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## 1.0 Revision Log

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<td>1.0</td>
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2.0 Injection Molding Tooling Standards Type A

2.1 Purpose

The purpose of this procedure is to assure when a new die is being manufactured for JCI that the construction and performance is consistent with the guidelines set forth in the Tool specifications and expectations of the company.

Scope: There are 3 different types of tools: Type A, B and C. This specification describes Type A

- Tools from 250,000 up to 7,000,000 shots
- Constructed for high performance.
- Simplified maintenance with replaceable spare parts. (Standards)

Type B
- Tools from 10,000 up to 250,000 shots
- Constructed for medium performance.

Type C
- Tools up to 10,000 shots (Low volume tool)

Type B and C are simplifications of Type A and are described in another specification book.

2.2 Abbreviations

<table>
<thead>
<tr>
<th>PU</th>
<th>Purchaser</th>
<th>SU</th>
<th>Supplier</th>
<th>OEM</th>
<th>Original Equipment Manufacturer</th>
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<tbody>
<tr>
<td>TE</td>
<td>Tool Engineer</td>
<td>IT</td>
<td>Injection Tool</td>
<td>IM</td>
<td>Injection machine</td>
</tr>
<tr>
<td>To</td>
<td>Tool</td>
<td>HM</td>
<td>Heated Manifold</td>
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2.3 Quote and Order Requirements

2.3.1 Quote Requirements

The quote is based on the "Technical Tool Data Sheet"=Page 1. This document contains all important information for the layout of the tool. For COST BREAK DOWN, use only the JCI Purchasing documents.

The quote must include a detailed time-line highlighting all manufacturing operations, PPAP steps, and Milestones.

The time-line format must meet the requirements of our Program Management /OEM.

The SU is, without exception, entirely responsible for the tool construction and its functionality. If there are unacceptable specifications, the SU must state this in writing to TE and Program Management.

Every deviation to these specifications must be approved by TE.

The toolmaker must continually evaluate the feasibility of all deadlines. If the tool feasibility or lead-time is jeopardized, the SU has the duty to inform the Program Manager and TE and provide them with proposals or solutions.

2.3.2 Order Requirements

1. Tool manufacture, including all documentation and special manufacturing equipment.
2. JC ownership of:
o Tool-2D-geometry (in existing format + HPGL2-format) and 3D-geometry, CAD and CAM data. (Possibly according to production plant specifications.)
o Preservation of all electrodes for 1 year beyond end of series car production, and/or with the possibility for new manufacturing.

3. Three sets of tool drawings and spare parts list with supplier contacts. (Hard copy).
4. Schematics (cooling, hydraulic, electric.), user and maintenance manuals. (Hard copy and digital).
5. First parts out of tool and 50 shots produced with capable process. Raw material must be purchased from JCI.
6. Two additional trial runs of 100 shots produced with capable process. Raw material must be purchased from JCI.
7. Dimensional report from 6 parts per cavity according to JCI quality department specifications. Additional reports will be required for corrected cavities.
8. An updated tool / part history overview must be sent to TE and Program management after every modification loop.
9. The core side must be constructed with scribe marks every 50 - 100mm to control the shrinkage. (Consider the position of the injection point).
10. Mold Flow Simulation according to the JCI specifications when required (Material, pressures, flow length, etc.).

Tool Tracking Procedure: the SU is obliged to submit an updated tool tracker form weekly (incl. digital pictures of the manufacturing progress).

2.4 Tooling Manufacturing Requirements

2.4.1 General
The tool must be constructed as small as possible without losing the needed strength. Depending on the tool size, a minimum fringe area from 100 -150 mm around the parts is recommended.

The tool must fit on the calculated machine size (or smaller). The clamping plates must match the fixing holes of the machine, and according to the machine specifications. Tool must also match the machine’s shut height and ejection stroke specifications.
The reference clamping force = “the part-projected surface” X “max. 98% melt pressure”.

<table>
<thead>
<tr>
<th>Material</th>
<th>Process Pressure</th>
<th>Flow length</th>
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<tbody>
<tr>
<td>PP</td>
<td>300 bar (4500 psi)</td>
<td>300 mm</td>
</tr>
<tr>
<td>ABS</td>
<td>500 bar (7500 psi)</td>
<td>200 mm</td>
</tr>
<tr>
<td>PA</td>
<td>450 bar (6500 psi)</td>
<td>250 mm</td>
</tr>
<tr>
<td>PC/ABS</td>
<td>600 bar (9000 psi)</td>
<td>150-200 mm</td>
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</table>

The SU commits to construct and build the tool according to the latest technologies. Specifically, the CAD must contain modules that can be used in further constructions. These modules will be placed in a database to enable reduced construction costs in following orders.

CAM must also meet the latest technologies to reduce manufacturing time.

2.4.2 Basic Construction
1. Wear plates must be used for absorbing slider forces. The wear plates must have a different hardness and composition than the slider body. Consider molder specifications for specific materials.

2. Tools must be properly vented at the parting line and in all other area where gas can become trapped to allow gas to escape the cavity without slow injection speeds or burning. [Tools for JCI Europe must use hardened wear plates for absorbing the clamping force and to ensure good venting along the tool split line. These plates must be adjustable plates. (Adjustable with a set of foil from 0.02 to 0.1mm) See picture 1-A on page 7.]

3. All sliders must be secured in the retracted position to prevent tool damage on mold close.

4. Ejector pins beneath sliders must be avoided if at all possible. If absolutely necessary, use positive ejection return system or at a minimum, a micro switch safety system.

5. Tool must have 4 ledges (pry bar slots) for disassembly of main parting line. Depending on the tool size, 2 or 4 ledges between all tool plates are recommended to simplify the disassembly. (See picture 1-F on page 7)

6. In so far as possible, use standard parts (Hasco, Strack-Norma, DME for Europe and DME-PCS-Progressive for U.S. parts). The use of self-made standards is not allowed. A set of critical spare parts must be supplied with the tool at no additional cost if requested.

7. Part identification (engraving) according JCI Engineering specification.

8. The tool must be equipped with Injection side center (locating) ring. Europe requires second ring on Ejection side. Rings must be according to the production plant specification. For transportation reasons the ejection side center ring must be mountable to the Mold side.

9. The assembled tool must include a balanced lifting system (eye bolts for U.S. and lifting bar for Europe). The single plates (above 25 Kg) require (marked) screw-threads on all sides for balanced transportations. Both halves of the mold must have support blocks to allow them to stand-up straight on the floor.

10. On the operator side of the moulds are engraved plates:

   Tool information shield
   - Tool number  Tool owner
   - Article name  Tool maker
   - Article number  Year of manufacture
   - JCI Art. number  Total weight
   - Tool dimension  Weight injection Side + weight ejection side

     Cooling- and hot runner schematic

     Sequence of sliders and connection schematic micro switches.

     Warning shield for critical process steps.

11. Tool must incorporate 2 transport safety straps (quick fasteners).

12. In case of a seamless graining true 2 mould parts, these parts must be mountable on both sides of the mold according to the molder’s specifications. (with a minimum of 1 till 2 degrees fitting angle and 2 fixation pins)

13. Venting through sufficient use of correctly sized pins, sinter metal inserts, grooves, etc. is required to avoid trapped air. (See picture 1-J on page 7).

14. For all insert molds, the average proportion between insert and chamber is H1=2-2.5 x h1. Depending on the part geometry, H1 may deviate from this formula. (See picture 1-C on page 7). The mold maker is responsible to determine the final dimension for fatigue strength of the insert.

15. As required by the inside tool pressure, the core side must have sufficient support blocks (pillars) to avoid bending of the mould plate. (see picture 1-H on page 7)

16. If water-cooled elements (inserts) are used inside or on top of the tool, vertical discharge channels must be created to avoid tool or process disturbance. TE must approve the use of water-cooled insert design.

17. Electrical boxes and connectors must be placed on top (or high as possible) of the tool to avoid electric disturbance or damage.

18. The hydraulic system for the injection plates must be symmetrical and incorporate a constant damper on the inlets and outlets to ensure an equal movement of the plates. Consider molder’s
specifications.

19 Cold runners must incorporate a sufficient cross section to avoid pressure drops. Take the ejection process into account for required molding pressure needed to make an acceptable part.

20 Guide holes for ejection pins are limited to a guiding length of 3-5D ejector pin (transition made with a taper reamer). Guiding tolerances must be evaluated considering tool temperature differences. (according supplier specifications)

21 Outside equipment (like connectors, pipes, etc.) must be kept close to the tool and covered with steel brackets to avoid damage.

22 To have a good heat transfer between the mould and the inserts, the inserts must fit tightly. (Contact to the mould).

23 The tool concept must allow quick movements of the tool or tool parts.

24 If the processing temperature >55 degrees C, insulation plates are required.
2.5 Guiding System Requirements

1. Guide pins must have zero clearance fit for final depth of engagement, which equals twice the diameter of the pin (2 x D). Pins will be tapered from this point to end of pin with minor diameter equaling (D – 0, 5 mm). Pins length should be sufficient to prevent collision of steel.

2. Guiding blocks or side locks are recommended on all tools and must be standard components from Hasco, DME or PCS.
   Guiding blocks (from tool weight >5 Ton on.)
   Pre guiding according to sketch.
   Pos 1.) 1.2842 Hardened 58 Hrc
   Pos 2.) 1.2842 Hardened 54 Hrc
   Pos 3.) Self lubricate bronze

Guiding blocks needs always to be on tool centre cross to catch different thermal expansions of the mold plates caused by different mold plate temperatures.
2.6 Ejection System Requirement

1. Tools up to 650 Ton clamping force and smaller tools with an expected risk for ejection problems are connected to the ejection system of the machine for positive pull-back of the ejector plate (connect according to machine specifications). (see picture 1-G on page 7).

2. Tools above 650 Ton clamping force must have a hydraulic ejector system unless molder specification allows mechanical connection to machine.

3. Ejection guide bushings must have radial play of 0.15 mm. (cooling in ejection plates is not required)

4. The ejector plates must be supported: (see picture 1-E on page 7)
   - Under each pushback pin and up away slider
   - Depending of the tool size, additional support disks must prevent bending of the ejector plates.
   - Ejectors are to be round. Rectangle shape can only be used after TE release.
   - Ejector plates don’t have cooling.

5. Bosses are formed with sleeve ejectors to insure a good air venting performance. (See picture 1-L on page 7).

6. Up and Away sliders (angled lifters) have a maximum angle of 12 degrees angle and need a guide foot with length compensation (Angles greater than 12 degrees require TE approval).
   - To avoid a movement of the part during ejection, 2 ejectors are required close to the up away slider, which fix the part.

7. The ejector plates are secured with 2 limit switches.

8. Guiding pins may not be fixed in the core plate of the mould. (See picture 1-K on page 7).

2.7 Cooling Requirements

The tool must be constructed as a heat exchanger. It is critical that the cooling circuit is sufficient and follows the contours of the tool closely. The tool must be large enough to accommodate the cooling system! The placement of the cooling circuit must follow the equilateral triangle concept; depending on tool size 50 – 70 mm. (see picture 1-B on page 7)

The tool surface must be evenly cooled. Temperature differences larger than 5°C are unacceptable.

The cooling system must have extra capacity, in order to accommodate reductions of 20% in the planned process cycle time.

The preferred method of cooling is a series of single cooling ducts. Vertical circuits should be avoided, due to their poor performance. If the part contour does not allow drilled circuits, CONTURA/GWK Elements (heat pipes) can be used with TE approval.
Sliders must be cooled (TE must approve exceptions), drilled holes may not be smaller than \( D = 8 \text{mm} \). Every circuit must prove a flow capacity of at least 18-20 ltr./min/3 bar (5 gal/min @ 45 psi). The cooling collector must have a diameter of approx. 5 \( D \). (see molder’s specification for cooling collectors (water manifolds)).

The cooling system must be approved.

\textit{The cooling system is to be broken down into cooling circuits, so the pressure drop is less than 2.5 (35 psi) bar through the system. Inlet and outlet points must be marked. Cooling connections must be created using standard parts. (See. Picture 1-I page 7)}

\section*{2.8 Injection Requirements}

The injection concept must consider position of the welding lines, customer requests, the dimensional tolerance of the part, and the injection process In order to meet the raw material manufacturer’s shrink rates, the melting pressures and flow lengths so they do not vary more than 25% from the given values in Table 1. The values are to be proved using a MFA.

Curved submarine, normal submarine with lost pin, etc injection types should be based on successfully implement concepts. No sink marks, no matt or glossy areas on the A surface. If no proven system is available, TE will decide the injection type.

If a cavity is to be filled over several injection points, a heated manifold must be used.

The hot manifold manufacturer must be approved by the TE.

The tool user must be involved in choosing the injection concept.

The use of torpedoes in hot runner nozzles needs TE approval.

\section*{2.9 Surface Geometry Requirements}

\subsection*{2.9.1 Core side}

If not otherwise agreed, HSC milling is preferred. The step should be approximately 0.5mm, but actual dimension of the step is dependent on part geometry. For Europe: the steps must be agreed with TE.

\subsection*{2.9.2 Cavity side}

HSC milling is the preferred method for cutting cavity surfaces that are to be textured. Cutting speed of 400-800 mm/min, at milling rpm of approx. 45,000 and cut depth of 0.1mm. Polishing should be oriented to grain direction. (EDM or cutting other than HSC must be careful not to stress the underlying steel in the cavity that may affect the uniformity of the textured surfaces).

\subsection*{2.9.3 Holes}

Functional holes (on the part) should be created using a tooling insert, as long as the cooling circuit is not compromised. Cooling has priority.

\subsection*{2.9.3 Grain}

Graining is to be completed only by qualified firms such as Standex, Krüth und Eschmann in Europe and Mold Tech, CST and Tenibac in North America and their licensees. Only the SU may give the final graining order. The process is described in the form “Graining Procedure for Injection Molds JCI”.

Uncontrolled if printed
2.10 Machine Specifications
All connections including hydraulic, cooling, electrical, center rings, etc, must meet the requirements of the production plant.
See also attachment Plant/Machine Data Sheets.
3.0 Injection Molding Tooling Requirements

3.1 Purpose and Introduction

This document contains tooling specific responsibilities. When conflicts arise between program specific statements of work (SOW) and these tooling responsibilities, this document will prevail.

This document outlines the tooling expectations and definitions of responsibilities associated with the development of injection mold tooling for Johnson Controls, Inc. (JCI) and its Parts Supplier (PS).

All Tooling is subject to audit and approval by Johnson Controls – AE. Tooling audit expectations and guidelines are located @ https://jci.portal.covisint.com/web/ae

These Global Tooling Supplier responsibilities set forth certain responsibilities and obligations of the Part Supplier listed below (PS) to JCI. This document does not guarantee Part Supplier any specific volume of business or any business at all from JCI.

THIS DOCUMENT IS NEITHER A SUPPLY AGREEMENT NOR A PROMISE TO ENTER INTO A SUPPLY AGREEMENT. In the event Part Supplier enters into a contractual relationship with JCI (pursuant to a Purchase Order, Long-Term Agreement or some other written document executed by JCI designated as a form of supply agreement, hereafter called the “Contract”), the Contract shall govern the terms and conditions of the Part Supplier -JCI contractual relationship.

In the event of any conflict between a term of the Contract and a provision of these Global Tooling Supplier responsibilities document, the Contract shall supersede and govern. In the event that a Contract has been or is entered into between Part Supplier and JCI, the procedures and obligations set forth herein shall be met by Part Suppliers and, if a Contract is consummated, shall become express warranties made by Part Supplier and JCI.

3.2 Purchasing Responsibilities

JCI Tooling Purchasing (JCI TP) is responsible to source, manage costs, and build injection molds (tools) for JCI’s Part Supplier (PS) with the cooperation of its Global Tooling Supplier(s) (GTS). This is to include the original build of the tools and any subsequent engineering changes prior to Part Supplier PPAP.

The GTS is a tool supplier to JCI that manages the construction of tools for JCI both within and outside the borders of the United States. The GTS can be a domestic tool shop, a tool broker, or any other entity that JCI enters into a contract with to purchase tools. Special circumstances may arise that cause discrepancies between the responsibilities contained in this document and other JCI documents, PS expectations, JCI program expectations, and GTS capabilities. Under those circumstances, the JCI tool buyer will determine the resolution to any discrepancies.

3.3 Global Tooling Supplier (GTS) Responsibilities

1. The GTS is responsible to be the mold ‘Builder of Record’ for all molds (tools) produced in its facilities as well as all tools produced in its subcontracted facilities both within and outside the borders of the United States. This means that the GTS is solely responsible for the performance of its subcontractors which will include, but not be limited to: timing commitments, tool quality, data integrity, tool functional try-outs, JCI quoted cycle times, shipment, delivery, adherence to applicable tool standards, and tool warranty. All tools will be designed and built with consideration for operator safety and ergonomics and in
compliance with all OSHA standards. If tooling issues are not resolved through the GTS, JCI reserves the right to redirect the tool source and any subsequent costs incurred will be the responsibility of the GTS.

2. The GTS is responsible to coordinate and cooperate with Ontrax as a third party certifier of responsibility compliance and to supply information requested by Ontrax. JCI will specify the level of service required by Ontrax and include the appropriate funding for Ontrax in its purchase order to the GTS. The GTS will pay Ontrax for 100% of its fees within 10 days of receiving the first progress payment from JCI. If GTS fails to timely pay Ontrax, JCI may, but is not required to, pay Ontrax directly and debit a corresponding amount from its payment to the GTS.

3. The GTS is responsible to present its subcontracted tools to JCI and its Part Suppliers (PS) as its own tools. This means that tools built offshore will be delivered to the GTS’s dock and will bear the GTS’s identification label. The GTS will make the process of subcontracting tools as transparent as possible to both JCI and its PSs.

4. The GTS is responsible to affix a metal tag to the tool that contains at minimum: “Property of Johnson Controls, Inc., JCI Tool #, JCI Part #(s), Part Name(s), Toolmaker’s Name and Job #, Date of Manufacture, Tool Dimensions (H x W x D), Total Tool Weight, Injection Side Weight, Ejection Side Weight.” This is in addition to any other tool markings specified in the JCI and/or PS tooling standards.

5. The GTS is responsible to design all tools to the latest level of JCI or PS specified CAD data and track and log all data levels and transmissions.

6. The GTS is responsible to insure and protect tools against loss or damage.

7. The GTS is responsible to obtain written authorization to proceed with tooling from JCI TP.

8. The GTS is responsible to submit costs within adequate timing to resolve any cost issues prior to the tooling release date.

9. The GTS is responsible to obtain approval from JCI TP before subcontracting tools to international locations other than in North America. The GTS will only use international tool suppliers that are approved by JCI TP or on the JCI Approved Supplier List.

10. The GTS is responsible for the design, build, and prove-out of all tools that will meet production part manufacturing requirements for JCI through its PS. The GTS is responsible to construct the tools to meet the minimum JCI Global Tooling Standards. This includes constructing tools that run in an automatic mode and meet quoted cycle times and press sizes. The GTS must inform JCI in writing of any tool that cannot be designed and built to meet these requirements with sufficient notice to allow correction of the deficiency without interruption to program timing and production.

11. The GTS is responsible to provide written weekly progress reports and tool-tracking spreadsheets throughout the build of the tools. The specific milestones used in the progress reports and tool-tracking spreadsheets are to be negotiated with JCI and the PS. The GTS is further responsible to communicate this information to Ontrax.

12. The GTS is responsible to maintain a written tool issues list during the design, build, and prove-out phases of the tool build. The GTS is responsible to create the list, add items as directed from Ontrax, JCI, and the PS and resolve those issues to the satisfaction of JCI, Ontrax, and the PS. The exact form of the list is at the discretion of the GTS, but at a minimum, it must include the following information: issue description, date issue was opened, person who opened it, resolution, date closed, and verifying person.

13. The GTS is responsible to provide the primary tool engineering services. This includes attendance at all requested tool meetings at JCI and JCI’s customer sites. The GTS is responsible to conduct part/tool feasibility, record any issues found in an open issues format, and coordinate resolution of those issues with JCI Engineering before tool kick-off. The GTS will obtain written TP Approval for any issue that cannot be resolved with JCI Engineering. Tool issues will include, but not be limited to: part functionality and appearance, part dimensional criteria and stability, tool standards, quoted press sizes and cycle times, and tool integrity.
14. The GTS is responsible for mold flow analysis, mold-cooling analysis, and part warp analysis as required by JCI and communicating those needs to JCI TP prior to final tool cost targets and POs. GTS is responsible to communicate the results of these analyses to its tool shops and the JCI Project Teams (JCI) and Ontrax.

15. The GTS is responsible to obtain the material type and the manufacturer’s material specification sheets including shrink rate from JCI-PS prior to establishing gating types or locations.

16. The GTS is responsible to establish both the locations and types of gating. The GTS is further responsible to obtain written approvals for the gating scheme from JCI for appearance and functional concerns. The form of these approvals should be a picture of the part with the gate type and location clearly described and an approval signature affixed.

17. The GTS is responsible to gain written approval for predicted knit and flow lines on the part as a result of the gating scheme. The predicted knit and flow lines should be shown on the picture of the part described in the gating approval.

18. The GTS is responsible to gain written approval from JCI for all parting lines. The form of this approval should be JCI’s approval of the final tool designs. The GTS must communicate the parting line requirements during the part design and preliminary tool design stages of the program.

19. The GTS is responsible to design the tool to all applicable JCI and PS tool specifications. This is to include all production press specifications, tool standards, JCI quoted cycle times and press sizes, automatic operation, and special tool requests from the PS as agreed to by JCI TP. All special tool requests from the PS that are above and beyond the scope of the JCI Global Tooling Standards are the expense of the PS.

20. The GTS is responsible to provide all necessary tool tryouts for the purpose of functional tryouts, pre-grain tryout, post-grain confirmation, and process and tool prove-out. At a minimum, the GTS will provide a functional tryout with 36 parts, a pre-grain tryout with 300 parts, and a post-grain confirmation tryout with 36 parts. The parts from each of these tryouts will be made available to JCI, the PS, and Ontrax. The GTS will provide the packaging and delivery for these parts. The GTS will invite representatives from JCI, PS, and Ontrax to each tryout. The Ontrax tool validation process will exhaust many of these parts, so quantities available to JCI may be less than the total number produced at these runs.

21. The GTS, with functional support from Ontrax, is responsible for conducting a detailed tool and process prove-out study, at quoted cycle times, which includes process studies as specified by Ontrax and a 6-piece part dimensional study on the gage as specified by JCI (must contain critical and significant characteristics at minimum (CCs & SCs)). Part dimensional checks conducted by the GTS are a subset of the PPAP dimensional requirements and should not be construed to mean a full PPAP layout. This information is to be compiled by Ontrax in a hand-off package that is to be supplied to the PS at the time of tool transfer.

22. First Tool Trial: The GTS is responsible to provide a functional tool trial to ensure tool functions properly and to resolve initial tool issues before involving Ontrax. The GTS will make up to 36 parts (total) available to JCI, PS, and Ontrax from this run upon request with packaging. The GTS will invite JCI and PS. The GTS will perform this first functional trial in accordance with the following guidelines:
   a. Correct material and colorants supplied by JCI
   b. Quoted press tonnage and cycle times as supplied by JCI
   c. Mold must run in automatic mold and auto-degate (exceptions to be signed-off by JCI)
   d. Decoupled molding method:
      i. 80% of machine injection speed until parts are 90% filled
ii. Pack part as necessary to resolve sink and other cosmetic issues

e. Record and correct issues that occur during decoupled process such as:
   i. Flash
   ii. Burn (venting)
   iii. Part sticking
   iv. Balance of fill (at least 98% for multiple cavity tools)
   v. Ejection pin push (other part distortions)
   vi. Surface imperfections and disturbances (splay, blush, sink, striping, etc.)
   vii. Mold mechanical problems

f. Fill pressures must not exceed 1500psi for Polypropylene and 1800psi for other engineered resins. If pressures exceed these values, perform short shot analysis to determine and correct high-pressure cause before opening gates.

g. GTS is responsible to correct all issues from this initial mold trial within one week and schedule Ontrax for second trial with a minimum requirement of two days notice.

23. Second Tool Trial (Pre-grain Run): The GTS will schedule this pre-grain trial with a minimum of 2 days notice and invite JCI, PS, and Ontrax. The GTS will perform this second tool trial in accordance with the following guidelines:
   a. Correct materials and colorants supplied by JCI
   b. Quoted press tonnages and cycle times as supplied by JCI
   c. Ontrax will perform their tool and process checks before parts may be run for JCI, PS, or other purposes.
   d. Ontrax will perform the following functions with decoupled molding process:
      i. Check water flow of each return line
      ii. Balance of fill test
      iii. Mold viscosity test
      iv. Gate freeze test
      v. Short shot study (if necessary)
      vi. Establish and document process for 300 piece run
      vii. Identify and document tool issues
   e. If issues identified by GTS, Ontrax, JCI, or PS disqualify this trial, GTS will correct the issue(s) and reschedule the event with a minimum of two days notice and at their own expense.
   f. If no disqualifying issues are found, GTS will proceed with 300 piece run. Parts from this run will be used for part layouts, pre-grain submission, and JCI or PS part requirements. The GTS will provide any packaging necessary for these parts.

24. Third Tool Trial (Post-grain Run Only): The GTS will schedule this post-grain trial with a minimum of 2 days notice and invite JCI, PS, and Ontrax. This run should occur after all ECs and texturing have been completed. For a tool without texturing, this trial will be the final mold trial before transfer to the PS. The GTS will perform this third tool trial in accordance with the following guidelines:
   a. Ontrax will verify that the process is within their acceptable parameters and that all tool issues have been corrected.
   b. Ontrax will collect and document any remaining items for the tool transfer package.
   c. The final process sheet must be signed-off by Ontrax. Additional concurrence signatures are encouraged by JCI, GTS, PS, and the customer if available.

25. The GTS is responsible to provide adequate packaging for sample parts at each tryout.

26. The GTS is responsible to certify the tool steel to all points and dimensions prescribed by JCI.

27. The GTS, with the functional support of JCI, is responsible to analyze the part dimensional reports from the pre-grain sample run. Process and measuring techniques must be ruled
out before steel is altered. When adequately demonstrated that the tool is at fault for out-of-tolerance conditions, the GTS is responsible to make the necessary corrections.

28. The GTS is responsible to grain the tool and provide a post-grain confirmation tool tryout. The GTS will correct any new tool issues that are a result of grainning the tool.

29. The GTS will transfer the tool to the PS after post-grain customer approval (which will be obtained by JCI). The GTS, with the functional support of Ontrax, will supply the PS with a package before or, preferable, at the time of tool transfer that contains the following items at minimum: final tool 2D designs in PDF format, 3D designs and all surface data in IGES format, part and steel dimensional certifications, a copy of the process sheet from the last functional tryout, a copy of the tool issues list signed off by Ontrax, and a copy of both the pre-grain and post-grain approval by the customer.

30. The GTS will correct any further tool issues that arise from the PS’s tool runs after transfer and before PPAP that are a result of tool function or steel dimensions.

31. The GTS will warrant the tools for tool functionality for a minimum of 90 days after the start of production date as specified by the PS.

3.4 Part Supplier Responsibilities

1. The PS is responsible to supply the GTS all production mold press specifications, press type, press tonnage, part cycle times, platen sizes, platen restrictions, plant locations, tool standards, and any special circumstances and requirements prior to each individual tool kick-off. The exact form of this document is at the discretion of the PS. The information contained in this document is complete and any changes required to the tool for manufacturing purposes is the responsibility of the PS. If the PS does not provide the above-mentioned specifications, JCI will instruct the GTS to build the tools to JCI standards.

2. The PS will provide the GTS with the exact production material and manufacturer prior to the tool kick off that allows the PS to meet all JCI dimensional and aesthetic requirements. If the PS does not comply with this requirement, JCI will assign the exact material and manufacturer.

3. The PS is responsible to accept the tool transfer when the tool package has been provided by the GTS, with the functional support of Ontrax. This package will contain the final tool designs including all surface data, dimensional steel certifications, a copy of the molding process from the final molding trial, a copy of the tool issues list signed off by Ontrax, and a copy of the pre-grain and post-grain customer approvals. The transfer will be final at the PS’s PPAP to JCI, at which time the PS will provide a tool sign-off.

4. The PS is responsible for all tooling preventative maintenance and service to meet all JCI manufacturing, delivery and quality requirements. JCI reserves the right to review the PS’s preventative and spare part plans if the situation requires it, in JCI’s discretion. Preventative maintenance plans and records must be documented and kept on file by the PS. Damage to tooling that is due to negligence or lack of preventative maintenance will be the responsibility of the PS.

5. The PS is responsible to maintain the tool throughout its service life (10 years after production ends).

6. The PS is responsible for managing and advising JCI on potential obsolescence during engineering changes, model year changes and production balance out.

7. The PS is responsible to insure and protect said property against loss or damage.
8. Expenses incurred by JCI to support processing and manufacturing of parts above and beyond what would normally be expected will be invoiced directly to the PS. PS will validate costs and direction prior to implementation.

9. The PS is responsible for process sign-off and part submissions (PPAP) and all associated activities that are required to achieve process sign-off and PPAP approval. An onsite process sign-off will be conducted prior to PS PPAP. PS PPAP requirements are identified in the JCI Supplier Standards Manual available at https://portal.covisint.com/portal/public/_l:en/tp/jci

10. The PS is responsible for the quality of parts produced by these tools after PPAP approval.

3.5 Johnson Controls Responsibilities

1. The JCI program team (JCI) is responsible to provide the JCI TP, GTS, Ontrax, and the PS with the tool lineup for the program, which includes a list of each tool and its cavities and the quoted cycle times and press sizes.

2. JCI is responsible to provide a part dimensional plan to the GTS, which embodies the part measurement criteria and provides an accurate depiction of the critical features of the part.

3. JCI is responsible to provide the GTS with grain callouts including any OEM directed grain sources. These callouts must include the exact customer grain specifications with draft requirements.

4. JCI is responsible to provide the GTS and the PS with the material type or specification to be used in production. The PS will provide the GTS with the exact production material and manufacturer prior to the tool kick off that allows the PS to meet all JCI dimensional and aesthetic requirements. If the PS does not comply with this requirement, JCI will assign the exact material and manufacturer to the GTS.

5. JCI is responsible to approve aspects of the tool designs to assure that the gate locations, parting lines, witness lines (lifers, slides, and inserts), and ejection marks will not adversely affect part visual and functional criteria. JCI approval of tool designs does not alleviate the GTS of any responsibilities identified in this document.

6. JCI is responsible to seek and gain customer pre-grain and post-grain approvals and provide signed copies of these documents to Ontrax and the GTS.

7. JCI is responsible to provide all material for all tool tryouts, prove-out runs, and part orders.

8. JCI is entitled to sample parts in one color from the functional tool trials as specified in the GTS section of this document. Part orders beyond these will be purchased by JCI or the PS from the GTS at a specified setup cost based on press tonnage and a piece price based on a multiple of the production piece price. JCI purchasing will establish these costs with the GTS. JCI will supply material to the GTS for part orders.
### 3.6 Approvals and Contacts

The individuals designated below are Managers for Johnson Controls, Part Supplier and Global Tooling Supplier. Unless otherwise indicated in these responsibilities/guidelines, the persons named herein will be responsible for all communication, acceptance, and approval of changes to these responsibilities/guidelines. They further agree to be bound by the requirements set herein. Any exceptions to these requirements must be communicated in writing to Johnson Controls within 2 weeks of the date of issue.

**PROGRAM:**

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