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|---|---|
| **Title:** | Supplier Quality Requirements |

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|---|---|
| **Revision:** | v7.0 |
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# List of changes

| Date | N° Rév. / Rev. # | Description (English) |
|---|---|---|
| 2013-05-27 | V6.0 | Business orientation changes for suppliers due to corporate changes at TM4 Added this list of changes<br>Major changes to structure and content of this document as follows:<br>New paragraphs added: 1, 8, acknowledgement form, 10.6,11, 12, 30.2, 39,40.1, 42.1, 42.2<br>Some changes and corrections made in paragraphs: 2, table 4, 10, 10.1, 10.2.1, 10.2.2, 10.2.3, 10.3, 14.1, 19.2, 22, 27, 27.1, 28, 38.<br>Modification in table 5 and 6.<br>Removed the sourcing process section. |
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# SECTION 1: SUPPLIER QUALITY PROGRAM

## 1 Introduction

This new version of this Supplier Quality Requirements Manual has been reformatted to make it easier for TM4 suppliers to use and understand. It is now reorganized in 3 main sections:

- Description of the TM4 supplier quality program.
- General quality requirements applicable to all suppliers (including small volume suppliers).
- Advanced quality requirements for production suppliers/partners.

## 2 Responsibility of suppliers

This manual defines the minimum quality requirements for TM4 suppliers to ensure that the product complies with TM4 customers', regulatory and safety requirements.

It is the responsibility of each supplier to comply with the requirements of this document and associated documents referred to throughout the text unless a special agreement is made between the TM4 SQA coordinator and the supplier.

The supplier shall reference the number and revision of this document on all purchase orders sent to subcontractors.

### 2.1 TM4 business priorities

- **Safety**
  It is of the utmost importance for TM4 that products perform reliably and safely. Product safety must therefore be the highest priority throughout the complete supply chain. TM4 will include suppliers' focus on safety management in our evaluation of suppliers based on the criticality of the supplied parts.

- **Financial performance**
  Our total acquisition costs and profits must be globally competitive to be a market leader and to provide acceptable value.

- **Quality**
  The most important task of the supplier is quality; we strive as a team to have a Zero Defect Strategy for our products and associated information and we will take all necessary measures to achieve this objective.

- **On-time delivery**
  We are committed to delivering our product and services on time to enable our internal & external customers to meet their commitments.

- **Service**
  We will be responsive, cooperative and effective in meeting the needs of our customers.

TM4 requires that all its suppliers and partners understand, adhere to and integrate these priorities when doing business with TM4.

# 3 Normative references

It is the responsibility of our suppliers to ensure that they are working with the latest version of the specifications and purchase order requirements referenced within TM4 requirements documents and that they obtain copies of the specified non-TM4 documents. These documents include, but may not be limited to, the following:

**Table 1** External normative reference source information

| Standards | Available from |
|---|---|
| ISO standards:<br>ISO 9001<br>ISO 17025<br>ISO 14001<br>ISO 26262<br>ISO 1940-1<br>ISO-1940-2<br>ISO 10012<br>ISO-IEC Guide 25<br>ISO 2859/1<br>ISO 898-1<br><br>CSA W59<br>CSA W47.1<br>CSA W47.2 | **Canadian Source**<br>Standard Council of Canada<br>270 Albert Street, suite 200<br>Ottawa, Ontario<br>K1R 6N7<br>www.scc.ca<br>**American Source**<br>American National Standards Institute<br>25 West 43nd Street, 4th floor<br>New York NY 10036 USA<br>www.ansi.org<br>**European Source**<br>ISO – Secrétariat central<br>1, ch. De la Voie-Creuse<br>CP 56<br>CH-1211 Geneva 20<br>Switzerland<br>www.iso.org |
| SAE specifications:<br>SAE J1739 | Society of Automotive Engineers<br>400 Commonwealth Drive<br>Warrendale, PA 15096-0001 USA<br>www.sae.org |
| ANSI specifications:<br>ANSI Z540-1<br>MIL-STD-45662 | American Society for Quality<br>600 N. Plankinton Ave / P.O. Box 3005<br>Milwaukee WI 53203-3005 USA<br>www.asq.org |
| AWS specifications: | American Welding Society<br>550 N.W. LeJeune Road<br>Miami, FL 33126 USA<br>www.aws.org |
| AIAG specifications:<br>TS16949<br>CQI-9<br>CQI-11<br>CQI-12 | Automotive Industry Action Group<br>26200 Lahser Road, suite 200<br>Southfield, MI 48033-7100 USA<br>www.aiag.org |
| Other:<br>ASTM E10-07<br>ASTM E18-07<br>ASTM B26<br>ASTM B108<br>ASTM B85<br>ASTM E94<br>ASTM E155 | ASTM Intl<br>100 Barr Harbor Drive<br>P.O.Box C700<br>West Conshohocken<br>PA 19428-2959 USA<br>www.astm.org |
| IPC | Association Connecting Electronics Industries<br>3000 Lakeside Drive, 309S<br>Bannockburn<br>IL 60015 USA<br>www.ipc.org |

**Table 2** TM4 normative reference sources

| Reference | Title |
|---|---|
| TM4 APQP toolkit | |
| TM4 PPV toolkit | |
| AC-5006 | Approved sources list |
| AC-5011B | Supplier certificate of conformance |
| AC-5012B | Supplier self-assessment |
| AC-6013E | All material supplier barcode & label requirement |
| IN-6024E | Mechanical parts identification |
| IN-6035E | Engineering instruction - ESA |
| SQ-5015E | Non-disclosure agreement |
| SQ-5020B | Corrective action report |
| SQ-5021B | Request for deviation |
| SQ-5024B | Quality control plan |
| SQ-5025B | Part submission warrant |
| SQ-5033B | Product quality planning summary and approvals |
| SQ-5036B | Team feasibility commitment |
| SQ-5037B | Initial risk evaluation checklist |
| SQ-5038B | Manufacturing flow diagram |
| SQ-5040B | Failure mode and effects analysis (FMEA) |
| SQ-5043B | First article inspection report (FAI) |
| SQ-5044B | Appearance approval report |
| SQ-5046B | ELV/IMDS data report |
| SQ-5048B | Production tooling cost breakdown |
| SQ-5051B | Inspection request |
| SQ-5053 | Engineering change request |
| SQ-5058B | Dimensional inspection report |
| SQ-6013B-001 | ELV/MSDS |
| SQ-6013B-002 | Product inspection |
| SQ-6013B-003 | Product preservation |
| SQ-6013B-004 | Part and process validation (PPV) |
| SQ-6013B-005 | First article inspection (FAI) |
| SQ-6013B-006 | Appearance and graining validation |
| SQ-6013B-007 | Direct part marking and tracking system |
| SQ-8005B | Visual inspection and cleanliness of products |

# 4 Definitions, acronyms and abbreviations

The words “shall” or “must” indicate a mandatory requirement.

The word “should” indicates a mandatory requirement with some flexibility allowed in the method of compliance.

**Note**: A supplier choosing other approaches to satisfy a “should” must be able to show that their approach meets the quality requirements of this document.

**Table 3** Acronyms and abbreviations

| Item | Description |
|---|---|
| AIAG | Automotive Industry Action Group |
| APQP | Advanced Product Quality Planning |
| CAD machine control | Computer-Aided Design machine control |
| CAM machine control | Computer-Aided Manufacturing control |
| CFC | Certificate of Conformance |
| CMM programs | Capability Maturity Model programs |
| CNC machining programs | Computer Numerical Controlled machining programs |

| Item | Description |
|---|---|
| Cpk | Process capability ratio |
| CSA | Coating System Assessment |
| CSC (critical) | Critical Safety Characteristic |
| CWB | Canadian Welding Bureau |
| ELV/IMDS | End-Of-Life Vehicle/ International Material Data System |
| FAI | First Article Inspection |
| FMEA | Failure Mode and Effects and criticality Analysis |
| F/N | Factory Number |
| FPI | Fluorescent Penetrant Inspection |
| ID | Identifier |
| IGBT | Insulated Gate Bipolar Transistor |
| IPC | Formerly the Institute for Interconnecting and Packaging Electronic Circuits, now the Association Connecting Electronics Industries, a standards body for the electronics industry. |
| JV | Joint Venture |
| MKC (major) | Major Key Characteristic |
| MOS | Manufacturing Operation Sheet |
| MRB | Material Review Board |
| MSA | Measurement System Analysis |
| NADCAP | National Aerospace and Defense Contractors Accreditation Program |
| NDT | Non-Destructive Testing |
| NIST | National Institute of Standards and Technology |
| PFMEA | Process Failure Mode and Effect Analysis |
| P/N | Product Number |
| PO | Purchase Order |
| Poka-Yoke | Mistake-proofing process |
| PPV | Production Part Approval Process |
| PPM | Parts Per Million |
| PRI | Performance Review Institute |
| PSA | Plating System Assessment |
| RPN | Risk Priority Number |
| RTS | Review of Technical Specifications |
| Rx | Radiographic examination |
| R&R | Repeatability and Reproducibility |
| SCAR | Supplier Corrective Action Resolution/Request |
| S/N | Serial Number |
| SPC | Statistical Process Control |
| SQA | Software Quality Assurance |
| QA | Quality Assurance |
| UI | Unique Identifier |
| Xbar&R control chart | Variable Control chart |
| 8D | Eight Disciplines Problem Solving |

## 4.1 Customer

The term "Customer" refers to TM4's prime customer.

## 4.2 Supplier

The term "Supplier" refers to the contractual part of TM4's suppliers and their subcontractors. In some cases, the supplier can also be the manufacturer.

## 4.3 TM4 partner

When a partner signs a license agreement with TM4, the partner shall ensure that quality control over their outsourced processes meets all TM4 requirements. The control over such processes does not absolve the partner and their subcontractors of the responsibility of

product conformity to all TM4 requirements. This includes costs incurred by TM4 as a result of non-quality or incidents including delivery disruptions.

### 4.4 Significant supplier

A significant supplier is one whose product or service (component, product sub-system, test bench or measuring equipment, etc.) could have an impact on final product quality

### 4.5 Identified preferred supplier

This is a significant supplier specially selected for a project with a unique product for system production OR this is a significant supplier specially selected for a project due to the uniqueness of their product in terms of our system production.

## 5 Default communication language

Unless otherwise specified, all quality documentation (inspection reports, CFC, etc.) shall be in English to ensure consistent communication through the supply chain. All other communication should be in French when possible.

## 6 General contact information

**TM4 inc.**
135 J.-Armand-Bombardier, suite 25
Boucherville (Québec) J4B 8P1
Tel: +1-450-645-1444
Fax: +1-450-645-1864
Website: www.tm4.com

**Table 4** TM4 quality representatives

| Contact name | Title | Email | Ext. |
|---|---|---|---|
| Guy Plouffe | Supplier Quality Assurance coordinator | guy.plouffe@tm4.com | 219 |

## 7 Non-disclosure agreement

The supplier must have signed a non-disclosure agreement with TM4 and the supplier is responsible for obtaining a similar agreement with his subcontractors. This requirement is not applicable for non-critical components. Verification of such agreement may be performed by TM4 at any time.

## 8 Supplier quality acknowledgement

The Supplier Quality Acknowledgement form (see Annex A) must be signed at parent company level and returned to the TM4 SQA Coordinator before any business arrangements between TM4 and the supplier.

**Note**: You will be contacted by TM4 if you are required to sign a new acknowledgement after major updates to this document; minor updates are covered by the original acknowledgement form.

# 9 Selection, classification and approval of suppliers

TM4 has developed a strategic selection, classification and approval system based on TM4 customer requirements, ISO 9001, TS16949 standards and regulatory requirements.

When applicable, or unless otherwise specified by TM4, the supplier shall be registered to ISO 9001, ISO 17025, and TS16949 by an accredited third-party certification body. Also, the supplier shall comply with the latest revision of ISO 14001 for the specific environmental requirements defined in this document. **A copy of the valid certification must be transmitted to TM4 by the supplier.**

## 9.1 Selection of supplier per product family

TM4 will select a main product family for each supplier. This will establish and ensure that the basic quality requirements applicable to its product family are met and followed. Complementary requirements may be defined for each specific product on the *SQ-5024B, Quality control plan* or the purchase order, if applicable.

**Table 5** Product families

| | | Basic Quality Requirements | | | | |
|---|---|---|---|---|---|---|
| | | QA system | CFC | Inspection report | Certificate | Compliant to ISO 14001 |
| Customer | When we buy a product from the customer to include in our product assembly | | X | | | |
| TM4 Drawing | All suppliers that manufacture or supply products from a TM4 drawing for an APQP level 2 min. E.g.: assy, machining, casting | X | X | X | X | X |
| Sub contract | All suppliers used to: perform external repairs; manufacture R&D parts only; or manufacture tooling | | | X | X (2) | |
| Distributor | All suppliers who buy products and parts for resale but do not manufacture them. E.g.: screws, gaskets, filters, etc. If a distributor is classified as Preferred, they will be evaluated in the same way as a production supplier highlighted here in yellow. | | | | X (1) | X (1) |
| Raw Material | Raw material supplier : electric wire, electronic components, IGBT, bar matl, insolation paper, etc | X (1) | | | X | X |
| Special Process | All special process suppliers: Heat treatment, paint, plating, balancing, Rx, FPI, Ultrasonic, Software and special production equipment, etc. | X (1) | | | X | X |
| Calibration / Lab | All external labs used for calibration and validation tests for our system | X | | | X | |
| Instruments | Suppliers who sell instruments | | | | X (2) | |
| Internal | For employee expense accounts | | | | | |
| Services | Maintenance, repair including parts, constructors, financial services, accounting, external HR services, consultants, etc | | | | | |
| Supplies | All purchased products that have no impact on our product | | | | | |
| Packaging | Delivery box Mfg, shipping matl, recycling, etc | | | | | X |
| Transport | | | | | | |
| Chemical Product | | | | | X (2) | X |

| | |
|---|---|
| | Catogory of supplier that needs to follow this AC-6011, Supplier Quality Requirement document |

**X : Basic Requirements**
**1: Required if the supplier is PREFERRED or CERTIFIED**
**2: Optional (Specific clauses on P.O.)**

## 9.2 TM4 supplier classification and approval

**Table 6** Supplier performance matrix and objectives

| | | | Certification | Quality | Delivery | GPR |
|---|---|---|---|---|---|---|
| PPV level 3 (Production) / PPV level 2 (pre-production) / Functional Prototype, Support or shared services | **Gold** | Certified | TS16949 | < 300 ppm | 100% /12 months | > 99.5 % |
| | **Silver** | Preferred | ISO 9001 min | < 5000 ppm | 95% / 12 months | > 95 % |
| | **Bronze** | Approved | Quality system in place | < 50000 ppm | 85% / 12 months | > 85 % |
| | **Yellow** | Conditional | | Data collection period | Data collection periods | > 70 % |
| | **Orange** | Probation | | | < 70% / 12 months | ≤ 70 % |
| | **Red** | Disqualified | | | | |

GPR (General Performance Rating)

### 9.2.1 Conditional supplier (current and new supplier under evaluation)

For any current or new supplier under evaluation, TM4 must receive a signed copy of the Supplier Acknowledgement for quality requirements (see Annex A). Any supplier who has any ISO 9001 certification may send a copy of the valid certificate with the Acknowledgement. After review, TM4 will assign a commodity and establish an appropriate level of approval.

### 9.2.2 Approved suppliers

For any current or new supplier, TM4 must receive an initial self-evaluation using the *AC-5012B, Initial new supplier evaluation* form. After review, TM4 will update the approval status.

This supplier approval level will be considered by TM4 in the selection of product purchase to accommodate TM4 development or to support or share services (no direct impact on the production of the product).

### 9.2.3 Preferred supplier (pre-production)

The supplier shall have at least a valid ISO 9001 or process specific certification. In the case of no certification, TM4 may give special approval based on acceptable quality method system (QMS) assessment evidence and a detailed action plan to fill the gap of requirements as defined in this TM4 document. This level of approval requires that the supplier meets all applicable requirements of Section 3 of this Supplier Quality Requirements including automotive techniques such as SPC, FMEA, MSA, PFMEA and PPV.

This status is required when PPV approval is required for TM4 drawings, raw materials and special processes specific to a product family supplier/manufacturer.

#### 9.2.4 Certified supplier (production)

The supplier shall have valid TS16949 certification. Also, a TM4 quality agreement or JV shall be signed.

This status is required when PPV level 3 approval is required for TM4 drawings, raw materials and special processes product family supplier/manufacturer.

This level will certify that the supplier has a self-inspection process in place that has been accepted by TM4. In this case, no receiving inspection will be performed at TM4.

#### 9.2.5 Supplier under probation

On experiencing issues with an approved supplier, TM4 will alert the supplier that they are on probation and must follow a corrective action plan in order to eventually have their approved status re-instated. If after 6 months of probation TM4 is not satisfied, the supplier may be disqualified.

#### 9.2.6 Disqualified supplier

After a decision by TM4 management, a supplier may be disqualified. In this case no further business will be possible between both parties.

### 9.3 Initial supplier evaluation and assessment

For a current or a new supplier requiring a quality assurance system evaluation as defined in paragraph 9.2.1 or when a major change in customer requirements occurs, an *AC-5012B, Initial new supplier evaluation* form must be completed by the supplier and evaluated by the TM4 SQA coordinator in order to be considered eligible for inclusion in the *AC-5006, Approved suppliers list*.

An on-site audit evaluation may be performed before approval or as required to ensure compliance with this requirement; to verify the quality assurance system, and specific product contract requirements; and/or to follow-up on previous corrective actions.

### 9.4 Access to supplier facilities

TM4 personnel shall have the right of entry to supplier facilities, access to personnel, procedures & records, quality-system documentation, and the right to verify product or service conformance with the purchase order requirements; including the authority to request corrective actions, product-validation evaluations or investigations.

### 9.5 TM4 approved suppliers list (AC-5006)

Any product, material or services used on final TM4 products must be purchased from suppliers on the *AC-5006, Approved suppliers list* unless otherwise authorized by TM4 in the *SQ-5024B, Quality control plan*.

The use of TM4 designated sources, including tool & gauge suppliers, does not relieve the supplier of the responsibility of ensuring the quality of the products purchased by TM4.

### 9.6 Responsibilities of suppliers with regards TIER 1 Suppliers

The supplier (Tier-1) must:

- Manage approval of TIER 2 process suppliers who have a direct impact on the TM4 product. TM4 reserves the right to directly assess Tier-2 process suppliers for verification. This assessment may include technical processes such as heat treatment, casting, balancing, welding, NDT, etc.
- Communicate TM4 requirements to their Tier-2 suppliers for the processes concerned.
- Be responsible for managing the instruction *SQ-6013-004, Part and process validation* for the PPV process of their Tier-2 supplier when applicable

IN ALL CIRCUMSTANCES, SUPPLIERS HAVE FULL RESPONSIBILITY FOR THE QUALITY ASSURANCE OF THEIR Tier-2 SUPPLIERS.

Once the product is PPV approved, requests for a sub supplier change that affects fit, form, function shall be directed to TM4 SQA through the *SQ-5021B, Request for deviation* form.

## 10 Supplier development of specially designated small suppliers

When an organization is so small as to not have adequate resources to develop a quality management system according to TS16949 or ISO9001, some specific requirements may be waived by TM4. The most important criteria that help us determine if a supplier can be defined as "small" are if the supplier:

- Is a TM4 local supplier;
- Manufactures batches of 50 pieces at a time;
- Will not be used for significant future production.

# SECTION 2: GENERAL QUALITY REQUIREMENTS
## APPLICABLE TO ALL SUPPLIERS

## 11 Mandatory general requirements

The requirements in Section 2 are applicable to all suppliers that manufacture products based on TM4 technical drawings: sub-contractors, raw material suppliers, or special processes, lab and chemical products that have a direct impact on the TM4 product.

If not already processed, the supplier must return the non-disclosure agreement and the supplier acknowledgement of quality requirements before participating in any business activity with TM4, unless otherwise agreed with TM4.

## 12 Purchase order & contract review

The supplier shall perform contract and record reviews to ensure that all relevant documentation, requirements and revisions are available and understood.

**VERBAL contractual agreements or instructions are not permitted.**

The TM4 buyers or SQA representative shall be contacted when:

- A specification on a document could result in a non-conformance.
- A lack of clarity or definition in a technical drawing or specification exists.

A purchase order acknowledgement must be sent back to the TM4 buyer.

Any change to quality or technical requirements a supplier wants to make on a quotation and/or purchase order shall be submitted to TM4 on an *SQ-5021B, Request for deviation* form.

## 13 Specific requirements for products under development

### 13.1 Quality control of prototype product

Specific quality control for a prototype product shall be defined by TM4's engineering department on a case-by-case basis and documented on the *SQ-5024B, Control Plan* for prototype product as required. These requests will be included as specific notes on the TM4 purchase order.

### 13.2 Tooling quality control

Unless specified in the purchase order or on the drawing, a material or special process certificate is not necessary for tooling quality control, but an *SQ-5058B, Inspection report* may be used.

## 14 Quality system requirements

The supplier shall have up-to-date documentation on their quality system and related policies to ensure compliance with the minimum quality requirements defined in this supplier quality manual.

If require by TM4, the quality manual shall be submitted to TM4 for review. Approval will ensure that the supplier is on the *AC-5006, Approved suppliers list*.

The personnel responsible for product quality shall have the authority to stop production, identify, segregate, evaluate quality problem and take necessary corrective actions. All production shifts shall have designated personnel with responsibilities for ensuring product quality.

### 14.1 Rejections

Materials, services or processes that do not conform to this specification may be subject to rejection.

## 15 Documentation and data control

The supplier shall control all documents and records relating to the purchase order, including technical drawings, specifications, engineering changes, work instructions, manufacturing processes, manufacturing operation sheets, scheduling and quality control plans, as applicable.

Corrections to work instructions or to documents during manufacturing must be recorded, dated and signed in ink. Once changes are made, authorized personnel must update the original data.

The supplier shall establish and maintain a control system for products supplied to TM4 to ensure proper distribution of all related quality documents. The system shall provide prompt removal of all superseded or obsolete documents. If superseded or obsolete documents are maintained for reference purposes, they shall be clearly identified to prevent their unauthorized use.

### 15.1 Document order of precedence

The order of precedence for documents is as follows:

- TM4 purchase order (last issued and acknowledged)
- TM4 technical drawings
- TM4 specifications
- Public specifications and standards

## 16 Record control and retention

The supplier shall maintain records of inspections, dispositions, test results and corrective actions to prove that these operations have been performed for a minimum period of ten (10) years or as specified on the purchase order. At the end of this period, records shall be offered to TM4 for retention before disposal in line with written instructions from TM4.

The supplier shall maintain complete records of traceability of serialized parts produced when serial numbers are required by technical drawings or purchase orders.

For non-serialized parts, the supplier shall maintain records for each lot produced. The records shall be traceable to the lot no. and/or heat code when applicable.

Methods shall be set in place to prevent tampering or loss of records.

### 16.1 Inspection control stamps and electronic signatures

Test status stamps and/or signatures (including electronic signatures and passwords) must be controlled and traceable.

### 16.2 Computer data control and backup

When software is used for processing, manufacturing or for quality control, the supplier must have a policy for software control to ensure that the final quality of the product complies with the purchase order requirements.

The software control procedure shall include, but not be limited to, software programming, software testing and/or setup, library control, backup, documentation control, etc.

## 17 Training and qualification of personnel

See the latest version of TS16949, paragraph 6.2.2.

## 18 Control of non-conforming product

### 18.1 General

TM4 shall accept only materials that meet all the specified purchase order requirements. Shipping of non-conforming materials to TM4 shall lower the supplier performance rating and measures shall be taken to ensure the supplier's future product conformance and control.

The supplier is also responsible for their subcontractors' conformance to the P.O. requirements.

Requests for deviation must be recorded on an *SQ-5021B, Request for deviation* (Excel format file provided by TM4). NO OTHER FORMAT WILL BE ACCEPTED BY TM4.

### 18.2 Requests for deviation

As soon as possible, before continuing the manufacturing process, the supplier shall fill in an *SQ-5021B, Request for deviation* form (see the TM4 PPV toolkit) and submit it to the TM4 SQA coordinator.

A supplier shall not ship non-conforming products to TM4 unless he has submitted an *SQ-5021B, Request for deviation* to TM4 and TM4 have accepted it. Acceptation may include specific conditions such as time, lot, special repairs, etc. If non-conformance is accepted, a copy of the request for deviation must be attached to the *AC-5011B, Suppliers certificate of conformance* of the shipped item.

The supplier shall not have his own MRB (Material Review Board) disposition or perform unauthorized rework on a non-conforming part without approval from TM4. Any repaired product shall be re-inspected and/or retested to demonstrate conformity to the requirements. Records of these results after repair shall be documented in the *SQ-5058B, Inspection* report, see TM4 PPV toolkit.

The supplier shall provide isolated and well-identified storage for non-conforming products.

For PPM defect calculation, all non-conforming products will be taken into account.

### 18.3 Supplier QA alert

When a non-conformance is found after delivery to TM4, the supplier must fill in an *SQ-5021B Request for deviation* form on which he must check the ALERT box (indicating a potential recall).

### 18.4 Request for engineering changes

An *SQ-5021B, Request for deviation* form must be completed for any engineering changes to a product under development or production. **No e-mail or verbal requests will be accepted**.

### 18.5 Non-compliance for critical problems

If non-compliance for a critical problem has a significant impact on compliance and causes an interruption of the production line, the supplier, with TM4, shall find a quick solution to the problem. The supplier may be required to go to TM4 to implement the solution(s).

## 19 Supplier corrective action request (SCAR) and preventive action

TM4 may raise an *SQ-5020B, Corrective action request* (see this form in the TM4 APQP toolkit) to analyse repetitive defective parts and material to determine the root causes and to take permanent corrective and preventive action measures.

The supplier shall complete an *SQ-5020B, Corrective action request* of non-conformities, including a detailed follow-up of actions taken, to ensure that corrective measures have been taken to prevent recurrence. The application of the corrective action method is required.

When a corrective action is required by TM4, the supplier shall complete and submit the report within 10 days with documented evidence confirming that the corrective action has been implemented. The response will be evaluated as part of the performance review and will affect the global supplier performance rating.

## 20 Identification and traceability

Marking of finished products shall be performed in accordance with the TM4 instructions *IN-6024E, Mechanical parts identification*, or *SQ-6013B-007, Direct part marking and tracking system*.

The product must be traceable at each step of the manufacturing process. The supplier must maintain identification: P/N (product number), F/N (factory number), S/N (serial number) or lot number as required on the technical drawing. This applies to all products and the relevant documentation.

### 20.1 Critical parts with UI marking (Unique Identifier)

When this type of marking is required on drawings or engineering requirements, the instruction *SQ-6013B-007, Direct part marking and tracking system*, must be applied. This marking will replace any S/N required on the part.

### 20.2 PPV part identification

If a PPV part is requested, the part used as a model for PPV validation must be identified with a tag stating the PPV level "x".

### 20.3 Part identification with accepted request for deviation

The *SQ-5021B, Request for deviation* identification number must be mentioned on a tag fixed to the deviating parts.

### 20.4 Bulk part identification

For this type of product, the parts package must be identified with a tag including the minimum information below:

- Item no. and rev.
- Lot no.
- Expiration date

### 20.5 Parts and packaging labels

All parts and packaging labels must follow the *AC-6013E, All material supplier barcode & label requirement* instructions.

## 21 Certificate of conformance (AC-5011B)

A copy of the certificate of conformance must be included with the shipment when it is required by the *SQ-5024B, Quality control plan* and/or the purchase order.

The objective of issuing this document is to ensure full traceability with all applicable processes and test results for each serial number or lot delivered to TM4. When the supplier does not have an appropriate system and process in place to ensure traceability of the product, the supplier must include at least one (1) original of the *AC-5011B, Suppliers certificate of conformance* (not the test result report) attached to the packing slip, with each shipment.

The certificate of conformance must, at a minimum, include the following:

- Indication of partial or complete shipment
- Part or assembly number and revisions
- Supplier name
- Supplier number (provided by TM4)
- Lot number (see requirements in paragraph 25)
- TM4 P.O. number
- Last P.O. revision date
- Quantity shipped
- Packing slip number
- Inspection report number
- Supplier request for deviation number (if applicable)
- Serial number(s) (if applicable)
- Description of raw material used

It must also include: All applicable specifications, with revisions and/or amendment status, and a statement to the effect that the products listed have been inspected in accordance with TM4 purchase orders, technical drawings and specifications.

For casting and forging products, the supplier shall state the tooling number (pattern), the manufacturing data sheet and heat/casting code numbers of the parts being shipped.

The certificate of conformance must be signed by a supplier's authorized quality representative with the following information clearly identified on the certificate: the signatory's title and position or designation.

In the case of a Software sub-contractor, the CFC must make reference to the software control procedure and shall include, but not be limited to, software programming, software testing and/or setup, library control, backup, documentation control, etc.

The use of the *AC-5011B, Suppliers certificate of conformance* form (available at www.TM4.com) is MANDATORY to ensure consistency of information.

# 22 Handling, storage, packaging, preservation and delivery

The supplier shall have a written process in place to ensure that in-process handling, product identification, storage, preservation, packaging of product including relevant documentation to ensure traceability, storage of material and delivery will prevent damage, deterioration, contamination, substitution or misuse of material. Details of TM4 requirements are specified in the *SQ-6013B-003, Product preservation* instruction.

# 23 Technical drawing and CAD

Only products manufactured according to technical drawings approved by TM4 will be accepted. TM4 technical drawings take precedence over any supplier/manufacturer manufacturing drawings.

Also, TM4 2D technical drawings specifications override 3D files. The 3D file will be provided only to support castings, models, tools and components. All components must comply with the 2D technical drawing.

Technical drawings identified as "Preliminary – Do not use for production" must be used only for quotation purposes, not for product manufacturing.

# 24 Dimensional inspection report

A copy of the dimensional inspection results must be included with the shipment when it is required by the *SQ-5024B, Quality control plan* and/or the purchase order.

The *SQ-6013B-002, Product inspection* instructions must be applied when required in an *SQ-5024B, Quality control plan* and/or the purchase order. The *SQ-5058B, Inspection report* is also available in the TM4 PPV toolkit.

## 24.1 Threaded holes

All threaded holes must by 100% controlled with calibrated thread plug gage Go and No-go (2.5 turns maximum for no-go). All threaded holes must be class 2, unless otherwise specified on the technical drawing.

# 25 Visual inspection

All parts shall be visually inspected to ensure that the complete manufacture, markings and surface finish meet the requirements and to detect any potential non-conformance (see the *SQ-8005B, Visual inspection and cleanliness of products*.

# 26 Raw material control and test results

A copy of the raw material certificate must be included with the shipment when it is required by the *SQ-5024B, Quality control plan* and/or the purchase order.

## 26.1 Material substitution

The use of a substitute material is not permitted unless:

- Such material is authorized by the engineering technical drawing/model or by material specifications in *IN-6046B-001, Raw material and process substitution*
- The original material is no longer used by TM4 nor specified in TM4's requirements.
- An *SQ-5021B, Request for deviation* is approved by TM4.

## 26.2 Material certification/raw material

Material certification shall include the following information:

- Material description
- Chemical composition of material
- Raw material source
- Mechanical and/or chemical properties
- Heat code number, batch or lot number as applicable to ensure full traceability
- Expiry date/lifespan (applies to perishables)

## 26.3 Casting

The use of recycled materials or materials containing a percentage of recycled material must be submitted to and approved by the engineering department of TM4, through an *SQ-5021B, Request for deviation* form.

All aluminum sand castings shall conform to the latest revision of the ASTM B26 standard.

All aluminum permanent castings shall conform to the latest revision of the ASTM B108 standard.

All aluminum die castings shall conform to the latest revision of the ASTM B85 standard.

# 27 Special process control and tests

A copy of the special process results must be included with the shipment when it is required by the *SQ-5024B, Quality control plan* and/or the purchase order.

For TM4, the following processes are managed as special processes as defined in the ISO 9000 standard:

- Non-destructive test (NDT)
- Radiographic inspection (X-rays)
- Destructive test
- Welding
- Heat treatment
- Plating

- Coating
- Balancing
- Leak and pressure test
- Adhesive
- EDM
-

The certificate is applicable for the functional prototype, pre-production and production product.

When the TM4 special control process is necessary, the selected process source (supplier) must be listed in the *AC-5006, Approved suppliers list*.

The supplier is responsible for ensuring he complies with the requirements of the applicable specifications defined on the engineering technical drawing and all of the relevant attachments.

All dimensions are to be taken after special processes meaning that the part is inspected to ensure final dimensional conformity. For specific cases defined in the *SQ-5024B, Quality control plan*, this inspection can be performed before coating but the certificate shall indicate the thickness of the coating performed.

Each year the supplier must perform periodic tests on special processes he has implemented, in compliance with the *SQ-5024B, Quality control plan*.

A copy of the annual test results must be sent to TM4.

It is permitted to use a third-party accreditation program such as the Performance Review Institute (PRI) NADCAP to validate special processes and non-destructive testing (NDT) systems.

## 27.1 Certification of special processes

The certificate of a special process shall include as a minimum:

- The special process description
- The process requirements description
- The identity of the certified operator and inspector
- Approval signature with stamp.

## 27.2 Non-destructive testing (NDT)

The supplier shall be certified by a valid independent organization for all non-destructive testing (NDT). The personnel must have a level I or II training; procedures and techniques require approval by a certified level III if necessary. Copy of certification and employee competence cards shall be made available and communicated to TM4 for our records.

## 27.3 Radiographic inspection (X-rays)

All new aluminum castings shall be tested in accordance with ASTM E94 and E155 to validate the specific grade of the first lot of a new model or for any modification of the cast technique. When X-rays are required, X-ray films or electronic photos and X-ray reports shall be attached to the PPV report.

The supplier shall be certified by a valid independent organization to do X-Ray testing. The personnel must have a level I or II training; procedures and techniques shall be approved by a certified level III.

Copy of certification and employee competence cards shall be made available and communicated to TM4 for our records.

## 27.4 Welding

All welding shall be performed by a supplier qualified by the CWB (Canadian Welding Bureau) or by an equivalent organization. The supplier shall also be certified for CSA W47.1 or W47.2 standards or equivalent and welding must be performed and supervised by qualified personnel. All certification copies and employee competence cards shall be made available and communicated to TM4 for our records.

Documented welding methods used on our products must be approved by a welding engineer, qualified by the CWB and provided to TM4 for PPV validation.

Welding repairs on any product are not permitted without having submitted an *SQ-5021B, Request for deviation* form to TM4, and having received TM4's approval. In this case, the supplier may propose a repair method to be approved by TM4 before proceeding.

## 27.5 Heat treatment

Applicability and effectiveness of a heat treatment process must be determined utilizing the CQI-9 Special Process: Heat Treat System Assessment (HTSA) published by AIAG. This self-assessment shall be completed on an annual basis and shall include all actions taken. These records shall be maintained and made available to TM4 for review.

After heat treatment, the supplier shall verify the hardness in accordance with ASTM E10-07 or ASTM E18-07 standards. Results shall be recorded on the final inspection report or on the Material certificate report.

## 27.6 Plating

Applicability and effectiveness of the plating process shall be based on the CQI-11 Special Process: Plating System Assessment (PSA) published by AIAG. This self-assessment shall be completed on an annual basis and shall include all actions taken. Records shall be maintained and made available to TM4 for review.

## 27.7 Coating

Applicability and effectiveness of the coating process shall be based on the CQI-12 Special Process: Coating System Assessment (CSA) published by AIAG. This self-assessment shall be completed on an annual basis and shall include all actions taken. Records shall be maintained and sent to TM4 for revision.

## 27.8 Balancing

When a product or subassembly balancing test, as defined in ISO 1940-1 and ISO 1940-2 standards, is successful each part shall be marked with:


## 27.9 Leak test and pressure test

When a product or subassembly leak test or pressure test is successful each part shall be marked with:

# 28 Inspection, measuring and test equipment control

The supplier shall establish and maintain a calibration system for its measuring and testing equipment in compliance with one or more of the following standards: ISO 17025, ISO 10012, MIL-STD-45662, ISO/IEC Guide 25, ANSI Z540-1.

Furthermore, calibration equipment and gauges shall be in compliance with & traceable to the National Institute of Standards and Technology (NIST).

The supplier shall promptly notify the TM4 SQA coordinator or buyer of any out-of-tolerance measure found on his measuring and testing equipment that may affect the quality of items already delivered to TM4 (see paragraph 18.2). The *SQ-5021B, Request for deviation* form must be completed.

## 28.1 Control equipment for measures and tests and inspection costs

Before receiving a PPV, and unless previously agreed with TM4, the supplier shall have all the necessary measuring and testing equipment's required for the inspection of all characteristics of the technical drawing.

Inspection costs, including outsourcing, calibration fees, purchasing of measuring equipment and gauges are the responsibility of the supplier.

If the supplier cannot inspect any of the requested characteristics, he must submit an *SQ-5021B, Request for deviation* form to TM4.

# 29 Qualified laboratory

The laboratory definition given in paragraphs 3.1.2 and 3.1.5 and requirements as described in paragraph 7.6 of the latest revision of TS16949 will apply.

If the supplier lab control is not approved by TM4, parts will be inspected at TM4 upon receipt to ensure they comply with requirements. If tests are accepted, material received shall be released. If tests are not accepted, the lot shall be rejected and returned to the supplier.

## 29.1 Lab testing piece

The supplier shall provide test specimens when requested on the *SQ-5024B, Quality control plan* in the Applicable Supplementary Requirements section. The sample must be identified as "Test Piece" with the applicable part no, Rev. and Lot number.

The test samples shall be processed simultaneously with each batch or lot of parts.

## 29.2 Lab Report

Laboratory and measurement reports shall comply with the requirements of TS16949 paragraph 4.2.4 and shall include:

- The identity and location of the laboratory used;
- The reference to the test methods used;
- Any deviation or alternative test methods used;
- Measurement results;
- All necessary materials and process traceability information on the tested components or samples.

# 30 ESA requirements on technical drawings (Engineering Source Approved)

When the note "THIS PART IS CONSIDERED CRITICAL AS PER *IN-6035B, Engineering instruction - ESA*" is specified, product manufacturing, processes and tests may affect the functional integrity of the part or of the assembly, safety and/or the vehicle regulations and certification. These products must be approved by TM4's engineering department based on the *SQ-5024B, Quality control plan* and tests specified via PPV level 3 approvals.

# 31 Bulk material and short-life material

Information must be provided on product materials likely to deteriorate over time due to storage or transport conditions. The supplier/manufacturer shall indicate on the package label the date of original manufacture of the product, shelf-life or expiry date.

All products having a limited shelf-life must still have 75 % or more of remaining shelf-life at the time of delivery.

## 31.1 Aging control of electronics components

The supplier shall deliver only parts manufactured within seven (7) years before the shipment date. An *SQ-5021B, Request for deviation* form shall be completed for parts exceeding this time.

# 32 Metric fasteners

All metric fasteners supplied to TM4 shall meet ISO 898-1 requirements unless otherwise specified on an *SQ-5021B, Request for deviation*. Fasteners M5 grade and above must be marked as per this standard. For fasteners < M5, we will accept grades 8.8 and 10.9, no matter what the item description is on the purchase order. Packaging from the manufacturer will show original information or this information will be transferred if re-packaged (Manufacturer's name, item number, item description, lot number and grade). The certificate of conformance shall be supplied upon request from TM4.

# 33 Software quality control

## 33.1 Non-deliverable software

The supplier should have in place procedures and records for the development, management of versions and changes including the computer security of software used for manufacturing, controls and product testing. The software may include, but are not limited to:

- CAD/CAM machine control
- CNC machining programs
- CMM programs
- Test programs
- Etc.

The procedure should clearly indicate who is responsible for modifications and maintenance of the software.

When test software is developed for TM4 products or when a specific request is issued by TM4 upper management for a specific software project, the supplier/manufacturer must

have in place a complete software project program including the design, coding testing, software implementation, configuration management and final testing. This program may be audited by TM4 for approval.

### 33.2 Software deliverables

The supplier shall establish, maintain and submit a Software Quality Assurance program for evaluation and approval by TM4.

The Software Quality Assurance program may include:

- Plan/procedure for control
- Design documentation
- Procedure and test records to demonstrate the software validation
- Version control & configuration management
- Archive backups of the deliverable software including source code
- Development of the operating and installation instructions of software

The supplier shall provide and maintain a system for the control of software used in the qualification/acceptance testing of deliverable hardware, software, and firmware to be furnished on the purchase order.

## 34 Internal audit

An internal quality and process audit must be performed each year. The audit shall include the items defined in the latest version of ISO 9001 or TS16949, paragraph 8.2.2.

Only qualified auditors of the said Standards shall perform internal audits.

## 35 Appearance approval report (special product requirements) & graining validation

The instruction *SQ-6013B-006, Appearance and graining validation* must be applied when required in the *SQ-5024B, Quality control plan* for a PPV and/or the purchase order. The form *SQ-5044B, Appearance approval report* is available in the TM4 PPV toolkit.

## 36 Electronic products

All products must meet the specified applicable specifications and IPC standards

# SECTION 3: ADVANCED QUALITY REQUIREMENTS

**Applicable to Production Suppliers**
**(Silver or Gold status)**

## 37 General Requirements

A copy of the specific results from section 37 to 50 must be included in the PPV package when it is required by the *SQ-5024B, Quality control plan* and/or the purchase order.

### 37.1 Initial risk evaluation & contingency plan

The Supplier with a "Preferred" or "Certified" status must complete an *SQ-5037B, Initial risk evaluation checklist* form included in the TM4 APQP Toolkit. As necessary, a contingency plan to deal with any eventuality that may have an impact on the quality and delivery of TM4 orders must be defined and communicated to TM4 buyers.

### 37.2 Supplier quality performance rating (under development)

TM4 will monitor and evaluate the supplier's performance based on the following:

- Quality – PPM (parts per million) defects
- Delivery performance – in line with agreed schedule, quantities and documentation.
- SCAR (supplier corrective action request resolution time).

This rating evaluation will be calculated and made available to the supplier upon request and availability.

## 38 Supplier continual improvement program

The continual improvement program aims to develop and promote a culture of good business relationships with suppliers based on performance improvement in terms of operational and strategic objectives. Overall, this program places emphasis on:

- The concept of zero defects (do it right first time).
- Getting suppliers to adopt minimum quality management and quality control methods recognized by ISO 9001 and TS14969 to support results.
- Participating in the development and improvement of product and processes.
- Identifying, quantifying and eliminating waste to meet the customers "just in time" needs.
- Optimizing the total purchasing cost.

If necessary, action plans for improvement can be implemented in accordance with the strategic decisions of TM4.

## 39 Advanced Product Quality Planning APQP

At a minimum, the "Preferred" and "Certified" supplier is required to implement Advanced Product Quality Planning (APQP) procedures and tools in accordance with this TM4 supplier quality requirements document.

The TM4 APQP toolkit shall be completed only once or in case of a significant future change.

The timing and sequence of implementation of these requirements will depend on the requirements and expectations established by TM4. The TM4 buyer will inform the supplier about the implementation of the APQP milestone.

These requirements also apply to subcontracting suppliers (for example, casting, special procedures, etc.).

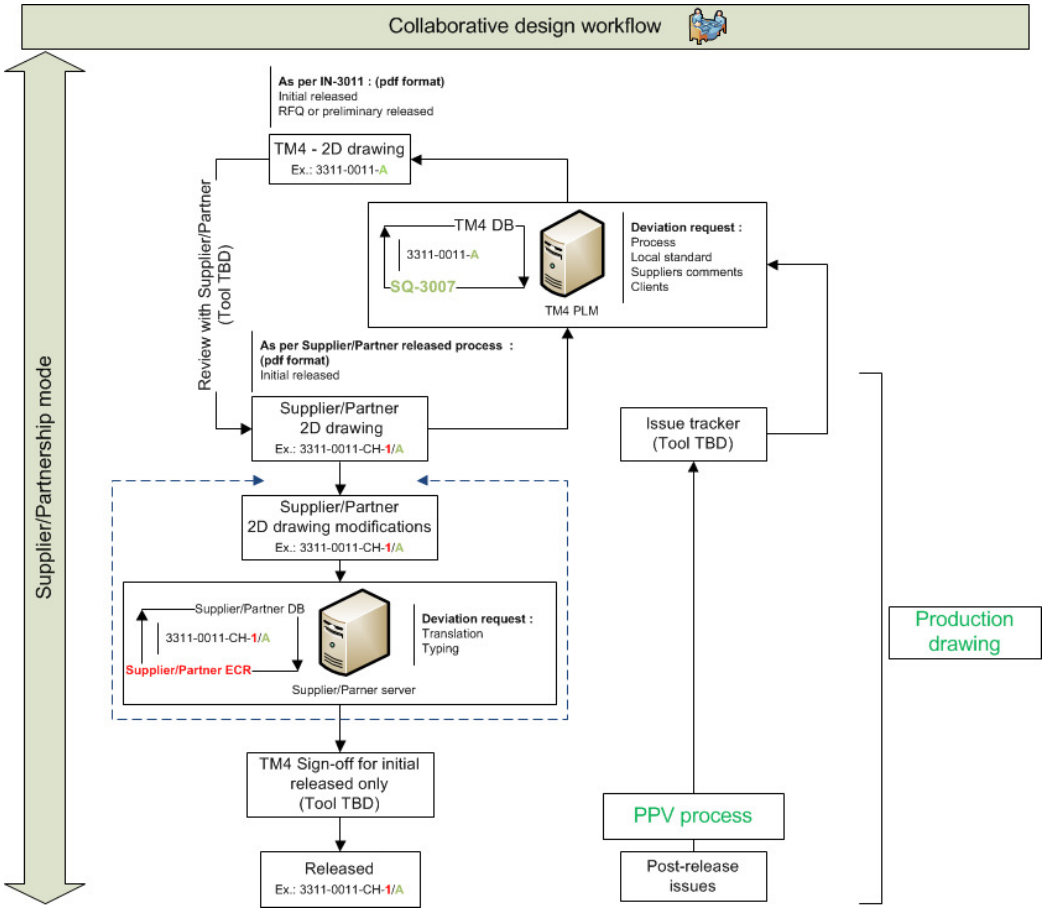
Over time, the tools may be updated to reflect the evolving requirements of TM4.

# 40 RTS – Review of Technical Specifications

The objective of this preventive process is to minimize the need for late design changes or design changes after the PPV part or tooling order has been placed.

The Review of Technical Specifications ensures that all the technical information defining the part or component has been thoroughly reviewed, is clearly understood by the supplier/partner and is feasible. This RTS process also provides the opportunity to collect and incorporate the design for manufacturing element from the supplier comments and suggestions into the drawings and technical specifications.

**Figure 1** Collaborative design workflow




This review of technical specification process is supported by TM4 Method / Engineering / Supplier Quality.

# 41 PPV – Product & Process Validation

## 41.1 Definition of key product – TM4 design

All parts used in TM4 product or system are important to customer satisfaction and safe reliable operation of the final product. However, there are some products that require additional attention. At the start of the project, TM4 will identify and select these key products which are then subjected to closer control and monitoring.

The key components are chosen by a cross functional project team using the following criteria as a minimum:

- Safety critical components/software;
- Components that must meet regulatory or legal requirements;
- Parts with critical characteristics;
- The supplier in design responsible (Development supplier);
- Complex part or components that constitute vital function or sub-function in a system;
- Parts that if changed, must require validation and/or retesting;
- Parts with a known or potential quality problem.

## 41.2 PPV Requirements

The PPV is required for all key products on the *SQ-5024B, Quality control plan* and/or the clause on a purchase order, the part for production must be validated as defined in the *SQ-6013B-004, Part and process validation (PPV)* specification.

The TM4 PPV toolkit shall be used for each PPV approval.

# 42 FMEA process (PFMEA)

When a PPV level 3 is required on the quality control plan, a process FMEA (failure mode and effects and criticality analysis) is required for each item. In application, an RPN greater than 100 and an index of severity of more than 8 are unacceptable. In this case, the manufacturing process shall be improved and validated.

The *SQ-5040B, FMEA* form can be found in the TM4 PPV toolkit. The evaluation must be performed in accordance with the latest revision of the SAE J1739 standard.

# 43 Quality control plan and processes

(For pre-production and production)

## 43.1 General

The Quality Control plan is a living document and it should be utilized/updated for the life cycle of the product.

## 43.2 Key characteristics

Key characteristics are characteristics marked “CSC” (critical) or “MKC” (major) or any manufacturing process parameter which can affect safety or compliance with regulations, fit, form, function, performance or subsequent processing of products. These are often the minimum quality control requirements for the product.

For safety, key characteristics, ISO 26262 (Road Vehicle – Functional Safety) shall be applied. The supplier shall submit a complete project & validation plan to TM4.

These key characteristics must be controlled throughout the product manufacturing process to ensure its conformity as defined in the *SQ-6013B-002, Product inspection* instructions.

Where design is under TM4's control, TM4 identifies these key characteristics on each detailed technical drawing and/or on a separate *SQ-5024B, Quality control plan* or on the *SQ-5051B, Inspection request* as defined by the status of the part.

The supplier shall use the TM4 *SQ-5024B, Quality control plan* or develop his own internal quality control plan that will include at least the requirements of TM4. This Quality Control Plan is required for pre-production and production.

A quality control plan must be available for each product, at each step of the process.

### 43.3 Reaction plan

The supplier shall initiate a reaction plan from the *SQ-5024B, Quality Control Plan* for characteristics that are either not statistically capable or are unstable. The reaction plan shall include containment of the product and 100% inspection, as appropriate. A corrective action shall then be completed by the supplier, indicating specific timing and assigned responsibility to assure that the process becomes stable and capable.

The reaction plan shall be reviewed with TM4.

The supplier shall maintain records of effective dates of process changes.

### 43.4 Approvals

The supplier must revise the initial version of the TM4 quality control plan and submit a final version for approval.

In some circumstances, it may be required that the quality control plan is approved by the prime customer of TM4.

After approval, any changes made to the product control plan must be re-approved by TM4.

## 44 Manufacturing Operation Sheet (Manufacturing flow charts and production method)

A detailed manufacturing operation sheet (MOS) shall be prepared showing the manufacturing sequences of the product. The *SQ-5038B, Manufacturing flow diagram* form may be used (see TM4 PPV toolkit).

This MOS shall provide operating personnel with sufficient detail to accurately carry out all required operations and control of the product. When applicable, the MOS shall include in-process quality control requirements as defined in the *SQ-5024B, Quality control plan*.

## 45 FAI – First Article Inspection

The instruction *SQ-6013B-005, First article inspection (FAI)* must be applied when required in the *SQ-5024B, Quality control plan* for a PPV and/or the purchase order. The form *SQ-5043B, First article inspection report (FAI)* is also available in the TM4 PPV toolkit.

# 46 MSA – Measurement system analysis

This method allows for the measurement of uncertainty during an inspection. All equipment used for verification of key characteristics should be submitted to an R & R (gage repeatability and reproducibility) capacity analysis to ensure validity of the measurement system.

Instruments and measuring equipment must have a resolution less than or equal to 10% of the specified tolerance or of the process variation.

Unless otherwise specified, the following give the acceptance criteria for a Gage R&R study:

- From 0% to 15% measurement system ACCEPTABLE
- From 15% to 30% measurement system MARGINAL: approval from TM4 is required
- >30 % measurement system UNACCEPTABLE: to be replaced or improved

These analyses must be recorded and retained.

# 47 Statistical techniques (SPC and sampling)

## 47.1 SPC – statistical process control

The supplier shall implement a statistical process control (SPC) program for all key characteristics identified on TM4 technical drawings. A variety of statistical techniques are available to attain process stability and perform process capability studies. The intent is to provide effective process control and statistical evidence of conformance over time. The key characteristics do not lessen the importance of other dimensions or characteristics selected by the supplier.

If more statistical process control is required, TM4 will mention these requirements in the *SQ-5024B, Quality control plan*.

## 47.2 Preliminary capacity evaluation

This preliminary study shall be conducted for all key characteristics starting from pre-production at the manufacturing location. When an Xbar&R control chart is used, at least 25 subgroups of 4 pieces (minimum of 100 results) are required to obtain sufficient data to determine initial process stability and capability. When sufficient data is not available, control charts must start with whatever data is available. The results of this study may be used as the basis for establishing ongoing SPC which must be noted on the *SQ-5024B, Quality control plan*.

Results of the statistical process control must be included in the final inspection report. The related data must be documented and retained at the supplier's facilities and be available for submission to and review by TM4.

Acceptance of a product based on SPC results is defined in the *SQ-6013B-002, Product inspection* instructions.

If Cpk results are lower than 1.00, a 100% quality control is required until an action plan is completed and the capacity results fully comply with the requirements. These actions shall be fully documented in the Supplier Quality Control Plan and in the applicable PFMEA.

### 47.3 Short-term process capability studies

The short-term process potential study provides a snapshot of the process capability and is used to predict whether the process is potentially able to meet the requirements. The short-term study can be performed on a single operation or in a process consisting of numerous operations. Short-term studies are also useful for studying and comparing outputs of multi-spindle machining, multi-cavity moulding, etc.

### 47.4 Long-term process capability studies

After the process has been found to be capable of meeting requirements for short-term capability, long-term capability studies must be conducted over a period of time long enough to include all possible sources of variation arising from changes in shift, operators, tooling, raw materials, etc. Data must be collected and recorded in a manner that reveals whether or not the process is in control. Once the process is in control, capability can be calculated.

### 47.5 On-going & periodical inspection

Recommendations for periodic inspections are defined in the *SQ-6013B-002, Product inspection* instructions. When applied, the supplier must document all periodic inspections on the *SQ-5024B, Quality control plan* for approval by TM4.

### 47.6 Sampling inspection

The supplier/manufacturer must be authorized by TM4 to perform a final inspection using the data sampling inspection as defined in the *SQ-6013B-002, Product inspection* instructions. If a supplier develops his own sampling techniques, they must comply with ISO 2859/1 and the program must be approved by TM4 prior to use.

The default acceptation level of sampling data shall be zero defects (c=0) (Ref. TS16494 paragraph 7.1.2).

## 48 Error and mistakes proofing (visual aids)

### 48.1 Error-proofing (poka-yoke)

Whenever possible, TM4 advocates the implementation of error-proofing methodology during planning and problem resolution to prevent manufacture of non-conforming products. The use of these error-proofing tools shall be documented in the *SQ-5024B, Quality control plan*. Also, as necessary, a preventive maintenance program shall cover these tools.

### 48.2 Boundary samples

Boundary samples may be required when TM4 permits the establishment of allowable deviations and where the external appearance or subjective features (such as texture, feel, etc.) is defined by TM4 specifications but where written specifications may not be sufficient.

Boundary samples must be agreed and signed off by the TM4 SQA coordinator, otherwise they will not be considered. A minimum of two (2) identical samples should be selected from the normal production parts. One sample will be used by the supplier/manufacturer and the

second will be kept at TM4. Revalidation frequency must be established by the supplier to prevent degradation of the samples.

Boundary samples must be clearly identified and referred to in the *SQ-5024B, Quality control plan*. The supplier/manufacturer will have to train the relevant personnel to ensure they are using the boundary samples correctly and consistently.

# 49 Tooling

All tools purchased by TM4 remain the property of TM4. The supplier must maintain and communicate at least, once a year, a Production tooling list. The form *SQ-5048B, Production tooling cost breakdown* list may be used.

Types of tooling include manufacturing tooling, testing, inspection and test equipment.

This list shall indicate as a minimum:

- Design with tool number and revision
- Tool category (dies, castings, gauges, patterns, etc.)
- Request for a PSW number
- Reference to part number and revision number
- Description
- TM4 reference number for the tool
- Manufacturing date
- Tool life
- Last calibration date and due date of next calibration, if tool is used for part inspection
- Inspection report number
- Tool location
- Latest condition of the tool and comments
- Photographs where appropriate

TM4 tools shall be permanently and clearly engraved so that ownership of each tool is easily visible.

The supplier shall establish and implement a tooling management and control system including:

- Verification/Calibration
- Maintenance and repair
- Storage and recovery
- Change program for short-life tools
- Tool designs and modifications to documentation, including engineering level changes.

## 49.1 Special gauge and verification device for quality control

Once a gauge has been manufactured, it shall be inspected/calibrated based on the instruction mentioned in paragraph 28 of this specification.

# 50 Hazardous materials and environmental protection

When the ELV/IMDS is a requirement, the supplier must follow the *SQ-6013B-001, ELV/IMDS* Instruction and complete the *SQ-5046B, ELV/IMDS data report* form in the TM4 APQP Toolkit.

# Annex A

## SUPPLIER ACKNOWLEDGEMENT

OF QUALITY REQUIREMENTS

## Confirmation

We hereby confirm that we have received, read and understood the information given in *AC-6011E, Supplier quality requirements*.

We understand that this manual defines the overall quality targets for the products that are purchased by TM4 as well as defining preferred methods of working with TM4.

We strive to meet these customer requirements in all our facilities working with TM4 products.

We understand that at the time of requiring, any or all supplier agreements we must take these supplier quality requirements into consideration.

We understand that it is our responsibility to periodically check the supplier section of the TM4 web site for revisions and updates of this document to ensure that we are referring to the latest available requirements.

The latest revision can be obtained from the supplier section of the TM4 web site at: http://www.tm4.com/en/suppliers.aspx

*Complete the following information and return to the TM4 SQA Coordinator by:*

**Email**: supplier@tm4.com
**Fax**: 1-450-645-1864
**Mail**: 135, rue Joseph-Armand Bombardier, Suite 25,
Boucherville, (Quebec), J4B 8P1, Canada

| | |
|---|---|
| **Supplier Name** | |
| **Supplier no** | |
| **Supplier address** | |
| **Submitted by (name)** | |
| **Function / Title** | |
| **Tel. no** | |
| **E-mail address** | |
| **Date, Signature** | |