



**QAD 7.4.1B**  
**Revision # 13**

# SMC Corporation of America Supplier Quality Assurance Manual

<b>Approval</b>	<b>Date</b>	<b>Revision</b>
Mark Miller	7/10/12	13



## Table of Contents

<b>Section</b>	<b>page</b>
SMC Quality Policy .....	3
SMC Environmental policy.....	3
Introduction .....	4
1.0 Purpose .....	5
2.0 Objectives .....	5
3.0 Scope .....	5
4.0 Supplier Selection & Assessment Process .....	5
4.1 Supplier Questionnaire, Supplier Self-Assessment .....	5
4.2 Supplier Quality System Requirements and Assessment ...	5
4.3 Supplier Performance Feedback .....	7
5.0 Control of Supplier's Subcontractors .....	8
6.0 Nonconforming Product and Supplier Corrective Action .....	9
7.0 SMC Supplied Product .....	10
8.0 Production and prototype Component Requirements .....	10
8.1 Drawing and Specification Requirements .....	10
8.2 Product First Build Approval Procedure .....	10
8.3 Design Changes .....	12
8.4 Copy Exact Requirements .....	12
8.5 Communications .....	12
8.6 Production Tooling Approval .....	13
9.0 SMC Standard Purchase Order Requirements .....	14
9.1 Packaging and Labeling .....	14
9.2 Documentation .....	14
 <b>Appendix</b>	
Production Sample Dimensional Report.....	15
Copy Exact Change Request .....	16
Explanation of Drawing Conventions for SMC vendors .....	17
Revisions .....	21



## SMC Corporation of America Quality Policy

Continually improve by bringing together the wisdom of all of SMC's employees and by having the ideas of Customer First and Quality First as our core business structure.

1. **Customer First** – Strive to respond promptly to customer demand and provide service that satisfies the customer.
2. **Plan Initiative** – Each employee shall be devoted to “Quality First” and shall execute the PDCA methodology to improve quality in their areas of responsibility.
3. **Source Control** – In order to establish a quality assurance system using source control, strive to discover and understand problems in the early stages so that they can be resolved quickly.
4. **Full Participation** – Every employee must recognize his/her own responsibility to produce the quality that customers expect. All employees shall act to improve quality.

To achieve these quality policies, establish and maintain a quality management system on which all related employees can act. Strive to continually improve these quality policies by maintaining and promoting this system.

## SMC Corporation of America Environmental Policy

SMC Corporation of America is committed to our employees, our communities, and our customers in reducing, reusing and recycling natural resources around the global environment. Accordingly SMC strives to adhere to the following:

- A. Commitment to continuous improvement in environmental performance including prevention of pollution.
- B. Monitor and comply with relevant governmental, local legislative and other regulatory environmental requirements.
- C. Provide environmental education to all our employees, and make every effort to spread thorough environmental awareness throughout the company.
- D. Establish and review environmental objectives and targets set by SMC Corporation of America with consideration of SMC global objectives and targets.



## Introduction

The basic requirements of SMC's Supplier Quality Assurance system will best be satisfied through the practice of:

- Mutual respect and co-operation
- Free exchange of information
- Agreement on evaluation of performance
- Commercial competitiveness
- Acceptance of respective responsibilities
- Conformity to specification

SMC is committed to developing long term supplier partnerships that will ensure the continued growth and prosperity for both companies. This partnership begins with gaining a thorough understanding of each organization's people, business, needs and capabilities. Through working together as a team, SMC and our partner suppliers will develop the best solution for our customers' needs in terms of product performance, quality, cost and delivery.

SMC hopes that this manual will prepare you with the basic requirements and expectations we have of you as a partner supplier.

We welcome suggestions for improvement, which will serve the mutual benefit of both SMC and our suppliers. If you have any suggestions for improvement or questions regarding the requirements in this manual, please contact the Quality Assurance Manager:

SMC Corporation of America  
10100 SMC Boulevard  
Noblesville, IN 46060  
317-899-4440 phone  
317-688-0991 fax



## **1.0 PURPOSE**

The function of Supplier Quality Assurance is to ensure that SMC receives products and services from its suppliers that meet all SMC requirements.

## **2.0 OBJECTIVES**

2.1 The objective of the SMC Supplier Quality Assurance initiative is to work with the supplier to achieve and maintain compliance to all requirements and promote the continuous improvement of the supplier.

2.2 With the acceptance of an SMC production order, the supplier agrees to all specifications and requirements within the SMC Supplier Quality Manual.

## **3.0 SCOPE**

Applies to outside suppliers of production assemblies, parts, materials and services to SMC Corporation of America. This manual does not cover SMC Corporation of America's intra-company inventory transfers or purchases.

## **4.0 SUPPLIER SELECTION & ASSESSMENT PROCESS**

### **4.1 Supplier Questionnaire, Supplier Self-Assessment**

SMC Corporation requires all suppliers, and may request potential suppliers, to complete and return the SMC Supplier Questionnaire Form "A" and/or Form "A" and "B" annually. The intent is to supply and maintain SMC with up-to-date information as to supplier's contacts and capabilities with respect to its quality system and technical support.

### **4.2 Supplier Quality System Requirements and Assessment**

Many suppliers or potential suppliers will have a quality program designed to meet a recognized standard. SMC may accept, as proof of acceptability, in place of the Supplier Questionnaire Form "B" or SMC Supplier Assessment, a recent satisfactory survey by a mutually recognized authority. We expect such suppliers to be compliant with the applicable ISO 9001:2000 standard and to demonstrate continuous improvement in their Quality System.



Following supplier approval and initial sample approval, periodic reviews may be initiated by SMC Supplier Quality Assurance and Purchasing to ensure Quality Standards are consistently maintained. The visits are also intended to open up channels of communications and identify areas of continuous improvement for both companies to address. The SMC representatives are expected to be provided with all necessary access to facilities and equipment so an accurate assessment can be made.

All suppliers that provide products or components that is specific to SMC Corporation drawings or specifications are required to maintain a minimum quality system that includes the following components:

A. Order Entry and Revision Control.

- Internal scheduling process to ensure efficient and timely completion of multiple operations within specified lead-time.
- Revision control process.
- Provides accurate conformation dates for product delivery.

B. Monitoring and measurement of product.

- Characteristics of the product must be monitored and measured to verify that product requirements have been met.
- Monitoring and measuring will be in accordance with planed arrangements.
- Records must be maintained to demonstrate conformity with acceptance criteria.
- Records must indicate the person authorizing the release of the product.

C. Customer property

- Process to identify and protect customer property.
- Records to identify lost or damaged customer property.

D. Preservation of product

- Provisions for:
  - Handling of raw materials
  - Processing of product
  - Packaging of product
  - Storage of product
  - Delivery of product

E. Calibration

- Measuring devises must be calibrated at specified intervals against standards traceable to national or international standards.



#### F. Control of Nonconforming Product

- Procedure to define the controls and related responsibilities and authorities for dealing with nonconforming product.
- Nonconforming product must be identified and controlled to prevent unintended use or delivery.
- Records of nonconformities and action taken.

#### G. Corrective Action

- Review the nonconformities
- Determine the causes of the nonconformities
  
- Evaluate the need for action
- Determine and implement the action needed
- Record the results of any actions taken
- Corrective actions taken must be reviewed

In order to be approved as an SMC supplier, an evaluation will be made of the supplier's ability to meet and maintain SMC quality system requirements. This may include an assessment or audit of the supplier's quality system.

Supplier assessment may be carried out when the following circumstances apply:

- New Supplier - SMC or customer specified
- Existing Supplier – Annual assessment per SMC Supplier Assessment Process.
- Supplier of new product (new product category from existing supplier).
- Change of source for subcontracted parts, materials, or services.
- New or modified tooling.
- Re-assessment due to poor quality record.
- Any change in manufacturing methods or processes.

### 4.3 Supplier Performance Feedback

Following the initial supplier assessment and approval of production samples, production deliveries will be assessed for quality. Supplier performance is tracked based on quality acceptance of product, on time delivery and quality system. These factors will be used to establish the suppliers rating.

Records are maintained to allow regular analysis of supplier's performance. SMC will periodically issue a Supplier Performance Report Card to suppliers that will include a performance rating in the areas stated below. Report cards will be issued per the SMC Supplier Selection and Assessment process.



- Quality Performance
- On Time Delivery
- Quality System

If an adverse trend in performance is detected, action may be taken to review a supplier's status. Any concerned SMC department may request this action.

When assessment of supplier performance shows there is just cause, supplier's status may be changed to reflect current performance, including a change in the supplier surveillance. If warranted, SMC Purchasing will contact the supplier to request a plan for corrective action. Changes in supplier status will be reflected on the Approved Supplier List.

When supplier performance degrades, the supplier may be requested to attend a meeting with SMC Quality Assurance Department and Purchasing Department. The meeting will be to discuss the quality problems and agree upon expedient corrective actions. Failure to do so may result in cancellation of orders.

The SMC QA Department has the right to re-define inspection levels where performance has improved or deteriorated. The evidence to implement new inspection levels will come from vendor performance data.

## **5.0 CONTROL OF SUPPLIER'S SUBCONTRACTORS**

A supplier shall not subcontract for components, processes, completed or substantially completed items supplied to SMC without prior written approval from SMC. The supplier will ensure that all sub-tier suppliers who have access (directly or indirectly) to SMC's specifications, internal SMC data, or other confidential information will sign and be governed by a Nondisclosure Agreement (NDA) that is similar in form and substance to SMC's NDA with supplier. Approval by SMC of a subcontractor selected by the supplier shall not alter supplier's obligations to SMC.

The supplier to SMC is responsible for the continued compliance to quality standards of his subcontractors of material and services. The supplier must assure that its suppliers will meet all required quality standards.

SMC Corporation may require the supplier use a special process supplier from the list of approved suppliers.

With reasonable notice, the SMC Quality Department will be allowed access into any supplier's sub-contract source accompanied by the supplier's representative. Suppliers are responsible for keeping records to verify the quality of materials and services provided to SMC and from the supplier's subcontractors and suppliers.





## 6.0 NONCONFORMING PRODUCT AND SUPPLIER CORRECTIVE ACTION

It is the responsibility of the supplier to ensure that only conforming product is delivered to SMC.

In the event that a product nonconformance is identified, SMC will notify the supplier. The supplier is required to immediately inspect, segregate and correct similar parts within its own facilities to assure that SMC will not receive additional shipments of suspect product until the cause of the nonconformance has been identified and controlled.

Any product rejected due to the fault of the supplier will be subjected to one or more of the following actions:

- 100% inspection at supplier's cost
- Rework at supplier's cost.
- Return to supplier at supplier's cost.

SMC may issue a Supplier Corrective Action Request when nonconforming material is discovered. Written corrective action response is requested within 15 working days of date issued.

SMC reserves the right to rework locally any supplier error that would pose a threat to production delivery dates being achieved. The supplier will be billed for the material and labor costs associated with the rework.

The following set of requirements applies to all reworked or replacement product delivered to SMC Corporation of America and is designed to facilitate the orderly processing of reworked or replacement product from suppliers:

- All orders must be clearly identified as reworked or replacement product, part number, part revision, and quantity.
- A packing list that references the SMC nonconformance report number, part number, replacement or rework quantity, and all pending rework or replacement quantities to be delivered.
- Parts must be segregated and packaged in a manner that will preclude the risk for shipping or handling damage.
- When required, rework or replacement products are to be packaged in sealed plastic bags to avoid contamination.
- Component boxes shall not weigh more than 35 lbs.



## **7.0 SMC SUPPLIED PRODUCT**

The verification, control, and storage of SMC supplied product from receipt through incorporation into the finished product is the responsibility of the supplier. Incorrect or damaged product received from SMC Corporation should be reported to SMC purchasing upon receipt. The supplier will be responsible for all SMC product damaged or destroyed by the supplier's process.

## **8.0 PRODUCTION AND PROTOTYPE COMPONENT REQUIREMENTS**

### Technical Requirements Review

Due to the fact that many of SMC's designs are based on JIS (Japanese Industrial Standards), suppliers should not assume that "typical industry tolerances or standards" apply. Suppliers should review the drawings and specifications carefully to ensure that they understand and can meet all requirements. If clarification of requirements is

needed, please contact SMC Design Engineering before submitting quote or producing any orders.

### **8.1 Drawing and Specification Requirements**

By acceptance of an SMC purchase order, the supplier acknowledges understanding of all dimensional drawing and material specification requirements. This includes an understanding of inspection methods, SMC workmanship standards, and process capability.

### **8.2 Product First Article Approval Procedure**

Product First Article Approval submissions are required for:

- New custom component, labels, etc made to SMC specifications.
- Custom component made to SMC specifications from a new supplier.
- Product modified by SMC engineering change (revision change).
- New tooling or modification to existing tooling.
- Process Change

Product First Build Approval submissions may be requested for prototype components.

When an SMC P.O. is received, the supplier must evaluate all SMC design and specification requirements and provide feedback if the supplier's manufacturing process is not capable of meeting defined requirements.



All production first builds submitted to SMC must be clearly labeled and accompanied by the required documentation. The documentation is to include:

- Full inspection report of one sample with strict reference to the SMC drawing or specification and bubble drawing(see appendix for sample dimensional inspection form). The layout must include all drawing notes and dimensions.

When specified on the PO or the SMC product specifications, additional documentation requirements for production first builds or standard orders may include:

- Full inspection report of one sample with strict reference to the SMC drawing or specification and bubble drawing(see appendix for sample dimensional inspection form). The layout must include all drawing notes and dimensions for every production run.
- Process Capability Study - Proof of statistical process control and capability. For processes, the on-going capability index (Cpk) must be  $\geq 1.33$  for designated critical characteristics. Critical characteristics are designated by CC inside a diamond shape or developed by consensus between the supplier and SMC Quality Assurance.
- Control plan – Supplier will develop a process control plan. Control plan must clearly define each characteristic as well as its processing parameters and control methods.
- PPAP – A level 3 PPAP may be required depending on customer requirements.

The sample(s) used to complete the full inspection report must be from a significant production run, typically from one hour to one shift of production. It is important that the production approval samples are manufactured using the same material, equipment, tooling, methods and processes, which are used for the remaining production volume. When tooling is a multiple cavity, a sample from each cavity must be prepared as described.

When ordered quantities are not great enough to demonstrate statistical capability, parts must be 100% inspected.

When shipments arrive at SMC, they will be subject to crosschecking of supplier results and will be either approved or rejected. The supplier will be notified through Design Engineering of a rejection for prototype components and Purchasing for a rejection of production orders.



On occasion, it will be to the advantage of SMC to approve samples at the supplier's premises. The Quality Assurance Department will make requests for such approval to the supplier.

Approval of samples by SMC Corporation does not reduce the supplier's responsibility to continue supplying only conforming material.

### 8.3 Design Changes

SMC may change its drawings, design, and specifications at any time and generate an Engineering Change Notice (ECN). Depending on the affectivity date, customer requirements, or the fit, form, and function of the components resulting from the new revision, SMC Corporation may elect to inspect components to the revision in effect at the time of order placement. Otherwise, SMC receiving inspection will inspect to the latest revision in effect at the time of receipt of the order.

### 8.4 Copy Exact Requirements

Copy Exact is a method that enables our customers to rapidly expand their factories to high volume production in a cost-effective manner. It ensures that identical tools perform identically upon installation without the need for any additional adjustment or tuning. It applies to all factory equipment, systems/spares and includes associated change control requirements.

SMC Corporation will not accept any changes to specifications, materials, processes, or sub tier suppliers, even when specifications are being met, made by a supplier. Therefore, a supplier shall not implement changes (and the supplier shall not

ship any items with any such changes) until written permission to proceed is given by SMC's purchasing, Quality Engineering, or Design Engineering. To issue a change request complete and forward the Copy Exact Change Request (Appendix B) to SMC Purchasing or Quality Assurance.

The supplier is required to establish a written policy and training program for employees and sub tier suppliers to prohibit Copy Exact violations by the supplier or sub tier suppliers. Training records should be maintained at the supplier's facility for review upon request. Failure to comply with SMC Corporation's Copy Exact requirements may result in the cancellation of existing or future orders.

### 8.5 Communications

Supplier problems with processes or SMC documentation will be communicated to SMC immediately. Under no circumstances will the supplier accept verbal changes in design or specifications. All direction on designs and specifications shall be communicated in writing. Design changes shall be communicated through released drawings. Specifications may be communicated through a purchase order or drawing.



## 8.6 Production Tooling Approval

### SMC's purchased tooling retained by supplier

The following provisions may be required at the discretion of SMC purchasing:

Tooling that SMC will own and be retained by the supplier shall be purchased under a separate Purchase Order. This tooling is the property of SMC Corporation of America, Inc., and must be labeled by the supplier as:

“Property of SMC Corporation”

The supplier shall be required to complete, sign and return to SMC Purchasing the Equipment Loan Agreement before invoice payment approval.

Such tooling may not be scrapped or relocated without written notification to SMC Corporation, SMC Corporation reserves the right to take possession of the tooling at their expense at any time. If quoted tooling has a limited life; the supplier must state that on their quotation. If not stated, tooling replacement will be the responsibility of the supplier. Tooling purchased by SMC Corporation of America shall be for the exclusive manufacture of parts for SMC Corporation unless otherwise authorized by SMC Purchasing.

### New or Modified Tooling

Before a new or modified tool, cavity, die, mold, etc, is put into production by the supplier, a production sample with inspection data must be submitted for approval to SMC before production shipment. For single cavity, die, mold, etc. tooling, a complete dimensional inspection will be performed on one piece. For multiple cavity tooling, a complete dimensional inspection will be performed on one part from each cavity. Sample approvals may also apply.

The supplier will indicate the reason for the production sample approval submission (new, design change, replacement, repair, etc.). The supplier may use SMC's dimensional inspection form or their own report.

The supplier invoice for tooling shall be authorized for payment by SMC Purchasing after the supplier's production sample submission has been reviewed and approved by SMC Quality Assurance.



## 9.0 SMC STANDARD PURCHASE ORDER REQUIREMENTS

The following set of requirements applies to each SMC purchase order and is designed to facilitate the orderly processing of deliveries from suppliers. Upon acceptance of the purchase order, the supplier signifies understanding and acceptance of all SMC requirements.

### 9.1 Packaging and Labeling

- All orders must be identified with the SMC purchase order, part number, part revision, and quantity.
- A packing list that references the SMC purchase order and part numbers must be included with every shipment. Please note the ship to address/dock door called out on the purchase order.
- Parts must be segregated and packaged in a manner that will preclude the risk for shipping or handling damage.
- When required, products are to be packaged in sealed plastic bags to avoid contamination.
- If parts are modified and the part number changes, remove or cross out all reference to the original part number. Label packaging with the new part number as stated on the purchase order.
- Each part number should be individually packaged and identified.
- Component boxes shall not weigh more than 35 lbs.

### 9.2 Documentation

- When specified, Certificates of Conformance must accompany each production order. Evidence of statistical capability for critical characteristics may also be required.
- Material certifications to accompany all raw material shipments.
- Full supporting documentation (First Article Inspection Report along with a tagged First Article Sample) must accompany initial production shipment on a new part, following a part revision change or and/or, if specified, normal production runs.





# Copy Exact Change Request

(Forward to QA Department for Material Review Board consideration)

MRB Number: \_\_\_\_\_

## Initiator

Supplier Name: \_\_\_\_\_

Supplier Contact: \_\_\_\_\_

SMC Part Number: \_\_\_\_\_

SMC PO Number: \_\_\_\_\_ Date: \_\_\_\_\_

Description of change Requested:

Specifications: \_\_\_\_\_ Material: \_\_\_\_\_ Process: \_\_\_\_\_ Sub tier Supplier: \_\_\_\_\_ Other: \_\_\_\_\_

Requested change will result in a cost reduction: Yes: \_\_\_\_\_ No: \_\_\_\_\_

Requested change will result in improved quality: Yes: \_\_\_\_\_ No: \_\_\_\_\_

Requested change will reduce lead time: Yes: \_\_\_\_\_ No: \_\_\_\_\_

## SMC Use Only

Analysis / Reason for acceptance or rejection of requested change.

Supplier Change Request is approved: Yes: \_\_\_\_\_ No: \_\_\_\_\_

Customer Approval Required: Yes: \_\_\_\_\_ No: \_\_\_\_\_

Engineering Change Request required: Yes: \_\_\_\_\_ No: \_\_\_\_\_

Authorized Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
(Purchasing)

\_\_\_\_\_ Date: \_\_\_\_\_  
(UTC)

\_\_\_\_\_ Date: \_\_\_\_\_  
(QA)





## Explanation of Drawing Conventions for SMC vendors:

### A. General notes:

These are notes found on the drawing, generally in the lower right above the title block. These notes apply unless otherwise specified. Not all the following notes appear on all drawings.

1. *REMOVE ALL BURRS AND SHARP EDGES:*

No sharp corners or edges are permissible that could cause scratches, cuts or other damage to anyone handling the part with bare hands

2. *ALL DIMENSIONS IN MILLIMETERS:*

If any dimensions are shown in inches, they will be specified using the inch mark (").

3. *TOLERANCES ARE PER JIS B0405, M*

All machining drawings have a box defining the tolerances to be applied to dimensions that have no tolerance indicated. This box is located to the left of the title block and is taken directly from the Japanese specification, JIS B0405. Three grades of tolerances, F (for fine), M (for medium) and C (for coarse) are shown here.

The above note indicates that the tolerance grade to be used for the drawing is M. To further define the tolerance grade to be used, the grades for F. and C. will be crossed out in the tolerance box.

4. *MODIFY SMC PART No. -----*

**If an SMC part number is to be modified, it will be given here.**

**5. MAKE FROM A6061-3/4"X1-1/2"X144"**

This note defines the SMC raw stock part number that is suggested for use in manufacturing the part shown on the drawing. The SMC part number gives the material and the size as ordered from the material vendor. Note that the size is generally given in inches.

This note is generally used for fabrication at SMC. The size (but not the material) can be changed to suit the machining vendor.

### B. Wiring Notes:

These notes are found on drawings used for electrical wiring, schematic drawings and other drawings where connections for electrical devices are described.

1. *ALL DIMENSIONS ARE IN mm.:*

See item 1 in "General notes"

2. **TEST FOR CONTINUITY (<4 OHMS):** of "Wire Harness" without attached electrical components *Continuity* testing is required and no reading should be greater than 4 ohms.



3. *TEST FOR ISOLATION:*

This note is mainly for wiring of electrical connectors but applies to any device that has more than one wire connected. Contact SMC Design Engineering for proper test method of devices.

The above note indicates that all connections must be isolated from each other; that there are no stray solder paths, frayed wires or other electrical problems that would cause a short between pin connections. Generally each pin should be checked for lack of continuity from one pin to *all* other pins. Electrical processes shall conform to IPC A-610 Type 2.

4. *ALL TERMINATIONS SHALL BE MADE IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS:*

The manufacturer's recommendation for terminal connections, including using the correct crimping tools, end stripping length, etc, shall be used.

5. *CUT LENGTH TOLERANCE IS +/- 5mm.*  
*Self-Explanatory.*

6. *ALL WIRES MUST BE BELDEN STYLE XXXX OR EQUIVALENT:*

SMC's preferred wiring is the Belden brand. Vendors may substitute another vendor's product if a spec sheet is provided to SMC indicating that all specifications meet or exceed Belden specifications.

7. *ALL PARTS NOT LISTED AS "BY SMC" IN THE REMARKS COLUMN OF THE BOM ARE PROVIDED BY THE ASSEMBLY VENDOR.*

This is included to assist the vendor in determining what components he is expected to supply. This is useful for the vendor quoting process.


8. *INSPECT ALL SOLDER JOINTS TO INSURE NO COLD SOLDER JOINTS EXIST:*


Solder joints that have a dull finish, or do not have a smooth transition from wire to mating component are probably cold solder joints. These solder joints also will have a very low pull force to separate the joint. If cold solder joints are suspected, the joint should be checked for continuity; the resistance reading of the joint must be < 4 ohms. Soldering is per to IPC A-610 Type 2.

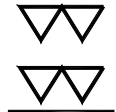
**C. Surface Finish Call-outs:**

The general surface finish specification used on the drawing is shown in the top right hand corner of the drawing, to the left of the revision block. The number above the triangles indicates the maximum roughness value (Ra or Rz) in microns (um) for the surface designated by the triangle(s). The notation is interpreted as follows:

~ The tilde surface finish designator indicates that the surface is not machined and the surface finish is controlled by the raw material surface finish tolerance.

 Two horizontal lines drawn through the surface finish designator indicates the surface finish tolerance is not used anywhere on the drawing.

() Parenthesis around a surface finish designator indicates that the designator is called out on the drawing. It is attached to either the dimension line or the object line of the surface. More than one designator can be called out like this in a drawing.

 A surface finish designator without any of the above notations or one that is that is underlined is used for all machined surfaces that are not called out by a designator. Only one designator is called out like this in a drawing

#### D. Surface Roughness values:

SMC uses the roughness parameter Rz which is the mean roughness depth, (in microns) to designate the surface finish expected. In the USA, most machining vendors expect to see the parameter Ra roughness average (in micro-inches).

Unfortunately, there is no direct conversion from Rz to Ra. Ra is the average of all the peaks and valleys and Rz is the average of 5 of the highest peaks and 5 of the lowest valleys. Ra is always smaller numerically than Rz when based on the same sample but the difference between the two is not constant.

The vendor is advised that the only way to guarantee that the surface finish is per the SMC drawing is to have profile measuring equipment that measures in Rz. An approximate conversion, based on past experience, is given below to assist the vendor in determining what the “Rz” surface finish callout means.

	√	▼	▼▼	▼▼▼	▼▼▼▼
RZ (µm)	~	100 z	12.5 z	6.3 z	.8 z
RA (µm)	~	25 a	3.1 a	1.6 a	.2 a
RA (µin)	~	1000 µin	125 µin	63 µin	8 µin

*Approximate conversion from Rz to Ra profile designations*

**Note: All machined component surfaces not specified as stated above must comply with SMC surface finish workmanship standard.**

### ***E. Drawing and Dimensioning Symbols used:***

✖ This is called the "wild" symbol. It is used as a variable in part and drawing numbers to indicate that the dimensions or group of dimensions that define a specific part are found in a table on the drawing. In some cases it designates deviation from SMC standard.

△ This is the revision symbol. The current revision level of the drawing is found in the lower right corner of the title block. An un-revised drawing is revision level "0". Vendors should insure that the drawing they are using for fabrication indicates the correct revision level.

◇ This identifies a dimension that SMC considers a "Critical Dimension". This symbol is found on the drawing attached to that dimension. SMC will check this dimension thoroughly during incoming inspection and non-compliant parts will be rejected. There can be many of these callouts on a part.

⊕ Parting lines are designated using this symbol on casting drawings.

˜ A dimension value that is shown with a double tilde indicates an "approximate" dimension. It is sometimes used to indicate that this dimension is a variable, and cannot be determined accurately. It is most generally used to indicate that the dimension is not critical and some discretion is allowed the vendor.

y 18



## REVISIONS

Revision	Prepared by	Description
0	R. Redmond	Initial Release
1	R. Redmond	Updates & additions to Introduction, sections 4.0, 6.0, 9.0, assignment of form numbers to Appendix forms, updates of Appendix forms.
2	T. Moody	General Revisions
3	T. Moody	Updates & changes to Introduction, section 4.4
4	R. Redmond	Update to conform to ISO9001:2000
5	T. Moody	Clarified supplier requirements
6	T. Moody	Added design change language to 5.2. Updated packaging requirements and added weight restriction in section 6.1
7	J. Schoen	Revision is based on current practices
8	T. Moody	Removed specific contact names from Introduction. Updated Surface Finish conversion. Added Copy Exact language and form.
9	T. Moody	Revised Copy Exact language.
10	T. Moody	Added supplier quality system requirements and Supplier Self-Assessment.
11	T. Moody	Updated the SMC Quality Policy.
12	T. Moody	Made several wording changes deleted the Supplier Self-Assessment.
13	T. Moody	Removed LA Factory reference