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Annex 1: Castings

Annex 1
 to the
**Quality Assurance Agreement
 Covering Production Material**

by and between

Nidec GPM GmbH
 Schwarzbacher Str. 28
 D-98673 Auengrund OT Merbelsrod

– hereinafter: "**NGPM**" –

and


– hereinafter: "**Supplier**" –

Material: Castings

Project: to be completed

Part: to be completed


Confirmed: to be completed

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1. Scope

This agreement applies to castings, e.g. made from aluminum alloys according to DIN 1706, regardless of the casting process. The objective of the agreement is the definition of requirements on casting quality and, if applicable, their unified entry in technical documents. This agreement is made between NIDEC GPM and the supplier of castings for the workpiece identified in the following and forms a constituent part of the general quality management agreement.


Designation	to be completed
Supplier:	to be completed
Supplier Number:	to be completed
Part Designation:	to be completed
NIDEC GPM Article No:	to be completed
NIDEC GPM Drawing No:	to be completed
Change Index / Date	to be completed
Customer Drawing No:	to be completed
Change Index / Date	to be completed
Unmachined Part Dwg. by NIDEC GPM:	to be completed
Unmachined Part Dwg by Supplier:	to be completed

2. Definition

- 2.1 Shrinkage pores (blowholes):
The different densities and thus different specific volumes of aluminum alloys in a liquid or solid state result in cavities (fissured, cavernous shape).
- 2.2 Gas pores, thermodynamic :
The higher solubility of gases in liquid aluminum alloys results in gas precipitation during solidification (as a rule, no round contours).
- 2.3 Gas pores, fluidic .
Inclusion of gases due to flow of metal (as a rule, round shapes).
- 2.4 Microporosity.
Pores with a maximum expansion of 0.5 mm, no reliable evaluation without measuring devices.
- 2.5 Macro porosity
Pores with a maximum expansion > 0.5mm
- 2.6 Pore clusters
In case of pore clusters, adjacent pores are at a distance smaller than the maximum expansion of the larger pore.

Further explanations see for example here:

- DAG/DBL4949
- VW/PV50097 (PV6097) or other customer specific requirements

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3. Non-visual inspection of castings by the supplier

Aside from dimensional checks, the supplier performs the following inspections:


Designation	Requirement*	Specification
X-ray inspection		
CT analysis		
Ultrasonic inspection		
Pressure tightness under water		... bar
Pressure test using the differential pressure Method with a permissible leakage of		... bar; < ... cm ³ min ⁻¹
Microsections		
Material analysis / attest		
Hardness test		

* check if applicable

Depending on function and purpose (e.g. housing carrying media), machined die-cast parts are subject to a pressure leak-tightness check after machining, whereby the pressure tightness relates to application in designated sectors of the media carried (e.g. water, oil,...). Determination of the application is based on the respective specification sheet requirements and drawing specifications. Verification of the pressure tightness accompanying the series is carried out by the supplier with a 100% pressure differential test of the finished parts using air / air or air / water (depending on the requirement of the specification sheet and drawing) and the limit values determined in accordance with the specification sheet and drawing specifications. However, this does not absolve the suppliers from their responsibility to supply components that can be used as intended without functional restrictions, e.g. structural defects in the form of blowhole cavities, string cavities or decompaction that could result in verified leakages in the end product (e.g. motors) under the influence of media, although the test has detected no deviation within the defined limits according to the pressure differential procedure.

Before applying the pressure differential procedure to be used, acceptance is required by NIDEC GPM and the functionality must be verified by an appropriate measurement equipment capability study.

Identification of the parts tested must be carried out in agreement with NIDEC GPM.

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4. Visual inspection of castings by the supplier prior to mechanical processing

4.1 The supplier performs visual pre-delivery inspections of all parts with regard to the following characteristics:

Designation	Requirement*	Specification
Porosität		Area 1 PK ... Area 2 PK ... Area 3 PK ...
Sink Marks		
Weld marks		
Pick-ups		
Drawing grooves		
Burrs, notching		
Gate / overflow residue		<.... mm
Fire cracks		
Mold release defects / flatness		
Ejector marks (raised / recessed)		
Fastening yes / clamping tabs (cleanliness, flatness, protrusions, notching)		
Continuity of channels		
Surface treatment (manually polished, sandblasted, vibratory grinding)		
Parting compound residue / contamination		
Packaging regulations		

* check if applicable

4.2 NIDEC GPM reserves the right of performing receiving inspections for verification purposes.


5. Visual inspection of castings after mechanical processing (not valid for raw-part suppliers)

5.1 The largest expansion of pores visible on functional surfaces is evaluated. In addition, if specified in the drawing, the minimum distance between pores is evaluated, as well. In the drawings, dimensions are indicated in mm and, if applicable, separated by a slash, as shown in the following example. The definition of areas with different requirements is permissible, for example, within and outside of sealing lips

PK 0.8 / 10, maximum pore size 0.8 mm, minimum distance 10 mm.

5.2 Pores and defective areas on machined functional surfaces are evaluated visually with the naked eye. Magnifying glasses with measuring scales are used to evaluate micropores.


5.3 The bottom of the pore must be visible, otherwise the inspected parts must be classified as scrap.

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6. Quality Objectives of the supplier

Designation	to be completed
ppm values of scrap	to be completed
Parts that failed the pressure test are vacuum impregnated once only by the supplier without freight charges and pressure tested once again	to be completed
Parts that failed the pressure test are vacuum impregnated once only by NIDEC GPM and pressure tested once again at a price per part of	to be completed
The maximum share of scrap at NIDEC GPM is	to be completed
In case the agreed share of scrap is exceeded, the casting supplier assumes responsibility for the loss of value creation at NIDEC GPM on a cost price basis of	to be completed

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For Nidec GPM GmbH (Nidec GPM)

Date: *to be completed*

Signature NGPM:

 Name: *to be completed*
 Member of the Management Board Nidec GPM

 Name: *to be completed*
 Director Procurement Nidec GPM

 Name: *to be completed*
 Supplier Quality Nidec GPM

For: (Supplier)

Date:

Signature Supplier:

 Name and job title printed:
 Supplier (authorized representative)

 Name and job title printed:
 Supplier (authorized representative)

 Commodity Manager / Employee