1.0 SCOPE

This specification outlines the surface finish quality and technical requirements for dimensional and geometrical tolerances of cast pump components to ensure compatibility, performance, and reliability in service. It applies to sand casting, investment casting, and permanent mold casting processes.

2.0 DEFINITIONS

- Casting: Any casting with a net weight of up to 500 kg. This is the reference in which values indicated within this document is based on.
- Surface roughness (Ra): Arithmetic average of absolute values of profile deviations from the mean line, measured in microns (µm).
- Cosmetic Defect: A visual imperfection that does not affect fit, form, or function.
- Critical Surface: Surfaces that interface with other components or where mechanical properties are critical.
- Non-Critical Surface: Surfaces not interfacing or contributing directly to function.
- As Cast: A casting that has not received any kind of finishing treatment after casting beyond removal of casting appendages, such as gates, risers and flash also the removal of residues of any moulding material where necessary using sand or bead blast).
- Casting Impregnation: A resin that seals the areas of porosity in a casting, through the process of vacuum impregnation, (bronze components only).
- External: Referring to parts of the casting that will not come into contact with the pumped medium, (fluid)
- Legacy Products: Parts designed and produced prior to the acquisition of Pegson & Terex IP by LFH Fluid Control Limited
- Internal: Referring to parts of the casting that will come into contact with the pumped medium, (fluid)
- IP: Intellectual Property
- MCS: Marine Classification Societies, a 3rd Party Society specified by an LFH Fluid Control Limited customer to Survey/Witness the testing of a customers order.

3.0 REFERENCED STANDARDS

- ISO 8062-3 — Dimensional and geometrical tolerances for castings
- BS EN 1370 — Founding — Examination of surface condition
- BS EN ISO 10135 - Geometrical Product Specifications, (GPS).
- Drawing indications for moulded parts in technical product documentation (TPD)
- BS EN ISO 1302 - Geometrical Product Specifications, (GPS). - Indication of surface texture in technical product documentation
- BS EN ISO 6892-1 - Metallic materials. Tensile testing. Method of test at ambient temperature
- BS EN ISO 6506-1 - Metallic materials. Brinell hardness test. Test method
- EN 10204 - Metallic products. Types of inspection documents (Type 3.1)

4.0 RESPONSIBILITY

- It is the responsibility of the Foundry to achieve the standards set out in the document below.
- It is the responsibility of LFH Fluid Control Limited to supply the foundry with a purchase order stating the following: -
- Part numbers to be printed on Purchase Order

- Current drawing revision to be printed on Purchase Order, (legacy products) do not have Casting drawings and as such current machine drawings should be held by the Foundry
- Material grades to be printed on Purchase Order
- Pattern to be used to produce part to be detailed on the Purchase Order

5.0 PROCEDURE

5.1 Casting Defects

Below is listed the categories covered and this will be used by LFH Fluid Control Limited to assess the condition of delivered castings and the resulting machined component.
Surfaces that do not require machining will be left in their original state, “As Cast”, no further fettling will be required at LFH Fluid Control Limited to make parts fit-for-purpose.
Over and above this specification will specify other tolerances that are necessary to our products.

- Hot Tears and Cracks
- Shrinkage
- Sand Inclusions
- Gas Porosity
- Veining
- Rat Tails
- Wrinkle, Laps, Folds and Coldshuts
- Cutting Marks
- Scabs
- Chaplets

Weld Repair areas: Marine Classification Societies (MCS) will not permit the use of welds repairs and as such LFH Fluid Control Limited cannot accept this as a viable repair.

6.0 SURFACE FINISH – BS EN 1302

6.1 Definitions

Casting Process	Surface Max Ra (µm)
Sand Casting	12.5
Investment Casting	3.2
Permanent Mold Casting	6.3

6.2 VISUAL APPEARANCE

6.3 Acceptable Visual Surface Conditions

- Minor roughness consistent with casting process
- Minor sand inclusions ≤ 2 mm diameter (non-critical surfaces only)
- Cold shuts or minor laps ≤ 1 mm depth (non-critical only)
- Surface discoloration from mold contact

6.4 **Unacceptable Conditions (Unless approved by LFH Fluid Control Limited)**

- Cracks, open or closed
- Porosity > 2 mm diameter in critical areas
- Shrinkage cavities or severe pitting
- Blisters or fins > 0.5 mm
- Mismatch > 1 mm across parting lines
- Sharp edges, burrs, or flash in handling zones
- Heavy grind marks on the casting
- Sand Inclusions
- Veining
- Rat Tails
- Wrinkle, Laps, Folds and Coldshuts
- Cutting Marks
- Chaplets

6.5 **The desired finish is also dependant on a number of factors which are all under the direct control of the Foundry: -**

- Type of pattern equipment used
- Type of sand being used
- Type of process being used
- Type of material being cast

6.6 **Filler**

Repairs using plastic or epoxy fillers are not acceptable, weld repairs are also not acceptable as determined by Marine Classification Societies, (MCS).

6.7 **Discontinuities**

The severity level for discontinuities will not be accepted outside VD4 of BS EN 1370. Microsurf 334 comparator will be used by LFH to determine any feature in question.

6.8 **Grinding**

- Unform grinding or blending is allowed without compromising dimensional or geometrical tolerances.
- All reworks must restore surface finish within specification.
- Pre and post shot blasting is preferable with a double finish shot blast for any inconsistent surface finishes.

7.0 DIMENSIONAL AND GEOMETRICAL TOLERANCES

7.1 GENERAL DIMENSIONAL TOLERANCES (AS CAST)

This defines the allowable tolerance on cast dimensions. Legacy parts (and parts designed before the issue of this standard), this tolerance for sand castings would be DCTG11 but in all new designs, we would expect to achieve a DCTG9.

Casting Process	Tolerance Grade	Notes
Sand Casting	ISO 8062-DCTG9	DCTG11 under agreement
Investment Casting	ISO 8062-DCTG7	
Permanent Mold	ISO 8062-DCTG8	

Example: For a nominal length of 300 mm with CT9, tolerance = ±1.6 mm

7.2 GEOMETRIC TOLERANCE

This defines the allowable geometric tolerance for cast dimensions.

Casting Feature	Tolerance Grade
Straightness	ISO 8062-GCTG5
Flatness	ISO 8062-GCTG5
Roundness	ISO 8062-GCTG5
perpendicularity	ISO 8062-GCTG5
Symmetry	ISO 8062-GCTG5
Coaxiality	ISO 8062-GCTG4

7.3 Test Piece

Test pieces used to produce test certificates should be representative of the finished casting. The test piece should be produced with the same method and procedure as the casting to ensure it is representative of the casting.

7.4 6.7 Material Certificates BS EN 10204 Type 3.1

Castings will not be booked in to stock after delivery unless they are accompanied by a valid 3.1 material test certificate. The test certificate must contain the following: -

- LFH Part Number as specified on the Purchase order
- Material grade
- Chemical analysis
- Elongation
- Proof strength
- Tensile strength to BSEN ISO 6892-1: 2009
- Brinell hardness (Cast Iron products only) to BSEN ISO 6506: 2005

8.0 ACCEPTANCE CRITERIA

- All castings must meet specified dimensional and geometrical tolerances.
- No features may exceed tolerance without prior NCR (Non-Conformance Report) and disposition.
- All casting defects (porosity, shrinkage, inclusions) must be within ISO allowable limits.

8.1 Porosity

The effect of porosity can be difficult to quantify. It depends where the porosity is in relation to operation of the part. Mating faces that require a seal will be an area of concern, as would a pressure vessel where a casting may leak. All bronze material pressure vessels will require to be double impregnated to guard against leak paths.
The degree of porosity for which we issue a concession varies according to the surface of the part on which it occurs. For example, two surfaces where we are stringent when issuing concessions for porosity are the wear ring diameter and the bore of an impeller.

8.1.1 Wear ring diameter

As the impeller is rotating at up to 3000 rpm within 0.2mm of the stationary volute, the possibility of pick up and consequent rubbing of the impeller on the volute is increased if the impeller wear ring diameter does not have a smooth surface. Within reason, we do accept a larger degree of porosity on the face of the impeller wear ring diameter, or where the impeller wear ring diameter is clear of the volute bore.

8.1.2 Impeller Bore

We do not issue concessions for porosity in the impeller bore. As this bore is highly stressed when the impeller is fitted to the shaft, porosity here could be a starting point for cracks when the pump is operating.

8.1.3 Impeller Shrouds

Porosity in other areas of the impeller is subject to a less stringent standard, for concessions it again depends on the appearance.

Gas bubbles

Regular shaped small pin-holes caused by gases may be acceptable; this would be assessed on a case by case basis, taking into consideration the effect on the mechanical strength of the casting or if it would be obvious to the end user.

Shrinkage

More difficult to quantify but it is likely to raise questions about material integrity and strength, this would be assessed on a case by case basis. What must be considered is that porosity which shows on a machined surface is only the external witness of an internal volume of porosity.

Contamination

Porosity, Shrinkage or Inclusions that are caused by contamination cannot be accepted.

Delaminating

If the material begins to split during machining this would be deemed unacceptable.

8.1.4 Impeller Vanes

The surface of the Impeller Vanes must be clean and free from slag or other casting flaws. The passageway between must also be clean and free of slag.

9.0 INSPECTION

9.1 Documentation & Traceability

- Any surface finish results to be included in Quality Control Report
- Maintain traceability to batch, heat, mold, and operator
- Non-conformance Reports (NCRs) must be logged and reviewed by LFH QA department.

9.2 DEVIATIONS

Any deviations from this specification must be approved in writing by LFH Fluid Control prior to production or shipment.

10.0 REQUIRED APPROVALS:

Design & Engineering Director	Approvals on File
CEO	Approvals on File

11.0 REVISION HISTORY

Revision	Date of Release	Author	Summary of Change
00	15/01/2026	GD	Initial release