



R9.2-1 - Cast Component Specification

INTRODUCTION

Welcome to Finish Thompson, Incorporated

Finish Thompson, Incorporated (FTI) specializes in providing fluid transfer pumps and recycling systems for the fluid handling and environmental markets.

Introduction to Manual

In today's manufacturing environment, product that is found to be non-conforming at receiving, or during production, causes serious disruptions of the production and shipping schedules, resulting in high production costs. Even the best receiving inspection program cannot detect all defective material. FTI requires suppliers to control the quality of material shipped to FTI, so that FTI can minimize inspections when the product is received.

This manual describes FTI's expectations for its suppliers in order to ensure that purchased material meets FTI's requirements.

Scope

This information applies to all suppliers who have interest in doing business with FTI. It also applies to FTI's outsourced partners or subsidiaries. Suppliers agree to be bound by and to comply with the terms of the Quality Manual. Acknowledgement of purchase orders, including without limitation, by beginning performance of the work called for by this purchase order, shall be deemed acceptance of this manual. The terms set forth in this manual take precedence over any alternative terms in any other document connected with this transaction.

FTI Quality Policy

Beginning with a clear definition of customers' expectations, we strive to consistently meet or exceed them. We adhere to all applicable standards and customer specific requirements and endeavor to provide processes that ensure we achieve this in order to build a robust and world class business.

1.0 MATERIAL SPECIFICATION FOR DUCTILE IRON CASTINGS

1. SCOPE

- 1.1 This specification covers the manufacture of ductile iron housings, motor adapters, clamp rings, drive hubs feet or similar parts.
- 1.2 The requirements of this specification are in addition to the requirements defined on the part drawing. In case of conflict between this specification and the part drawing, the requirements on the drawing take precedence.

2. REFERENCE DOCUMENT

- 2.1 The following documents of issue in effect on the date of casting purchase form a part of this specification to the extent referenced in this material specification.

Specification Number	Description
ASTM A 247	Evaluating the Microstructure of Graphite in Iron Castings
ASTM A 536	Ductile Iron Castings
ASTM A 802	Steel Castings, Surface Acceptance Standards, Visual Examination
ASTM A 834	Common Requirements for Iron Castings for General Industrial Use
ASTM E 8	Tension Testing of Metallic Materials
ASTM E 689	Reference Radiographs for Ductile Iron Castings
ASTM E 1030	Radiographic Examination of Metallic Castings
ISO 8062-3	Geometrical product specifications (GPS) – Dimensional and geometrical tolerances for molded parts – Part 3: General dimensional and geometrical tolerances and machining allowances for castings

3. MECHANICAL PROPERTIES

- 3.1 Separately cast test blocks shall be used to qualify each production lot. The separately cast Keel blocks or Y blocks shall be manufactured and poured in accordance with ASTM A 536, Section 6. The size of the Y blocks shall represent the section thickness of the castings unless otherwise noted.
- 3.2 The test blocks shall be subjected to the same thermal treatment as the castings they represent. Test specimens removed from the coupons must conform to the requirements of the specified grade defined in Table 1 of ASTM A 536.
- 3.3 The tension specimens shall be machined from the coupons at the designated locations and shall meet the dimensional requirements defined in ASTM A 536
- 3.4 The tension specimens may also be cut from castings to qualify each lot. The mechanical properties of the specimens cut from the castings shall meet the same requirement as the separately cast coupons.
- 3.5 The tensile specimens shall be tested in accordance with ASTM E 8. The number of tests and retests shall be in accordance with ASTM A 536, Section 10.

- 3.6 Brinell hardness tests shall be conducted in accordance with ASTM E 10 at the location defined on the part drawing. After enough material has been removed from the casting surface to ensure representative hardness reading, the parts shall have a Brinell hardness of 156 to 217.
- 3.7 When requested by purchaser, process capability studies shall be conducted to show that the hardness, tensile strength, yield strength and percent elongation requirements can be met. A minimum of 30 test specimens from separately cast test coupons or form castings shall be used. The data shall provide a Cpk value for each property and must be 1.33 or larger.

4. HEAT TREATMENT

- 4.1 The casting shall be in the as-cast condition or may be given a normalize and temper to meet the requirements for Grade 65-45-12, unless a special heat treatment is specified on the part drawing or purchase order.
- 4.2 In order to minimize distortion after machining of the parts in the as-cast condition the castings may be stress relieved

5. COMPOSITION

- 5.1 The chemical composition of the ductile iron is subordinate to the mechanical properties, but the typical chemical composition of unalloyed iron should conform to the following ranges:

Element	Weight Percent
Total Carbon	3.20 – 4.10
Silicon	1.80 – 3.00
Manganese	0.10 – 1.00
Phosphorus	0.05 Max.
Sulfur	0.02 Max.

- 5.2 Individual Foundries may produce narrower ranges than those shown in order to provide the specified mechanical properties. The spheroidal graphite structure is produced by alloying the molten iron with small amounts of one or more elements such as magnesium or cerium or both.
- 5.3 A modified chemical composition may also be agreed upon with the supplier.
- 5.4 A lot of castings is defined in accordance with ASTM A 834, Section 8
- 5.5 The chemical composition shall be determined by the supplier by analyzing samples produced at the time the castings are poured or from samples taken from the castings. The sampling methods for determining composition shall be conducted in accordance with ASTM A 834.

6. QUALITY REQUIREMENTS

- 6.1 Casting quality and inspection shall conform to the appropriate quality requirements of ASTM A 536 and A 834 and any other requirements specified on the part drawing or purchase order. Castings shall be free from shrinkage defects, hot tears, cracks, blow holes, foreign matter and other injurious discontinuities and must not disclose such defects during machining or subsequent testing.
- 6.2 Porosity of any type is unacceptable on cast or machined surfaces exposed to FTI roto-lining process. Areas of highest concern can be seen in Appendix A. A typical lined housing can be seen in Appendix B
- 6.3 Porosity on UC Outer Drive Hubs, motor adapters, feet and clamp rings is prohibited on machined surfaces.
- 6.4 Casting surfaces shall be reasonably smooth and shall be free of scale and burned on sand. Runners, risers, fins and other such cast-on pieces shall be removed and dressed down to blend with the normal profile of the casting surface. The surface discontinuities shall be evaluated in accordance with and meet the visual acceptance standards defined in ASTM A 802, Level 3 for resin sand or shell mold and Level 4 for green sand processes. Internal surfaces of ductile iron housings shall be evaluated in accordance with and meet visual acceptance standards defined in ASTM A 802 for gas porosity C1.
- 6.5 Casting dimensional tolerance grades shall be in accordance with ISO 8062-3, grade 10 for resin sand or shell mold castings or grade 12 for green sand operations.
- 6.6 Casting geometric tolerance grades shall be in accordance with ISO 8062-3, grade 5 for resin sand or shell mold castings and grade 6 for green sand operations.
- 6.7 Required machining allowance grades shall be in accordance with ISO 8062-3, grade F for resin sand or shell mold castings and grade G for green sand operations.
- 6.8 Radiographic inspection of prototype and pre-production parts shall be in accordance with ASTM A 834 supplementary requirement S2. The radiographic evaluation shall be conducted in accordance with ASTM E 1030, E 689, E 446, and E186. The acceptance criteria shall be defined on the part drawing. This test method shall be used to qualify the manufacturing process prior to production release. Any significant change to the manufacturing process requires requalification of the parts. As an alternative method of establishing internal soundness, representative castings may be destructively sectioned at multiple locations and the results submitted to Finish Thompson Quality Department for approval.
- 6.9 Casting dimensions shall meet the part drawing requirements
- 6.10 The microstructure of the castings shall be evaluated in accordance with ASTM A 247 and shall consist of at least 85% spheroidal graphite conforming to Type I and II. The nodule count shall be greater than 150/mm² in all sections less than 2 inches. The matrix shall consist of ferrite or ferrite and pearlite and the material shall not contain greater than 2% carbide or steadite. The microstructure should be uniform so as not to impact the machineability.
- 6.11 The supplier shall afford Finish Thompson Quality Department representatives all reasonable access to their facilities and the inspection, process or test reports necessary to confirm that the material is being furnished in accordance with this specification and associated procurement requirements.

6.12 Castings may only be machined with a water-soluble coolant. Oil-based coolant or coating is prohibited.

7 REPAIR

7.1 Castings shall not be repaired without the approval of Finish Thompson. If specific permission is granted, any repair must be conducted in accordance with a qualified repair procedure and performed by qualified personal.

7.2 Repairs using non-metallic filler material is prohibited on all UC Housings

8 IDENTIFICATION

8.1 Unless otherwise specified, all castings shall be identified with a part identification number per part drawing and heat lot. Additional requirements shall be in accordance with the part drawing and/or purchase order. The markings must be stamped into the casting. Location will be defined on the part drawing.

9 Certification

9.1 A certificate stating that each lot has been sampled, tested and inspected in accordance with this specification shall be provided by the supplier. The certification must include tensile properties for yield strength, ultimate strength, elongation and hardness as well as certificate of microstructure analysis. Where noted on part drawing Declaration of Conformity in accordance with ISO/IEC 17050-1 must be provided with each purchase order.



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2.0

MATERIAL SPECIFICATION FOR ALUMINUM DIE CASTINGS

1. SCOPE

- 1.1 This specification covers the manufacture of aluminum die cast liquid chambers, piston plates, center sections, drum pump components or similar parts
- 1.2 The requirements of this specification are in addition to the requirements defined on the part drawing. In case of conflict between this specification and the part drawing, the requirements on the drawing take precedence.

2. REFERENCE DOCUMENT

- 2.1 The following documents of issue in effect on the date of casting purchase form a part of this specification to the extent referenced in this material specification.

Specification Number	Description
BS EN 1706	Aluminum and Aluminum Alloys – Castings – Chemical composition and mechanical properties
ISO 8062-3	Geometrical product specifications (GPS) – Dimensional and geometrical tolerances for molded parts – Part 3: General dimensional and geometrical tolerances and machining allowances for castings
ASTM E 8	Tension Testing of Metallic Materials
ASTM E23	Standard Test Methods for Notched Bar Impact of Metallic Materials
ASTM B85/85M	Standard Specification for Aluminum – Alloy Die Castings
ASTM E 3061	Standard Test Method for Analysis of Aluminum and Aluminum Alloys by Inductively Coupled Plasma Atomic Emission Spectrometry
ASTM B 179	Standard Specification for Aluminum Alloy in Ingot and Molten Forms for Castings from all Casting Processes
	NADCA Product Specification Standard for Die Castings

3. COMPOSITION

- 3.1 The material grade should be LM24 in accordance with BS EN 1706 or A380 in accordance with ASTM B 179.
- 3.2 The typical chemical composition of aluminum alloy should conform to the following ranges for LM24:

Element	Weight Percent
Aluminum	Balance
Copper	3.0 – 4.0
Magnesium	0.3 Max.
Iron	1.3 Max.
Tin	0.2 Max.
Nickel	0.5 Max.
Zinc	2.9 Max.
Manganese	0.5 Max.
Silicon	7.5 – 9.5
Trace	0.5

- 3.3 The typical chemical composition of aluminum alloy should conform to the following ranges for A380:

Element	Weight Percent
Aluminum	Balance
Copper	3.0 – 4.0
Magnesium	0.1 Max.
Iron	2.0 Max.
Nickel	0.5 Max.
Zinc	3.0 Max.
Manganese	0.5 Max.
Silicon	7.5 – 9.5
Trace	0.50

- 3.4 Individual Foundries may produce narrower ranges than those shown in order to provide the specified mechanical properties.
- 3.5 A modified chemical composition may also be agreed upon with the supplier.
- 3.6 A lot of castings is defined per ASTM B85/B85M Section 7, Clause 7.2.1
- 3.7 The chemical composition shall be determined by the supplier by analyzing samples produced at the time the castings are poured or from samples taken from the castings. The sampling methods for determining composition shall be conducted in accordance with ASTM E 34, E607 E1251, or EN 14242.
- 3.8 Sampling shall be performed in accordance with ASTM B85/85M Section 8, Clauses 8.1.1.

4. MECHANICAL PROPERTIES

- 4.1 Mechanical properties of the aluminum alloy are subordinate to the chemical composition of the alloy.
- 4.2 Mechanical properties are to be in accordance with ASTM B85/85M Annex X2.
- 4.3 FTI reserves the right to require mechanical test reports of tensile bars cast in the same press(es) as components produced for FTI. The chemical composition of test pieces must align with chemical composition of components produced for FTI.

5. QUALITY REQUIREMENTS

- 5.1 Casting quality and inspection shall conform to the appropriate quality requirements of ASTM B85/85M and any other requirements specified on the part drawing or purchase order. Castings shall be free from shrinkage defects, hot tears, cracks, blow holes, foreign matter and other injurious discontinuities and must not disclose such defects during machining or subsequent testing.
- 5.2 Casting surfaces shall be reasonably smooth and shall be free of scale. Runners, risers, fins and other such cast-on pieces shall be removed and dressed down to blend with the normal profile of the casting surface. The surface discontinuities shall be evaluated in accordance with and meet the visual acceptance standards defined in ASTM A 802, Level <1.
- 5.3 Porosity of any type is unacceptable on machined surfaces. Examples can be seen in Appendix A.
- 5.4 Radiographic inspection of prototype and pre-production parts shall be in accordance with NADCA Product Specifications for Die Castings Section 7, Porosity. Acceptance shall be as defined on part drawing. This test method shall be used to qualify the manufacturing process prior to production release. Any significant change to the manufacturing process requires requalification of the parts. As an alternative method of establishing internal soundness, representative castings may be destructively sectioned at multiple locations and results submitted to Finish Thompson Quality Department for approval.
- 5.5 Casting dimensions shall meet the part drawing requirements.
- 5.6 Casting dimensional tolerance shall be in accordance with ISO 8062-3, per table:

Dimension	Grade
<50 mm	6
50 – 180 mm	7
180 – 500 mm	8
>500 mm	9

- 5.7 Casting geometric tolerance grades shall be in accordance with ISO 8062-3, grade 3.
- 5.8 Machined dimensions shall meet the part drawing requirements.
- 5.9 Required machining allowance grades shall be in accordance with ISO 8062-3, grade C.
- 5.10 The supplier shall afford Finish Thompson Quality Department representatives all reasonable access to their facilities and the inspection, process or test reports necessary to confirm that

the material is being furnished in accordance with this specification and associated procurement requirements.

6. REPAIR

6.1 Repair of castings is prohibited.

7. IDENTIFICATION

7.1 Unless otherwise specified, all castings shall be identified with a part number per part drawing and date code. Additional requirements shall be in accordance with the part drawing and/or purchase order. The markings must be cast into the casting. Location will be defined on the part drawing.

8. Certification

8.1 A certificate stating that each lot has been sampled, tested and inspected in accordance with this specification shall be provided by the supplier. The certification must include chemical composition. Where noted on part drawing, a Declaration of Conformity in accordance with ISO/IEC 17050-1 must be provided with each purchase order. Certification of mechanical testing required only at Finish Thompson request.



FINISH THOMPSON INC.

3.0

MATERIAL SPECIFICATION FOR ALUMINUM SAND AND GRAVITY CASTINGS

1. SCOPE

- 1.1 This specification covers the manufacture of aluminum gravity cast manifolds, explosion-proof motor housings or similar components
- 1.2 The requirements of this specification are in addition to the requirements defined on the part drawing. In case of conflict between this specification and the part drawing, the requirements on the drawing take precedence.

2 REFERENCE DOCUMENT

- 2.1 The following documents of issue in effect on the date of casting purchase form a part of this specification to the extent referenced in this material specification.

Specification Number	Description
BS EN 1706	Aluminum and Aluminum Alloys – Castings – Chemical composition and mechanical properties
CSA 22.2 No.145-11	Electric motors and generators for use in hazardous (classified) locations
ISO 8062-3	Geometrical product specifications (GPS) – Dimensional and geometrical tolerances for molded parts – Part 3: General dimensional and geometrical tolerances and machining allowances for castings
ASTM B 179	Standard Specification for Aluminum Alloy in Ingot and Molten Forms for Castings from all Casting Processes
ASTM B 985	Standard Practice for Sampling Aluminum Ingots, Billets, Castings and Finished or Semi-Finished Wrought Aluminum Products for Compositional Analysis
ASTM A 802	Steel Castings, Surface Acceptance Standards, Visual Examination
ANSI H35.1/H35.1M	American National Standard Alloy and Temper Designation Systems for Aluminum 2017

3 COMPOSITION

- 3.1 The material grade should be LM25 in accordance with BS EN 1706 or A356 in accordance with ASTM B 179.
- 3.2 The typical chemical composition of aluminum alloy should conform to the following ranges for A356:

Element	Weight Percent
Aluminum	Balance
Copper	0.2 Max.
Magnesium	0.45 Max.
Iron	0.2 Max.
Titanium	0.2 Max.
Zinc	0.1 Max.
Manganese	0.1 Max.
Silicon	6.5 – 7.5
Trace	0.15

- 3.3 The typical chemical composition of aluminum alloy should conform to the following ranges for LM25:

Element	Weight Percent
Aluminum	Balance
Copper	0.2 Max.
Magnesium	0.45 Max.
Iron	0.2 Max.
Titanium	0.2 Max.
Zinc	0.1 Max.
Manganese	0.1 Max.
Silicon	6.5 – 7.5
Trace	0.15

- 3.4 Individual Foundries may produce narrower ranges than those shown in order to provide the specified mechanical properties.
- 3.5 A modified chemical composition may also be agreed upon with the supplier.
- 3.6 Sampling shall be per ASTM B26/B26M Section 7 Clause 7.1.1, 7.1.2, and 7.1.3.
- 3.7 The chemical composition shall be determined by the supplier by analyzing samples produced at the time the castings are poured or from samples taken from the castings. The sampling methods for determining composition shall be conducted in accordance with ASTM B 985.

4 MECHANICAL PROPERTIES

- 4.1 The mechanical properties of the aluminum alloy shall be per ASTM B 26/B 26 M, Table 2 for A356 T6 aluminum alloy.
- 4.2 Separately cast test specimens shall be used to qualify each production lot. The separately cast test specimens shall be manufactured, poured and prepared for testing in accordance with ASTM B 26/B 26 M, Section 13, clause 1.
- 4.3 The test specimens shall be subject to the same thermal treatment as the castings they represent.
- 4.4 The test specimens shall be tested in accordance with B 557/B 557 M. The number of tests and retests shall be in accordance with ASTM B 26/B 26 M, Section 12.
- 4.5 Brinnell hardness tests shall be conducted in accordance with ASTM B 557/557 M at locations defined on the part drawing. After enough material has been removed from the casting surface to ensure representative hardness reading, the parts shall have a Brinnell hardness of 70.
- 4.6 When requested by purchaser, process capability studies shall be conducted to show that the hardness, tensile strength, yield strength and percent elongation requirements can be met. A minimum of 30 test specimens from separately cast test coupons shall be used. The data shall provide a Cpk value of each property and must be 1.33 or larger.

5 HEAT TREATMENT

- 5.1 Temper must be T6 per ANSI H35.1/H35.1M

6 QUALITY REQUIREMENTS

- 6.1 Casting surfaces shall be reasonably smooth and shall be free of scale. Runners, risers, fins and other such cast-on pieces shall be removed and dressed down to blend with the normal profile of the casting surface. The surface discontinuities shall be evaluated in accordance with and meet the visual acceptance standards defined in ASTM A 802, Level 2. For castings identified on the part drawing as "ATEX" components, the surface discontinuities shall be evaluated in accordance with and meet the visual acceptance standards defined in ASTM A 802, Level <1.
- 6.2 Casting dimensions shall be per part drawing.
- 6.3 Casting dimensional tolerance grade shall be in accordance with ISO 8062-3, grade 7.
- 6.4 Casting geometric tolerance grades shall be in accordance with ISO 8062-3, grade 4.
- 6.5 Machining dimensions shall be per part drawing.
- 6.6 Required machining allowance grades shall be in accordance with ISO 8062-3, grade E.
- 6.7 AODD Manifolds must pass 125 psi hydrostatic test as defined on part drawing. As an alternative, all parts from production lot may undergo impregnation process per repair section of this document.
- 6.8 Porosity of any type is unacceptable on machined surfaces. Examples can be seen in Appendix A
- 6.9 Casting must be in accordance with CSA C22.2 No. 145-11 where noted on part drawing.

6.10 The supplier shall afford Finish Thompson Quality Department representatives all reasonable access to their facilities and the inspection, process or test reports necessary to confirm that the material is being furnished in accordance with this specification and associated procurement requirements.

7 REPAIR

7.1 For components requiring hydrostatic testing, repair can be made by impregnation process utilizing Abnen 8690 or Loctite Resinol 90C acrylic sealant. Alternative sealants may be used with prior authorization of Finish Thompson Quality Department. Alternative sealants must not contain silicone. Prior to authorizing alternate material, an affidavit must be acquired along with a material specification showing the material will withstand maximum working temperature of the aluminum alloy and does not contain silicone.

8 IDENTIFICATION

8.1 Unless otherwise specified, all castings shall be identified with a part number and date code per part drawing. Additional requirements shall be in accordance with the part drawing and/or purchase order. Location will be defined on the part drawing.

9 CERTIFICATION

9.1 A certificate stating that each lot has been sampled, tested and inspected in accordance with this specification shall be provided by the supplier. The certification must include chemical composition, hydrostatic and mechanical test results for yield and ultimate strength, hardness and elongation. Where noted on part drawing Declaration of Conformity in accordance with ISO/IEC 17050-1 must be provided with each purchase order.

FINISH THOMPSON INC.

4.0

MATERIAL SPECIFICATION FOR STAINLESS STEEL INVESTMENT CASTINGS

1. SCOPE

- 1.1 This specification covers the manufacture of stainless-steel drum pump heads, impeller housings, diffusers, flanges, impellers and discharge nozzles.
- 1.2 The requirements of this specification are in addition to the requirements defined on the part drawing. In case of conflict between this specification and the part drawing, the requirements on the drawing take precedence.

2. REFERENCE DOCUMENT

- 2.1 The following documents of issue in effect on the date of casting purchase form a part of this specification to the extent referenced in this material specification.

Specification Number	Description
ISO 8062-3	Geometrical product specifications (GPS) – Dimensional and geometrical tolerances for molded parts – Part 3: General dimensional and geometrical tolerances and machining allowances for castings
ASTM A 802	Steel Castings, Surface Acceptance Standards, Visual Examination
ASTM A 834	Common Requirements for Iron Castings for General Industrial Use
ASTM A 351/A 351M	Standard Specification for Castings, Austenitic, for Pressure-Containing Parts
ASTM A 997	Standard Practice for Investment Castings, Surface Acceptance Standards, Visual Examination
ASTM A 985/A 985M	Standard Specification for Steel Investment Castings General Requirements, for Pressure-Containing Parts
ASTM E 8	Tension Testing of Metallic Materials

3. COMPOSITION

- 3.1 The stainless-steel alloy grade shall be in accordance with the part drawing
- 3.2 The typical chemical composition of CF3 stainless-steel alloy should conform to the following ranges in accordance with ASTM A351/A351M-18:

Element	Weight Percent
Carbon	0.03
Manganese	1.50
Silicon	2.00
Sulfur	0.04
Phosphorus	0.04
Chromium	17.0 – 21.0
Nickel	8.0 – 12.0

Molybdenum	0.50
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3.3 The typical chemical composition of CF3M stainless-steel alloy should conform to the following ranges in accordance with ASTM A351/A351M-18:

Element	Weight Percent
Carbon	0.03
Manganese	1.50
Silicon	1.50
Sulfur	0.04
Phosphorus	0.04
Chromium	18.0 – 21.0
Nickel	9.0 – 12.0
Molybdenum	2.0 – 3.0

3.4 The typical chemical composition of CF8 stainless-steel alloy should conform to the following ranges in accordance with ASTM A351/A351M-18:

Element	Weight Percent
Carbon	0.08
Manganese	1.50
Silicon	2.00
Sulfur	0.04
Phosphorus	0.04
Chromium	18.0 – 21.0
Nickel	8.0 – 11.0
Molybdenum	0.50

3.5 The typical chemical composition of CF8M stainless-steel alloy should conform to the following ranges in accordance with ASTM A351/A351M-18:

Element	Weight Percent
Carbon	0.08
Manganese	1.50
Silicon	1.50
Sulfur	0.04
Phosphorus	0.04
Chromium	18.0 – 21.0
Nickel	9.0 – 12.0
Molybdenum	2.0 – 3.0

3.6 Individual Foundries may produce narrower ranges than those shown in order to provide the specified mechanical properties.

3.7 A modified chemical composition may also be agreed upon with the supplier.

- 3.8 Sampling is to be in accordance with ASTM A 985/A 985M, Section 4.5.
- 3.9 The chemical composition shall be determined by the supplier by analyzing samples produced at the time the castings are poured or from samples taken from the castings. The sampling methods for determining composition shall be conducted in accordance with ASTM A 351/A 351 M

4. HEAT TREATMENT

- 4.1 All castings shall receive heat treatment per ASTM A351/351M – 18 table 1 followed by water quench.

5. MECHANICAL PROPERTIES

- 5.1 All Mechanical testing shall be in accordance with ASTM A 370
- 5.2 The mechanical properties of the stainless alloy shall be in accordance with ASTM A 351/A 351 M, Table 3 for the proper stainless alloy.
- 5.3 The test specimens shall be subject to the same thermal treatment as the castings they represent.
- 5.4 When requested by purchaser, process capability studies shall be conducted to show that the tensile strength, yield strength and percent elongation requirements can be met. A minimum of 30 test specimens from separately cast test coupons shall be used. The data shall provide a Cpk value of each property and must be 1.33 or larger.

6. QUALITY REQUIREMENTS

- 6.1 Casting surfaces shall be reasonably smooth and shall be free of scale. Runners, risers, fins and other such cast-on pieces shall be removed and dressed down to blend with the normal profile of the casting surface. The surface discontinuities shall be evaluated in accordance with and meet the visual acceptance standards defined in ASTM A 802, Level 1.
- 6.2 Mechanical testing shall be in accordance with ASTM A370
- 6.3 Chemical composition shall be tested in accordance with ASTM A 751.
- 6.4 Casting dimensions shall be per part drawing
- 6.5 Casting dimensional tolerance grade shall be in accordance with ISO 8062-3, per table:

Dimension	Grade
<100 mm	5
100 – 400 mm	6
>400 mm	7

- 6.6 Casting geometric tolerance grades shall be in accordance with ISO 8062-3, per table:

Dimension	Grade
<100 mm	5
100 – 400 mm	6
>400 mm	7

- 6.7 Required machining allowance grades shall be in accordance with ISO 8062-3, grade E.
- 6.8 Porosity of any type is unacceptable on machined surfaces. Examples can be seen in Appendix A.
- 6.9 Components must be hydrostatically tested to 60 psi or per part drawing requirements
- 6.10 Each casting shall be subject to hydrostatic testing per ASTM A 985/A 985M Section 11, or as noted on part drawing.

7. REPAIR

- 7.1 Repairs shall be made by welding using procedures and qualified welders under practice ASTM A488/A488M.
- 7.2 Repairs are to be inspected to the same quality standards used to inspect the castings.
- 7.3 Castings that have been repaired must be solution heat treated following the repair.

8. IDENTIFICATION

- 8.1 All castings shall be identified with a part number and date code per part drawing. Additional requirements shall be in accordance with the part drawing and/or purchase order. Location will be defined on the part drawing, if drawing does not indicate location of the marking, the part can be unmarked.

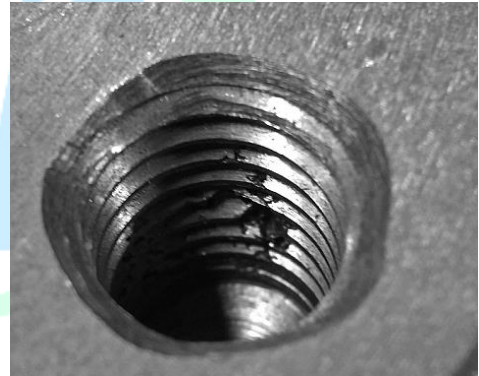
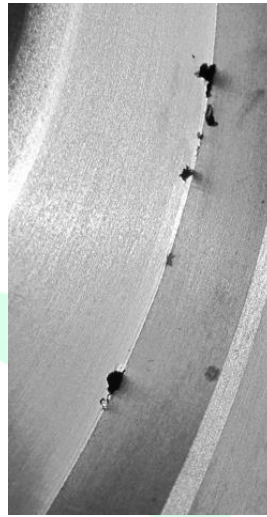
9. CERTIFICATION

- 9.1 A certificate stating that each lot has been sampled, tested and inspected in accordance with this specification shall be provided by the supplier. The certification must include tensile properties for yield and ultimate strength, elongation as well as certificate for heat treatment and hydrostatic testing. Where noted on part drawing Declaration of Conformity in accordance with ISO/IEC 17050-1 must be provided with each purchase order.

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APPENDIX A

Machined areas -

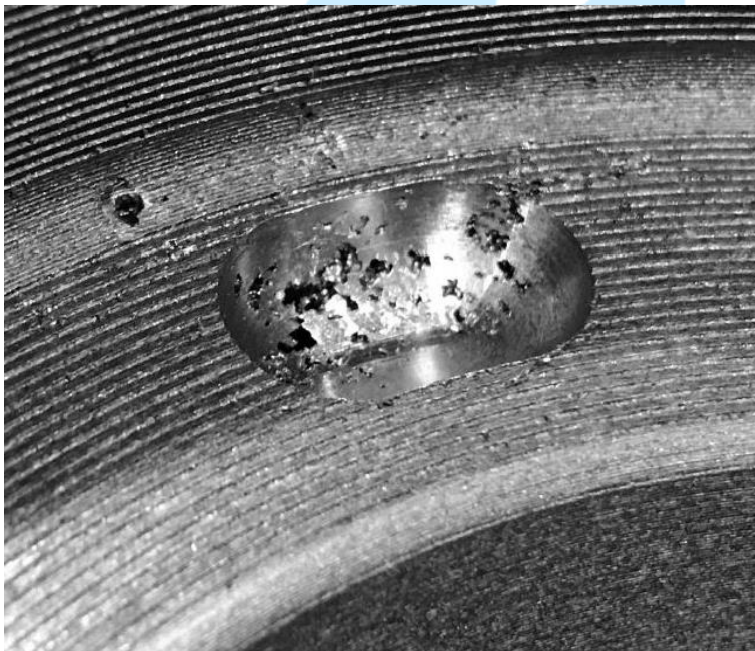


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Drain Bosses -

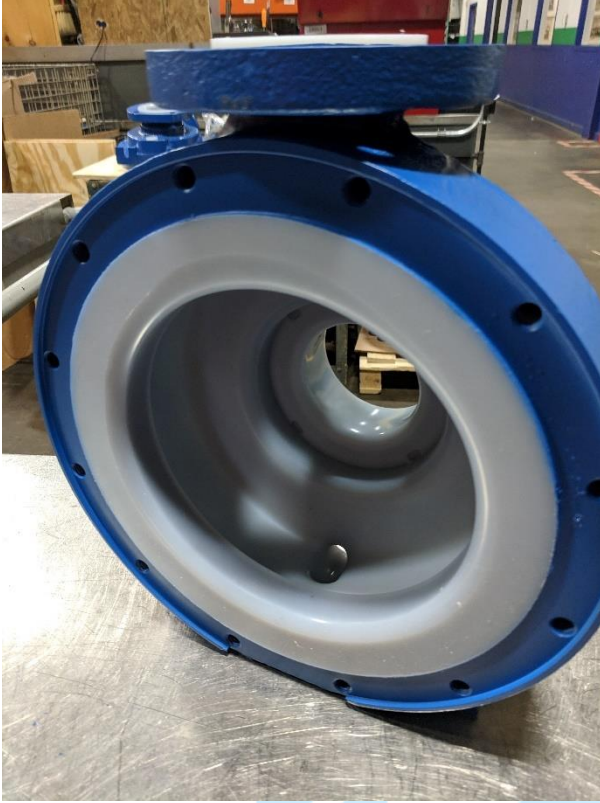


Front Shaft Support Anti-Rotation Pockets



SON INC.

APPENDIX B – UC Housing Lined Areas



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Revision	Date	Change
1	7/22/19	Initial Launch
2	5/9/22	Added subsection 6.12 to section 1.0



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