



Supplier Quality Manual

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1. Bracalente Quality Policy

Bracalente Manufacturing Company (BMC) strives to work with our employees and our suppliers in an environment of continuous improvement to provide our customers with an optimized total cost solution for machined parts and assemblies. This total cost solution leverages Bracalente's domestic and global capabilities, including global inventory systems, to provide cost effective, quality parts, delivered on time to their customer's facilities.

2. Purpose

This manual describes the fundamental elements comprising the Bracalente Supplier Quality Management System. It was developed to effectively communicate the expected interaction between the Bracalente Manufacturing Group and our suppliers.

3. Scope

This manual applies to all suppliers that provide production material or who provide outsourced processes to Bracalente.

4. Expectations

The expectation is that when our suppliers accept a purchase order they will work in good faith to comply with the requirements of the purchase order along with the requirements as set forth in this manual. BMC will flow down any necessary requirements related to the processes, products, and services to be provided including the identification of relevant technical data (e.g., specifications, drawings, process requirements, work instructions). These requirements may include special, critical, or key characteristics. Suppliers shall maintain qualified personnel capable of manufacturing the parts to the requirements. BMC will validate the requirements with the supplier either through external communication and exchange of data or through on-site interaction to ensure requirements are met. Certain dictated suppliers from our customers must be used as part of our contractual obligation – no substitutes may be used. Suppliers are responsible to have a system to ensure counterfeit parts and raw materials cannot be used at any time. Materials and components used for assembly must match the specification as stated by our PO and/or drawing specifications. Our suppliers are an important part of the supply chain and are a key contributor to the conformity of the end product. The parts we supply are sometimes critical safety components and non-conformances can lead to injury or death. BMC holds itself to high ethical standards and we expect our suppliers to behave in a manner consistent with the BMC team.

5. Supplier Qualification Requirements

SQM Rev B

This Document is only valid at time of Printing. Check Revision at time of use.

Supplier qualification ensures that the supplier has the basic elements in place to:

1. Strategically manage the business,
2. Produce parts with consistent quality,
3. Deliver parts consistently on time
4. Become more efficient over time (therefore reducing cost over time)

Bracalente considers a culture of strategic management in combination with an AS9100 or ISO9001 quality system and a Lean Production system to be the ideal combination for its suppliers. Suppliers who are currently certified to AS9100 or ISO 9000 will be considered as meeting the qualification requirements. Suppliers who are not certified to AS9100 or ISO 9000 will be assessed via the Bracalente Supplier Quality Survey. The target is to have all of our suppliers develop and maintain a strong QMS. This assessment may take place as a self-assessment or through an on-site audit. Supplier performance including OTD and non-conforming material will be monitored and communicated with the supplier as needed.

6. Production (or Process) Approval Requirements

The disciplined use of the production (or process) approval process ensures the complete development of an effective manufacturing system for a part. Specifically that the:

- Supplier has the required information to consistently produce quality parts
- “part/process learning” happens before the start of production
- process is stable and is capable.
- material handling, packaging, and labeling requirements are fully in place and understood.

6.1 Part Approval Check Sheet

The Part Approval Check Sheet is issued with the initial purchase order to communicate all part qualification requirements relevant to a specific part or part family.

The initial part submittal must be accompanied by all elements identified on the Part Approval Check Sheet. Questions from the supplier for any element identified should be discussed with the relevant BMC commodity manager.

6.2 Sample Parts

The supplier must:

- Provide the number of sample parts as specified on the Part Approval Check Sheet.
- Take or make samples from actual production tooling and/or processes unless otherwise approved in writing. Where multiple production molds, cavities, dies, machines, etc., are utilized, samples are required from each.
- Complete the dimensional analysis and performance test reports as required, and provide it with the sample parts.
- All results must be traceable to the specific samples from which obtained.

6.3 Material Test Results

When requested, a qualified, independent third party must supply certified material test results.

6.4 Key Characteristics (KCs)

A key characteristic is any feature of a material, process, or part whose variation within or outside the specified requirement has a significant influence on product fit, form, function or other expected deliverable. KC's will be communicated to the supplier for special attention as needed.

6.5 Process Studies

For all key characteristics, an acceptable level of process capability or performance must be determined prior to production. Initial process studies, often referred to as short-term or preliminary studies, refer to assessments of the manufacturing process based on data collected over a short period of time, usually less than 30 days or from one operating run. The collection of this data should consider the type of process and production level. Data should be analyzed with control charts. Based on the capability study analysis and method for sampling, a minimum value of 1.33 Cpk is required. If acceptable process capability/performance cannot be obtained a corrective action plan and revised Control Plan must be developed by the supplier and approved by BMC. Acceptable interim controls require 100% inspection or other means agreed to. Such controls must remain in place until capability can be demonstrated. SPC will be used as needed or as dictated from our customer to ensure process stability is maintained.

Long-term process capability studies consist of data collected over a longer period of time or multiple production runs. The studies reflect all possible types of normal variation found in the manufacturing process, such as material, method, personnel, fixtures, equipment, tool wear, and environment. The period of time should be long enough to include all expected sources of variation. Process capability is defined when the control charts for this interval show the process to be in statistical control. Based on customer requirements BMC may require long term process capability data to be gathered and reported on.

6.6 Gage Repeatability and Reproducibility (Gage R&R)

Gage repeatability and reproducibility analyses measure the total repeatability and reproducibility of a gage system as a percentage of the total specification.

Gage repeatability and reproducibility analyses should be completed for all variable gages that are used to monitor key product or process characteristics. 20% Gage R&R is the maximum limit that is allowed.

6.7 Process Flow Diagram

The process flow diagram is a schematic representation of the current or proposed process flow. The supplier shall have a process flow diagram that clearly describes the production process steps and sequence beginning at material receipt through packaging and shipping. Where process steps include operations performed by outside sources, these steps need to be identified within the diagram.

6.8 Process Failure Mode and Effects Analysis (PFMEA)

The Process Failure Mode and Effects Analysis (PFMEA) is a preventive analytical technique to methodically study the cause and effects of potential failures in a process. The process is examined for all the ways in which a failure can occur. For each potential failure, an assessment is made of its effect on the system and its seriousness, and a review is made of the action being taken (or planned) to minimize the probability of failure or to minimize the effects of the failure. The FMEA is a living document and shall be revised as changes are made to the product or process.

6.9 Control Plan

The Control Plan is a detailed, process step-by- process step listing by which the part is to be manufactured, inspected, and tested. The control plan outlines the process monitoring and control methods that will be used to control characteristics.

6.10 Material Handling, Packaging, Labeling, Shipping

As part of the production approval process material handling during production processing and during shipping must be analyzed and defined. Part protection which effectively manages metal-to-metal contact and rust is to be developed. Containers which effectively deliver the parts to the customer's "point-of-use" need to be defined. When specified BMC formatted labeling which employs bar coding is to be used. When required material handling, packaging, labeling and shipping requirements will be forwarded with the purchase order.

7.0 Repeating Order Requirements

For specific orders ongoing quality requirements will exist such as:

- submittal of sample parts with a dimensional analysis
- submittal of material certifications
- submittal of heat treatment certifications
- submittal of plating certifications

These ongoing Quality requirements will be communicated through the purchase order.

8.0 Change Management

The culture of continuous improvement drives changes to the design of parts and processes. The supplier is expected to have effective systems in place to manage part or process design changes. The current P.O. and any documents supplied with the P.O. will completely define the part requirements. Any changes to the part requirements will be communicated through an updated P.O.

To manage part design changes the supplier is expected to check that:

- the part requirements listed on the current P.O. match the part requirements used to develop existing processes; and that,
- the revision level of any documents supplied with the current P.O. match the revision level of the documents used to develop the existing processes.

If the requirements do not match, a thorough review of the requirement changes should be undertaken and the appropriate adjustments should be made to the process. The outputs of the changed process should be validated against requirements.

To manage complete process changes at the supplier (for example, when parts are going to be processed on a different machine group) an updated PPAP must be submitted by the supplier to BMC. In these cases the supplier should contact their BMC commodity manager to coordinate the management of the process change.

9.0 Management of non-conforming product

BMC uses the 8D process to contain the issue, analyze the issue and drive improvements to the supplier's process. A sample of the BMC 8D form is attached. Initial responses to the 8D are expected in 4 weeks with a validation of the actions taken due with the receipt of the next order. In cases where the response will take longer the supplier should contact their BMC commodity manager to discuss. Responses to the 8D should include:

- A completed 8D form
- A process flow diagram marked to indicate the problem area
- An updated control plan
- A root cause analysis (5 why, fishbone, design of experiment,)

In cases where there is an ongoing, chronic quality issue BMC will request that the supplier submit a final inspection report with each order submitted, which will include a dimensional analysis, using a C=0 inspection plan at a AQL level of 1.0. Upon resolution of the issue and demonstration that the process is again capable this requirement will be dropped.

In critical cases BMC reserves the right to send quality personnel to the supplier to participate in the final inspection and to participate in the process improvement activities. Our customer maintains MRB authority and design control, so the supplier does not have the authority to make MRB decisions without approval from our customer. Our customer has design and development control, so any changes to the elements of design will be communicated to the supplier.

10.0 Supplier Performance Management

The Bracalente Business System is based on the principle of continuous improvement. As such Bracalente strives to work with our employees and our suppliers in an environment of continuous improvement to provide our customers with an optimized total cost solution for machined parts and assemblies. BMC will look for opportunities to work "in an extended team framework" with our supplier's to establish strategic capabilities valued by our joint customers. Therefore BMC seeks suppliers who also value working in an extended team framework. Supplier performance including OTD and non-conforming material will be monitored and communicated with the supplier as needed.

11.0 Records retention

The supplier shall contact Bracalente to determine the records retention policy for the parts being processed. Retain records for a minimum of 10 years or as dictated on our PO.

12.0 Right of Entry

The supplier shall grant access as needed to the business for the purpose of audits or inspections. These visits might include regulatory agencies or End Use Customers in addition to Bracalente staff. The time of the visit will be agreed upon by all parties.

Appendix



Part Approval Check Sheet

Supplier Name:	
Part Number:	
Part Name:	
Revision Level:	
Date:	

<u>Qualification Requirements</u>	<u>Comments</u>
<input type="checkbox"/> Sample Pieces Required:	
<input type="checkbox"/> 100% Dimensional Required (pcs):	
<input type="checkbox"/> Critical Characteristics Only (pcs):	
<input type="checkbox"/> Material Test Results (certs):	
<input type="checkbox"/> Process Capability Studies (CTQ's)	
<input type="checkbox"/> Control Plan and Flow Chart	
<input type="checkbox"/> Gauge R&R Studies	
<input type="checkbox"/> Process FMEA	
<input type="checkbox"/> Supply Sample of Shipping Method (Boxing, part protection, rustproofing, labeling)	
<input type="checkbox"/> Other	
<input type="checkbox"/> Other	

Key Characteristics:

Notes:

Initial Sample Inspection Report

Bracalente Manufacturing Company Inc.

Part Number	84350488	Part Description						Print Rev.						
		TOLERANCE	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4	SAMPLE 5	SAMPLE 6	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4	SAMPLE 5	SAMPLE 6
XYZ Corp.			1.5	1.6	1.6	1.8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4
CHARACTERISTIC		Max	1.7	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
3.2√		Max	.023	.017	.011	.018	.016	.016	.016	.016	.016	.016	.016	.018
[L] 0.03			.020	.019	.025	.017	.021	.021	.021	.021	.021	.021	.021	.021
[//] 0.03 B		+0.0/-0.1	1.05	1.06	1.06	1.05	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
∅		Max	1.4	1.7	1.4	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
∅ 143		± 0.2	143.12	143.02	143.08	143.04	142.91	142.91	142.91	142.91	142.91	142.91	142.91	142.91
∅ 13.5		± 0.25	13.54	13.49	13.49	13.55	13.52	13.52	13.52	13.52	13.52	13.52	13.52	13.52
∅ 13.5		± 0.25	13.53	13.49	13.49	13.54	13.51	13.51	13.51	13.51	13.51	13.51	13.51	13.51
∅ 13.5		± 0.25	13.54	13.51	13.50	13.53	13.54	13.54	13.54	13.54	13.54	13.54	13.54	13.54
∅ 13.5		± 0.25	13.54	13.48	13.50	13.54	13.51	13.51	13.51	13.51	13.51	13.51	13.51	13.48
∅ 13.5		± 0.25	13.52	13.49	13.50	13.55	13.52	13.52	13.52	13.52	13.52	13.52	13.52	13.50
∅ 13.5		± 0.25	13.54	13.51	13.50	13.54	13.53	13.53	13.53	13.53	13.53	13.53	13.53	13.50
∅ 13.5		± 0.25	13.53	13.50	13.49	13.56	13.49	13.49	13.49	13.49	13.49	13.49	13.49	13.49
∅ 13.5		± 0.25	13.52	13.49	13.48	13.54	13.54	13.54	13.54	13.54	13.54	13.54	13.52	13.52
[+/-] 0.2 @ A B			.03	.07	.04	.03	.08	.08	.08	.08	.08	.08	.08	.15
[+/-] 0.2 @ A B			.02	.05	.03	.05	.06	.06	.06	.06	.06	.06	.06	.22 @ .46 MMC
[+/-] 0.2 @ A B			.06	.11	.06	.10	.07	.07	.07	.07	.07	.07	.07	.19
[+/-] 0.2 @ A B			.13	.07	.07	.09	.11	.11	.11	.11	.11	.11	.11	.15
[+/-] 0.2 @ A B			.03	.06	.09	.04	.05	.05	.05	.05	.05	.05	.05	.16
[+/-] 0.2 @ A B			.05	.09	.03	.11	.04	.04	.04	.04	.04	.04	.04	.18
[+/-] 0.2 @ A B			.09	.10	.05	.12	.10	.10	.10	.10	.10	.10	.10	.26 @ .45 MMC
[+/-] 0.2 @ A B			.04	.09	.10	.10	.09	.09	.09	.09	.09	.09	.09	.23 @ .47 MMC
3.2√		Max	1.5	1.6	1.4	1.4	1.7	1.7	1.7	1.7	1.7	1.7	1.5	
∅ 61		± 0.25	61.03	61.05	61.01	60.98	60.99	60.99	60.98	60.98	60.98	60.98	60.99	60.99
Remove All Burrs and Sharp Edges			OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
30-37 HRC Per MAT4050			32	33	32	33	34	34	34	34	34	34	33	33
Cleanliness Per ES-A7003			OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Material: ASTM A576, 1045														
6.3√		Max	< 3.2	< 3.2	< 3.2	< 3.2	< 3.2	< 3.2	< 3.2	< 3.2	< 3.2	< 3.2	< 3.2	< 3.2
Inspected By			John Smith						1/1/2012					
Certification			Certification											

Bracalente Manufacturing Company Inc. Control and Containment Plan										
Control Plan Number/Rev.	Control Plan Number/Rev.	Control Plan Number/Rev.	Control Plan Number/Rev.	Control Plan Number/Rev.	Control Plan Number/Rev.	Control Plan Number/Rev.	Control Plan Number/Rev.	Control Plan Number/Rev.	Control Plan Number/Rev.	Control Plan Number/Rev.
84350488 - Rev. B	XYZ 84350488 - Rev. A	XYZ 84350488 - Rev. A	XYZ 84350488 - Rev. A	XYZ 84350488 - Rev. A	XYZ 84350488 - Rev. A	XYZ 84350488 - Rev. A	XYZ 84350488 - Rev. A	XYZ 84350488 - Rev. A	XYZ 84350488 - Rev. A	XYZ 84350488 - Rev. A
Revision	Core Team	Supplier Name	Supplier Name	Supplier Name	Supplier Name	Supplier Name	Supplier Name	Supplier Name	Supplier Name	Supplier Name
	John Smith	Bracalente Manufacturing Company	Bracalente Manufacturing Company	Bracalente Manufacturing Company	Bracalente Manufacturing Company	Bracalente Manufacturing Company	Bracalente Manufacturing Company	Bracalente Manufacturing Company	Bracalente Manufacturing Company	Bracalente Manufacturing Company
Process/ Operation Description	Machine, Device, Jig, Mfg. Tools	Product/ Process	Special Characteristic/ Class	Product/ Process Specification/ Tolerance	Evaluation Measurement Technique	Sample Size	Sample Freq.	Control Method	Reaction Plan	
	N/A									
Resolving Inspection										
C4		Supplier Incoming Material Verification		Aluminum 6061-T6	Composition Certification	1	Per Lot	Composition Certification	Quarantine and reject material.	
C4		Supplier Incoming Material Verification		146mm Stock	Caliper	1	Per Lot	Per Work Instruction OAL 1001	Quarantine and reject material.	
Production - OP 10, Slug										
-		First Piece Inspection		All applicable dimensions and features in accordance with manufacturing drawing.	As Appropriate	1	Prior to production	Inspection Method Sheet	Quarantine non conforming product, adjust process setup, and measure new part.	
C4		In-Process		146mm Stock	Caliper	1	Every 20 Minutes	In-process Inspection Sheet	Quarantine all parts produced following prior inspection, 100% inspect all quarantined parts.	
-		In-Process		1220mm Slug for Barfeeder	Tape Measure	1	Every 20 Minutes	In-process Inspection Sheet	Quarantine all parts produced following prior inspection, 100% inspect all quarantined parts.	
Production - OP 20, Turn										
-		First Piece Inspection		All applicable dimensions and features in accordance with manufacturing drawing.	As Appropriate	1	Prior to production	Inspection Method Sheet	Quarantine non conforming product, adjust process setup, and measure new part.	
A5		In-Process		Hold $10.2 \pm .025$ for Grind OP	Micrometer	1	Every 20 Minutes	In-process Inspection Sheet	Quarantine all parts produced following prior inspection, 100% inspect all quarantined parts.	
A7		In-Process		$\text{Ø } 143 \pm 0.2$	Caliper	1	Every 20 Minutes	In-process Inspection Sheet	Quarantine all parts produced following prior inspection, 100% inspect all quarantined parts.	
B4		In-Process		Hold $\text{Ø } 61.01 \pm 0.05$ for Mill OP	Bore Micrometer	1	Every 20 Minutes	In-process Inspection Sheet	Quarantine all parts produced following prior inspection, 100% inspect all quarantined parts.	



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Issue Date	Revision	By	New Rev.
5/19/2016	Initial release	K. Brown	A
6/22/18	Integrated AS9100D requirements into the manual.	D. Ardente	B
Approved	Name	Signature	Date
	David Borish	<i>David Borish</i>	6/22/18