



Groth Corporation
13650 N Promenade Blvd
Stafford, Tx 77477
Phone: 281-295-6800

Groth Continental Manufacturing Pvt Ltd
423/P/11, Mahagujarat Industrial Estate, Moraiya
Sarkhej-Bavla Road, Ahmedabad (GJ) 382213, India
Phone: +(91) 2717-619-345

SUPPLIER QUALITY ASSURANCE REQUIREMENTS (SQAR)

The following supplier quality assurance requirements, referenced by number on the Purchase Order, are an integral part of each order placed by Groth Corporation or Groth Continental Manufacturing Private Limited. Compliance with these requirements is a condition for product or material acceptance. Additional requirements may be identified in the text of the Purchase Order.

1. GENERAL REQUIREMENTS (applicable to all purchases)

- 1.1. Purchased products or materials shall be in compliance with all referenced specifications, drawings or special instructions. Any nonconformance must be reported to the Purchaser's Material Review Board for disposition, prior to shipment.
- 1.2. All certifications and documents shall be legible and reproducible and shall accompany the shipment. Certifications and documents shall be packaged with the shipment such that they are not lost or damaged in transit. Additionally, soft copies of all certifications and documents may be emailed to the Purchaser at the time of shipment.
- 1.3. No work shall be subcontracted to sub-tier suppliers without prior written approval of the Purchaser. Should such approval be granted, all quality requirements shall flow down to any approved sub-tier supplier.
- 1.4. Suppliers shall allow access to their facilities by the purchaser, the purchaser's customer, or regulatory organizations for on-site quality surveys or source inspections. (See Groth Purchase Order Terms and Conditions, form GEF-CPO-1001). These requirements and any advance notification deadlines shall be incorporated in the text of the purchase order. As required, all applicable customer purchase order documents shall be available to the customer source inspector at the supplier's facility. Acceptance at source by the purchaser or purchaser's customer does not preclude product from being rejected at later inspection points.
- 1.5. No major weld repair is permissible after heat treat processes. Major weld repair is defined by the applicable ASTM/ASME material specification as specified on the purchase order.
- 1.6. Materials or product of multiple heat numbers shall be segregated and identified by a legible heat number.
- 1.7. Fabricated, pressed, stamped or spun components must meet the acceptance criteria in GGEP-9409
- 1.8. Supplier shall notify the Purchaser of changes to; company location, senior, or quality management. As well as changes to; equipment, processes, or quality system that may impact product quality.
- 1.9. Suppliers shall engage in ethical behavior in all business practices and processes.
- 1.10. Groth Corporation prohibits the use of child labor.
- 1.11. All material to be radiation free.

2. INSPECTION AND REPORTING (applicable when referenced in the P.O.)

- 2.1. First Article Inspection (FAI) is required using QCF-1003-2. The completed First Article Inspection Report (FAIR) shall be supplied with the order.
- 2.2. Source inspection by the Purchaser or Purchasers' customer is required. Advise purchaser 72 hours prior to parts being available for inspection.

- 2.3. A Certificate of Conformance (C of C) shall be provided by the supplier attesting that the item(s) shipped are in compliance with all purchase order and applicable specification requirements. The C of C must be signed by the Seller's authorized Representative.

The following minimum information shall appear on the C of C:

- Purchaser's Purchase Order and line item number;
 - Quantity shipped;
 - Item part number or raw material specification;
 - Processing specification (as applicable);
 - Drawing number and revision (as applicable);
 - Item serial number (as applicable).
 - Batch and/or Cure Date (as applicable)
 - State the manufacturers trademark name when trademarked material is specified on the PO
- 2.4. A Certificate of Analysis (C of A) shall be provided for injection molded components made of Polyphenylene Sulfide (PPS) polymers. The C of A must clearly indicate the material manufacturer, material specification, batch number and test results.
- 2.5. When invoked on the purchase order the Country of Origin of the material is required and the supplier shall provide a Test Report or Test Certificate (TC) which declares the country of origin.

3. MATERIAL TEST REPORTS (applicable when referenced in the P.O.)

- 3.1. Furnish certified material test reports (chemical and mechanical) with country of melt from producing mill or processor.
- 3.2. Material Test Report to be marked as an EN 10204, 3.1 or 3.2 Inspection Certificate
- A. 3.1 inspection certificate is required for either of the following quality systems.
- i. The material manufacturer has an approved quality system and a PED certificate.
 - ii. The material manufacturer has an ISO quality assurance system of at least EN ISO 9001 type, certified by a competent body established as a legal entity within the European community, and when the scope of the certification includes relevant material types.
- B. If vendors do not meet the requirements outlined in bullet A, then the vendor must provide a signed 3.2 inspection certificate as provided by Groth Corporation for each Purchase Order (GQCF 1003-3). Direct inspection of material testing and results is required by the company's delegated inspector prior to shipment.
- C. It is acceptable to transfer test results from a material test report to a 3.1 or 3.2 inspection document as long as the results are not modified or changed.
- 3.3. Hardness in BHN shall be included on Material Test Report.
- 3.3.1. Hardness may be reported in other units of measure provided it converts to BHN. Reference MP-7002 for conversions.
- 3.4. NACE hardness requirements shall be per MP-7002, Paragraph 4.3.3 and Appendix B. (Reference ISO-15156 & MRO-175)
- 3.5. Carbon Steel main pressure bearing components: Charpy Impact testing required per ASTM A370. Impact testing shall be performed at -20°F (-28.9°C). Bending rupture energy shall be no

less than 27 Joules (20 ft-lbs). Results can be recorded on the MTR or in a separate impact test certificate.

- 3.6. Carbon Steel main pressure bearing components: Tensile results for elongation shall be no less than 14% when carried out by a standard procedure.

4. CLEANING, HANDLING AND PACKAGING (applicable to all purchases)

- 4.1. All product and material shall be suitably processed, packed and protected to prevent damage during handling and shipment.
- 4.2. All machined parts shall be free of chips, machining fluid, dirt or grease.
- 4.3. Carbon steel machined parts shall be protected with a *light coating* of anti-rust oil (Mobilarma 245, Castrol Rustilo DWX32, DW904 or DW902, Ensis DW 1255, Iconol Rust Stop, WD 40, Cortec Vp CI 377)
- 4.4. Threaded, machined, or polished surfaces must be protected from scratches, nicks or dents, during production and while in transit.
- 4.5. Parts furnished by Purchaser for special processing must be inspected upon receipt for surface damage. Supplier shall advise Purchaser of any damage, prior to performing work.
- 4.6. For components with flatness requirements, the components shall be packaged such that tolerances are not compromised in transit.
- 4.7. If the Purchase order requires special testing reports (Radiographic inspection, inter granular corrosion test, Magnetic Particle, Ultra-sonic test, Impact, Liquid Penetrant, Hydro or other special testing), the supplier shall segregate and tag to clearly identify product which has been tested and shall not mix with non-tested product.

5. STEEL CASTINGS (applicable to all castings)

5.1. First Articles of all steel castings:

5.1.1. Liquid Dye Penetrant Testing is required on 100% of Machined and Cast surfaces. Penetrant testing shall be completed by qualified personnel per ASTM E165, Standard Practice for Liquid Penetrant Examination for General Industry.

5.1.1.1. Machined Surface acceptance criteria is per ASTM A903 Level II.

5.1.1.2. Cast Surface acceptance criteria is per ASTM A903 Level IV (equivalent to ASME B16.34 appendix III)

5.1.2. Radiography will be conducted per ASTM E94 on 100% of the casting surfaces.

5.1.2.1. Acceptance criteria per ASME B16.34-2004/ASTM E-446, Table I-1

5.1.2.2. Supplier shall provide RT report and films with the order.

5.1.3. Major weld repair is not permitted on First Article castings.

5.2. Production steel castings:

5.2.1. For all production castings; weld repair and weld repair inspection should adhere to API 20A specification section 5.6.7 for a CSL 2 casting.

5.2.1.1. Weld repair shall be performed using weld procedures qualified in accordance with ASME Section IX, AWS D1.1, ASTM A488 or ISO 9606.

5.2.1.2. Weld repair shall only be performed by welders or welding operators qualified in accordance with the standards in section 5.2.1.1.

- 5.2.1.3. Welding consumables shall conform to the manufacturers specification and the supplier shall have a written procedure for the storage and control of welding consumables.
- 5.2.1.4. Weld repaired product must be subjected to heat treatment after weld repair.
- 5.2.1.5. After weld repair is completed, the product shall be re-examined by the NDE method that originally exposed the defect. Weld repairs made as a result of radiographic examination shall be radiographed after welding.
- 5.2.1.6. Weld repair is not permitted on duplex stainless steel.
- 5.2.1.7. Weld repair shall be documented on a pictogram showing the location of the weld repair.
- 5.2.1.8. After weld repair is completed, the casting will be shot blasted by the Supplier to ensure that a smooth even visual appearance is achieved per GGEP-9406 “Acceptance Criteria for Steel Castings”.
- 5.2.1.9. Steel castings shall comply with the acceptance criteria in GGEP-9406 “Acceptance criteria for Steel Castings”.

5.2.2. Heat number stamping shall meet the requirements of GQCF-1003-4

6. ALUMINUM CASTINGS

6.1. First Articles of all aluminum castings:

- 6.1.1. Liquid Dye Penetrant Testing is required on 100% of Machined and Cast surfaces. Penetrant testing shall be completed by qualified personnel per ASTM E165.
 - 6.1.1.1. Machined Surface acceptance criteria is per ASTM A903 Level II.
 - 6.1.1.2. Cast Surface acceptance criteria is per ASTM A903 Level IV (equivalent to ASME B16.34 appendix III)
- 6.1.2. Radiography will be conducted per ASTM E94 on 100% of the casting surfaces.
 - 6.1.2.1. Acceptance criteria per ASTM E155, Level 3 or better.
 - 6.1.2.2. Supplier shall provide RT report and films with the order.
- 6.1.3. Major weld repair is not permitted on First Article castings.

6.2. Production aluminum castings:

- 6.2.1. Aluminum castings shall comply with the acceptance criteria in the following documents based on the applicable casting process:
 - 6.2.1.1. GGEP-9407 “Acceptance criteria for Aluminum Castings”.
 - 6.2.1.2. CGEP-9408 “Acceptance criteria for Aluminum Die Cast Castings”
 - 6.2.1.3. Heat number stamping shall meet the requirements of GQCF-1003-4
 - 6.2.1.4. Painting or Coating of aluminum castings to cover or hide defects is not allowed.

7. FIBERGLASS / PLASTIC VALVES (applicable to all fiberglass and plastic valves)

- 7.1. All Fiberglass or Plastic Valves requiring painting will have a uniform smooth coat of paint, free of chips, scratches, and damage.

- 7.2. Pressure testing is required. The testing will be done in accordance with the provided Purchaser's testing procedure. The procedure will be supplied with the purchase order.
- 7.3. Valves made of Furan which will be CE marked per the Pressure Equipment Directive (PED) shall be manufactured per the requirements of GQCI-8000.

8. SPECIAL REQUIREMENTS (applicable when referenced in the P.O.)

- 8.1. Steel and aluminum castings to be pressure tested and stamped "P" for Pneumatic or "H" for Hydro near the heat number and a test certificate of pressure test is required. Reference Table 1 for applicable models, test media, pressures and durations.
 - 8.1.1. Prior to performing pneumatic testing, liquid penetrant examination shall be performed on machined surfaces. Perform LP examination per ASTM E165 using the acceptance criteria per ASTM A903 Level II.
- 8.2. All stainless steel castings to be Acid Pickled per ASTM A380. Pickling shall be performed after machining and before shipment to the company.
- 8.3. Radiographic inspection, when invoked by the purchase order, shall be done in accordance with GQCI-5004 Radiographic Examination Procedure and radiography reports with films shall be supplied with the order.
- 8.4. Steel Flame Arrester castings to be pressure tested and stamped "H" for Hydro or "P" for Pneumatic near the heat number and a test certificate is required. Reference Table 2 for applicable models, test media, pressures and durations.
- 8.5. When the purchase order requires "US Material Only", the supplier shall supply product where the country of melt is the United States. The Material Test Reports shall clearly identify the country of melt is the United States.

9. KEY CHARACTERISTICS (reference QCI-1060)

- 9.1. The supplier shall measure, control and report manufacturing data on the variation of Key Characteristics as defined in the Process Control Document (PCD).
- 9.2. Key characteristics will be identified on company drawings with the (K) symbol and the process for measuring variation will be specified in a Process Control Document.
- 9.3. The company shall provide the supplier a revision controlled PCD with the purchase order. The PCD at a minimum defines the part number, key characteristic and method of measuring and monitoring the variation of the Key Characteristic.
- 9.4. The supplier is responsible for providing the company with the graphical representation of the process variation as defined in the Process Control Document. For example, an XBar and R chart may be specified and therefore supplied with each shipment. Soft copies of the data are required.
- 9.5. In no way does the inclusion of Key Characteristics absolve the supplier of the responsibility to comply with all drawing dimensions, notes and requirements.



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Table 1: Pressure Testing Requirements by Product Model

Product Models (all sizes unless specified)	Industrial (shell testing REQUIRED for all materials)	Upstream (shell test <u>not</u> required)	Test Pressure	Duration	Approved Methods:
12E	X		45 psig Pneumatic	3 minutes	1.) Fully submerge product under water for the duration of the test or 2.) Leak Detector completely covering external surfaces for the duration of the test
12F	X				
13T	X				
13S	X				
14E	X				
14F	X				
17F	X				
16F	X				
1660	X				
L11E	X				
61T	X	X (8" aluminum only)			
All Flame Arrester bases	X		Reference table 2		
12-TH		X			
12-TL		X			
10E		X			
10L		X			
8" and 12" L22E		X			
Adapters (Round & Y-Type)		X			



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Table 2: Pressure Test Requirements for machined flame arrester castings

Model	Material of Construction	Test Pressures	Duration	Approved Methods
7618	Steel	45psig pneumatic	3 minutes	1.) Fully submerge product under water for the duration of the test or 2.) Leak Detector completely covering external surfaces for the duration of the test
7628	Steel	45psig pneumatic		
7618	Aluminum	45psig pneumatic		
7628	Aluminum	45psig pneumatic		
76V	Steel	45psig pneumatic		
76V	Aluminum	45psig pneumatic		
			3 minutes	1.) Fill casting entirely with water and pressurize to the required test pressure, monitor the casting for leaks during the entire duration of the test
76C	Steel	160psig hydro		
76C	Aluminum	160psig hydro		
76T	Steel	160psig hydro		
77E	Steel	160psig hydro		
76L	Steel	160psig hydro		
76L	Aluminum	160psig hydro		



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GQCF-1003-1 REVISION CONTROL

Rev.	Description	Date	Approved
A	Separated the CDC and Groth/GCMPL SQAR's. This is the initial release of the Groth/GCMPL SQAR document. Added requirement for Radiography per GQCI-3000	4/5/17	Shane Bacon
B	Changed 9.2 and deleted the word "steel". Deleted clause 9.5.	8/3/2017	Shane Bacon
C	Added para 7.2.2. Fixed typo in para 3.4. Changed First article report to QCF-1003-2. Changed Director of Supply Chain to Tom Bueche	2/8/2018	Shane Bacon
D	Added requirements in section 1.7, 5.1.3, 5.2.2, 7.1.3, 7.2.1.3	12/18/2018	Shane Bacon
E	Updated bullet 3.3 to include Hardness in other units of measure. Revised 5.1.2, Deleted section 6.0, revised 7.1.2	3/15/2019	Shane Bacon
F	Added rust preventer Cortec Vp CI 377, added table 1 & 2. Revised 8.1, 8.2 and 8.5 to reference tables 1 & 2	7/11/2019	Shane Bacon

ACKNOWLEDGEMENT			
Department:	Name:	Signature:	Date:
Vice President, Global Supply Chain	Tom Bueche	Tom Bueche	7/16/2019
Groth Quality Manager	John Fowler	John Fowler	7/11/2019
GCMPL Quality Manager	Satyam Gupta	Satyam Gupta	7/12/2019
GCMPL Supplier Quality Engineering Manager	Ashadkhan Pathan	Ashadkhan Pathan	7/11/2019
Groth Supplier Quality Engineering	Bradley Davis	Bradley Davis	7/12/2019