.
3. 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.

5.2.3 Handling of parts and products

1. Gloves should always be used when handling mechanical parts that will conduct current (typically all surface treated parts, some pure aluminium parts).
2. The parts and products should only by handled in an environment that is in good order and tidy, free from unnecessary things
3. The flow, markings, signs and label should clearly separate untested, passed and failed parts.

5.2.4 Bill of material and part specifications

1. TBD.

5.2.5 Other lesson learned

1. Reuse of raw material is only allowed if stated on the organizations drawing.

5.3 PCBA and box build

5.3.1 Traceability and labelling

General

1. Process setup (solder paste machine parameters, solder profile, AOI setup, test parameters, etc) should be managed with change control (revisions).

Incoming material

1. Verification of incoming components must be based on original labels when assigning in-house part numbers to component reels.
2. Bar Code Reading should be used when loading assembly machines to verify correct setup.
3. 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.
4. Traceability should exist on critical PCB panel layouts (e.g., IMS-boards on one panel should be individually numbered so that location on panels can be traced).

In process

1. Serial numbers should be assigned to each board as early as possible, preferably at the first operation (screen print).
2. Each serial number should be tracked on the assembly line (manufacturing time stamp).
3. Process steps as AOI, X-ray and other tests, should have test results logged by serial number.
4. It should not be possible to start the next process step on a unit that has not passed the previous step.
5. It is preferable to process PCBA in serial number ascending order.
6. Touch up and repair work should be tracked by serial number and actions.

5.3.2 Test and fixtures

1. Normally an in circuit test (ICT) and a functional test (FCT) is designed by the supplier, based on a test specification from the organization and a P-FMEA done by the supplier.
2. The supplier shall provide evidence that the test equipment fulfils the test specification. Also see 2.3.
3. Test results shall be logged by serial number and should be used in a process control system.
4. The organization should 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.
5. Test data should be easily accessible by serial number.
6. The supplier shall maintain and calibrate equipment according to an agreed plan, independent of whether the organization owns it or not.
7. The test equipment including software must be documented to enable maintenance and improvements.
8. The tests are part of the process; therefore they should be handled according to 2.4.
9. 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.

5.3.3 Handling of parts and products

1. The facility shall have an ESD protection and a process to regularly ensure adequate ESD protection.
2. Gloves should always be used when handling PCBA’s and PCBA components.
3. The parts and products should only by handled in an environment that is in good order and tidy, free from unnecessary things
4. The flow, markings, signs and label should clearly separate untested, passed and failed parts.

5.3.4 Bill of material and part specifications

1. The Supplier BOM should be verified with the organization’s original BOM before production starts.
2. How to interpret the organization’s BOM’s: see [Ref 1]’
3. The work should be done according to IPC 610 class 2.

5.3.5 Other lesson learned

1. 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.
2. Repair work should be performed by trained personnel and with controlled soldering temperatures.

5.4 Counterfeit - Pirated/imitation parts

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

5.5 The organization's equipment

The Supplier may from time to time use and keep product-specific equipment owned or leased by the organization. Such equipment shall be kept on behalf of the organization 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 the organization. The equipment shall be kept safely and properly. The Supplier shall maintain and service the equipment and insure the said equipment. The supplier should keep a register of the equipment and regularly report to the organization.

5.6 Sub-suppliers

The Supplier is fully responsible for sub-suppliers, even if the organization originally selected them.

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

5.7 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 the organization. A time-limited approval may be given if the customer is protected.

6 References

#.	Name	Number/Ref.	Rev
[Ref 1]	How to interpret PCBA BOMs	1P129121	
[Ref 2]	The Automotive Industry Action Group (AIAG) PPAP manual		
[Ref 3]	Enovia supplier user manual.doc	1P110822	

7 Document Revision & Definitions

7.1 Abbreviation

Abbreviation	Description
BOM	Bill of material
CM	(sustainable) counter measure
DBS	Danaher Business System
dpm	defects per million
DPMO	defects per million opportunities
ECO	Engineering change order
ECR	Engineering change request
EMS	Electronic manufacturing supplier
FPY	First pass yield
OOB	Out of box
OTD	On time delivery
PCBA	Printed circuit board assembly
PPAP	Production part approval process, see [Ref 3]

Abbreviation	Description
QDC	Quality, delivery, cost
RC	Root cause
RFQ	Request for quotation
RMA	Return Material Authorization
SIR	Supplier investigation report
SOC	substances of concern
SPC	Statistical process control

7.2 Revision history

Revision No	Revision Change	Date
Rev 7	Updated after review, several minor changes	2011-05-02
Rev 8 & 9	Introduced “Supplier portal” Updated “Change control chapter” Renamed PPAP to PQP	2014-10-31
Rev 10	Chapter 2.6 updated will bullets 9 and 16.	2015-05-08

8 Appendix A – Supplier Investigation Report