



GENERAL TOOLING SPECIFICATION

Rev.1. 25/10/13

This document covers the basic requirements of a tool supplied to *Magal Engineering Ltd.* it does not exempt the manufacturer from the responsibility of supplying a tool which will function satisfactorily for its designed life, and meet all the requirements of British Health and Safety at Work Acts.

This document is applicable to all injection moulding tools manufactured for *Magal Engineering Ltd.*

Please note: These standards supersede **any** previous standards issued by *Magal Engineering Ltd.*

This standard is written with the authority of the technical/ tooling manager and may not be amended without his written permission.

Each trial must produce 200 parts unless specified otherwise by *Magal Engineering Ltd.*
4 trials for grained parts and 3 trials for painted or non-textured parts

5 Parts of each cavity should be measured by CMM at the toolmakers unless agreed otherwise.

Try out press at toolmakers must be of the same or greater clamp tonnage than specified at *Magal Engineering Ltd.*

All parts at the trials must be removed by ejecting part with no hang-up; this is the responsibility of the toolmaker.

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Specifications for General Assembly Drawings

***Magal Engineering Ltd.* must be consulted on tool design in all cases. A General Assembly review meeting will take place after which, written approval in the format of general assembly “Tooling Buy Off” sheets will be signed and issued. These must be received by the Toolmaker before any form of tool manufacture is started. (I.e. Before steel is ordered or cut).**

General assembly drawings must be supplied for the review meeting or viewed on laptop

Preliminary design review to include:

- ❖ G.A. **must** consist of plan view of each half of the tool, all relevant end views, detailed sections, and also show:
- ❖ Overall tool dimensions & estimated weight min cavity thickness and platen tie bars position.
- ❖ Moulding material and agreed shrinkage factor.

Main design review to include:

- ❖ Tool split line in 3D non-shrinkage format to be supplied for customer approval.
- ❖ Tool review to be carried in 3D format.
- ❖ Tool model to include press fixing holes.
- ❖ Clamping of backplates to press is not acceptable. (Not always possible)
- ❖ If press is QMC show overall sizes.
- ❖ *Magal Engineering Ltd.* will supply press details.
- ❖ Tie-bar positions and to which press they relate. (Tools must fit specified presses without tie-bar removal).
- ❖ Standard register ring size is to machine specification. Slip rings are required from this to suit all the machines the tool is required to run in (this applies to BOTH halves of the tool).
- ❖ Cooling layout
- ❖ Hot-runner layout and type
- ❖ Nozzle sprue radii 12.7mm on all tools
- ❖ Position of feed points in accordance with Mouldflow information.
- ❖ Tool sequence of operation
- ❖ Position of fabrication / split-lines of major mould parts (cavities, bolsters, etc.).
- ❖ Drawing or 3D model showing all cores in their forward position to ensure no clashes and part release.
- ❖ One copy of the signed off General Assembly drawings will be retained at for reference

TOOLING BUY OFF - MOULD TOOL

Supplier		Part Description				
Toolmaker		Part No				
Date of Review						
Tool Try out Satisfactory		YES / NO (Delete as appropriate)				
Number of FMECA's to be Actioned Review =		Details	N/A	S	N/S	F
1.00 General Details and Services						
1.01 Tool dimensions						
1.02 Tool weight						
1.03 Lifting arrangements						
1.04 Press compatibility						
1.05 Fixing and clamping points						
1.06 Loading clearances						
1.07 Quick change requirements						
1.08 Position of Water connections						
1.09 Position of Electrical connections						
1.10 Position of Hydraulic connections						
1.11 Position of Pneumatic connections						
1.12 Schematic plate diagrams or special instructions						
1.13 Component unloading and access Manual / Auto						
1.14 Robot load access						
1.15 Special features						
1.16 Are Register Rings correct for machine range Req'd?						
1.17 Position of transit posts ok Side to Side?						
2.00 Impressions / Core / Cavity / Steel Supplier & Type						
2.01 Construction (to meet product specification)						
2.02 Split lines (optimum position for moulding and manufacturing)						
2.03 Shut off faces						
2.04 Draft angles (for release and texturing / sparking)						
2.05 Inserts						
2.06 Cores (sliding plus "up and aways")						
2.07 Cooling						
2.08 Ejection (type and position)						
2.09 Hot runner positions (sections showing water)						
2.10 Gates / Runner design and positions						
2.11 Special features						
3.00 Ejection						
3.01 Standard coupling						
3.02 Standard parts						
3.03 Hydraulic ejection – With Suitable Flow Divider						
3.04 Area						
3.05 Push back pins/ Number off? Do they interfere with demoulding?						
3.06 Travel						
3.07 Guides						
3.08 Supports						
3.09 Balanced						
3.10 Do Electrical switches terminate with 16 pin Harting socket						
Review ejector design to ensure fail safe conditions						
3.11 Sticking / Jamming / Breakage - potential cavity damage						
3.12 Special features						
Legend:-		N/A = Not Applicable N/S = Not Satisfactory			S = Satisfactory F = FMECA required	
					Sheet 1 of 4 mldtool.xls	

TOOLING BUY OFF - MOULD TOOL (continued)

		Details	N/A	S	N/S	F
4.00	Slides / Moving Cores / Mechanisms					
4.01	Functions					
4.02	Locations and guides					
4.03	Mechanical					
4.04	Hydraulic					
4.05	Locking					
4.06	Do Electrical switches terminate with 16 or 24 pin Harting socket					
4.07	Operations and sequencing ensuring fail safe condition (Core & Cavity)					
4.08	Special features					
5.00	Cooling					
5.01	Layout of circuit					
5.02	Connections					
5.03	Seals					
5.04	Fixed pipe work					
5.05	Flow rates of each circuit					
5.06	Special features					
6.00	Runner / Gate details					
6.01	Mould flow recommendations					
6.02	Bush specifications					
6.03	Hot runner specifications / drops					
6.04	Runner details					
6.05	Gate details					
6.06	Insulation requirements					
6.07	Electrical specification Socket and wiring Correct					
6.08	Nozzle radii 12.7 sph					
6.09	Special features					
7.00	Additional Items					
7.01	Shrinkage factor supplied					
7.02	Mould flow recommendations					
7.03	Fill pattern					
7.04	Wall section					
7.05	Venting					
7.06	Core and Cavity finishes					
7.07	Tool steel specification and supplier certification					
7.08	Tool steel heat treatment and certification					
7.09	Fool proofing Core and Cavity mechanisms					
7.10	Potential cracking points					
7.11	Date stamp details / position					
7.12	Part No details / position					
7.13	Insert removal while tool is in the press (if applicable)					
7.14	CAD / CAM datum's established on drawings and tools					
7.15	Spares identified					
7.16	Maintenance identified					
7.17	Special items					
7.18	Approved welded areas (if any) marked on tooling drawings					
Legend:-		N/A = Not Applicable N/S = Not Satisfactory	S = Satisfactory F = FMECA required		Sheet 2 of 4 mldtool.xls	

[illegible]

TOOLING BUY OFF - MOULD TOOL (continued)[illegible]

1 Materials

H13/ P2767

1.1 Cavities and Cores

Production Tooling

Specific cores to be nitrided to min. 55Rc

Method of treatment must be agreed at the General Assembly sign off meeting and recorded accordingly.

All mould details / parts to be clearly identified with the details of the material from which they are produced and the relevant detail No, from the respective detail drawing.

Core side to have two lines scribed on it as far apart as possible that have shrinkage added so a check can be made to the actual shrinkage.

Cavity hardness 52/54Rc

Prototype Tooling

Low volume

Aluminium or EN8 cavities and cores are standard. The type selected must be agreed by *Magal Engineering Ltd.* at the time of order.

1.2 High Heat areas

- In areas of tooling where poor cooling may occur, these areas should utilise a suitable grade of Ampco material(Beryllium free). Type and grade to be confirmed at the tool design stage.
- Reference to the Mouldflow data will determine these areas.
- The extent of such inserts should be clearly defined on the GA approval drawings.
- Cool pins should be used for parts that have thin sections where cooling is not practical.

1.3 Parting face and Heel block angles

- Minimum standard parting face angle to be 7 degrees
- Tool heel block (wedge faces) to be 5 degrees
- If parting face is less than standard then a local wedge block should be added which is 1 degree less parting face to act as protection.
- Wear plates on Heel blocks or slides, should be manufactured in Standard Gauge Plate and be hardened and tempered to 58 / 60 R.c., with suitable oil / grease grooves machined into working surfaces.
- These plates should be recessed into blocks so no dowels are required.
- Gauge plate to be used on slideways.

1.4 Sprue Bushes

Sprue bushes should be manufactured in a suitable tool steel and be heat-treated to 52 / 54 R.c.

1.5 Pressure Pads

- Pressure pads to be fitted to the tool parting faces to prevent full locking forces being applied to the mould shut off areas max load of 1.25 tonnes per sq. cm and area of plates should match press size.
- The number and positions are to be agreed at the time of tool design and be manufactured in the same material outlined within the Wear plate Section above, screwed and recessed into place in pockets in all instances.
- Material to be advised.

1.6 Bolster Plates and Housings

P20 – EN8.

Lever slots should be provided on all corners to assist tool strip down.

1.7 Backplate Bolting to Press

- Each plate should have the following number of fixing holes in proportion to tool weight.
- Tools up to 10t should have min 4 holes per plate.
- All pipe work or electrics should not interfere with press fixing holes.

2 Ejection

In all cases the ejector plate must operate smoothly

- All ejector plates must be supplied with a minimum of 4 ejector guide pillars.
- Guide bushes must be ball cage type and be of sufficient length to ensure the ejection remains square at all times.
- All ejection actuation space apertures on top of tools to be fitted with steel or aluminium mesh guards screwed to the bolster and or risers in order to prevent debris falling into the ejection system.
- All tools must have an engraved brass plate showing the maximum ejector stroke.
- Limit switches must be fitted in return position.
- All wiring should be protected by conduit or covered in a slot in the tool.

2.1 Push Back Pins

- A minimum of 4 'Push Back' return pins to be fitted to the ejector plate.
- These must be cushioned if any ejector pins, lap over the cavity edges in order to prevent impact damage.
- On a smaller tool up to 5 tonnes 4 push backs are required. Pin must run in clearance holes to ensure no pick up when tool hot i.e. dia+1mm.

2.2 Ejector Pins

- Metric ejector pins are to be used unless otherwise specified and agreed with *Magal Engineering Ltd.* at the initial design stage.
- Only standard ejector pins that are readily available in the United Kingdom are to be used.
- When **non** Standard ejector pins and or sleeves are used, **ONE** complete set of spares must be supplied with the tool upon delivery and be fully specified on tool drawings.
- Ejector pins to be type "A" nitrided; any pins, bearing shaped or formed heads to be pinned or keyed into their carrier plate to prevent them turning. All ejectors to be marked with positional identification numbers / letters. Spares required.
- Parts with bosses should have sleeve ejectors where possible for smooth ejection and venting.
- If standard sleeves are too short then they are to be used in a carrier pin.
- Ensure that pins are of good size and in the best possible place to push of without marking or giving any show through
- Blade ejectors must only be used with prior agreement with *Magal Engineering Ltd.*
- Ejection under side cores within the cavity must be avoided if possible. If not possible, ejectors must be positively pulled into their safe return position and detected with a suitable safety switch system to prevent press closure and ensure mechanical safety.

2.3 Sprue Pullers

Sprue puller to have a reverse taper of adequate proportions to the size of sprue taking into account the type of material.

2.4 Air Valves

If part is of deep enclosed section consider the use of an air valve to release part.

2.5 Up and Away's

- Areas such as clip features are to be carried on up and way's.
- These must be produced in a suitable H13 nitrided material and have a bed-out angle that is 2 degree bigger than the lifter angle in direction of movement and 2 degrees on the sides.
- Each lifter should have a gauge plate strip under the head area and at the back of the core a bush that can be adjusted if any mis-alignment.
- When deciding the size of the head lifter ensure there is sufficient area for head to sit on without it trying to hob in.

2.6 Ejector Guide pillar

These should locate in the backplate and have a clearance in the back of the core of 0.5 all round to allow for expansion due to temperature difference between core and ejector/backplate.

3 Welding

- Magal Engineering Ltd. will **not** 'accept' welding on any New Tools.
- No welding of any form area of the tooling is permitted without prior discussions and authorisation of *Magal Engineering Ltd.*
- Any authorised welding must be in conformance with steel suppliers welding specifications, which are pre heating and using correct welding rods then stress relieving.
- The location and extent be indicated on the relevant detail drawing for future reference.
- Laser welding only is permitted

4 Inserts and Venting

- All deep ribs are to be produced using inserts where ever possible so as to provide a natural venting situation and ease of access for polishing.
- When inserts cross over on to bed-out faces and are fixed from the front the screw counter bores should be filled with a copper plug.
- All potential gas trap areas (usually highlighted by Mouldflow) should have an ejector pin fitted or be locally inserted - again for natural venting.
- Aperatures within the form that are totally enclosed with plastic must have a hole drilled in the bed-out area to vent to atmosphere.
- **All tools must have a suitable gas relief channel cut into cavity half of the tool and encompassing the complete periphery of the component (except in gate areas); this will be broken into by *Magal Engineering Ltd.* as and where required. Size of the groove to suit tool.**
- All Multi cavity tooling must be equipped with the option of running individual cavities at any time.
- Runners to each cavity must have the facility to 'blank off' the runner in order to attain this
- Preferred method is a rotating insert / bush or if it's a multi drop hot runner they should be valve shut of type.
- All small core areas, where they are vulnerable to wear or fatigue must be inserted and fully removable when the tool is in the press.
- **One spare insert (ALL INSERTS) fully fitted, to be supplied with the tool upon delivery.**

5 Mechanical cores (Sliders)

- Mechanically operated cores (i.e. those actioned via cam-dowels etc.) must be positively retained in the "out" position.
- Retention by ball-catches or D.M.E. Type core retainers alone will not be accepted, unless no other option exists.
- Large external springs should be encased in guard to safe guard operator in case spring breaks.
- Cores at the bottom of the tool (in the press), must have double safety stops fitted to prevent cores falling from tool.
- Coatings to be advised at the time of GA.
- Cores must be suitably surface treated upon final fitting / approval. i.e. Nitrided or Tuftrided

- Cores should run on gauge plate and side rails and slides over 250 should have a centre key way to prevent slide jamming when being activated by 2 heel pins.
- When moved by hydraulic cylinders they should be positioned on centreline of slide to prevent jamming.
- If part of the form is on slider, the design should allow for the slide to be positively located on the cavity side to be polished in position in order to ensure good match of form

5.1 Hydraulic Cores

- Appertures that have to be formed by hydraulic core movement with no mechanical lock the cylinder must have an area of 10 times larger than area being formed or a hydraulic valve that locks of oil supply so cylinder cannot move back.
- Where possible a mechanical lock is to be used i.e. heel block
- Limit switches must be used on all cavity side cores to show the position of the cylinder so tool is only opened in the safe position.
- Each half of the tool with cores require a 16 or 24 way 'Harting' socket for core signals, mounted on the top of the tool, position to be determined at design stage.
- See machine matrix for number of core pulling functions on each press.

6 Lifting and Storage Requirements

- The tool must be supplied with a suitable central lifting bracket and eyebolt of DC type. Size will depend on the tool size and weight (to be specified at time of tool design).
- Minimum 4 off, suitable to lift tools must also be supplied with eyebolts for main lifting and turning over.
- Large slides and cores (over 10 kg's) require eyebolt holes for tool room handling. Eyebolt sizes to be clearly identified.
- *Magal Engineering Ltd.* at the design stage require a central lifting bracket due to both weight and height restraints within the moulding shop, refer to the maximum height and weight appendix enclosed for all machine sizes.
- All lifting equipment should be identified and tested in accordance with U.K specifications.
- **A Test Certificate must be supplied with all lifting equipment provided with the tool.**
- All Bolster plates must be provided with 2 off suitable eyebolt lifting holes on **all sides**, with 4 off in the **rear side** of the backplates, (allowing a square lift). These holes must allow for full depth of thread engagement if plate is too thin, then a boss should be welded to the plate on the non-platen side in order to assist splitting for maintenance purposes (sizes and positions to be specified at time of tool design).
- Eyebolt thread sizes must be clearly identified.
- **Back plate must have 4 holes and all of them should always be used for safety reasons.**
- Nonstandard size eyebolts are **not** to be used.
- In all cases the tool must lift horizontally in both planes in order to allow easy loading / removal to and from the press.
- Eyebolts / chains, must not interfere with the press tie bars.
- Each Half of tool must lift square for independent handling.
- Support feet must be fitted to the tool in such a way as to allow even stability of both halves when separated.
- These feet should extend to the same level as the backplate and be recessed into the tool and be of a suitable size (The recessing into the tool takes the sideways load of the fixing bolts)
- Eyebolt access must be possible without fouling of pipes, cylinders, switches etc., consideration should be given to fouling and damage of fragile ancillaries during tool loading and turning procedures, without the need of removal, of any such features.

7 Guide Pins to be used on tools

- To project a minimum of 30mm above the highest point on the core, and be capable of protecting the tool when being split using an overhead crane, provided reasonable care is taken.
- Pillars must engage with main bushes before any angle pins engage with their cores or any core to cavity location takes place.

- One of the horizontal guides / pins must be offset by a minimum of 5mm, to prevent miss- assembly of core and cavity.

8 Water Circuits

- Water circuits are to be sealed with BSPT plugs and individual circuits linked external with hoses.
- Water holes (drillings) to be a minimum Dia. of 8mm and be a minimum of 20 mm from any moulding face, and 10 mm from other holes using N9 water fittings.
- Any interconnections to be contained within the tool wherever possible.
- All hoses must be routed to avoid interference with press fixings, eyebolt holes, hydraulic manifolds, electrical plugs etc.
- All tools must have an engraved plate on both sides showing a schematic of the water circuits
- Each water connection on the tool body must be stamped 'in' and 'out' and clearly marked with the circuit number.
- "O" Seals are to be Viton standard bought in parts and fitted in a full groove under compression. They must not break across the edge of waterways.
- **TWO** full sets of seals must be delivered with the tool on completion.
- All internal baffles to be of brass or plastic and be securely held in place.
- All tools must have the water circuits / systems pressure tested to 117 P.S.I. /8 bar before trial and held at this pressure for 15 mins. this should be carried out before connecting circuits.
- Toolmaker must supply water flow rates for each circuit.

9 Register Rings

The Nominal diameter for tool register rings is as to machine spec. provided by *Magal Engineering Ltd.* For location to machines with larger diameter registers, slip rings for the range of machines the tool will fit (as per order) **MUST** be supplied. These rings will be securely fixed to the outer faces of the tool in a suitable 'safe position' upon delivery to *Magal Engineering Ltd.* All register rings must be fixed with 4 off M8 Soc hd cap screws. Minimum of 6mm to 8mm location after insulation plate

10 Hydraulics

- In all cases 'Hasco' or 'Merckle' cylinders are preferred and must be to ISO standard, rated at 3000 PSI with cushion both ends of their stroke and fitted with 'Viton' seals as standard.
- **All cylinder types Fitted to the Tool MUST be covered with, ONE spare set of seals upon tool delivery to Magal Engineering Ltd.**
- All hydraulic connections must be B.S.P. thread form with hydraulic hoses swaged on to the fitting.
- Wherever possible, the tool body itself is to be used as the hydraulic manifold to minimise the hydraulic pipe work around the tool.
- Care must be taken to ensure all swarf is removed from the circuit.
- Where this is impractical, then flexible hoses are preferred so as to minimise the number of joints used.
- Steel pipe must NOT be used unless prior agreement at the design stage is obtained or when hoses are impractical.
- *Magal Engineering Ltd.* preferred supplier is fully aware of this requirement.
- Where possible, no hydraulic cylinders may be buried or sunk into the tool body as the heat from the tool may affect the hydraulic seals.
- All hydraulic cores must be locked into position mechanically (i.e., with heel blocks) during injection and not rely solely on hydraulic pressure to hold them in position.
- If unable to mechanically lock the cores, a pilot operated check valve must be fitted within the hydraulic circuit.

11 Limit Switches.

- Core movements, switches or proximity to be discussed at GA meeting.
- All switch wiring to be protected by conduit or laid in a slot in the tool with a cover to prevent damage.
- The toolmaker must notify *Magal Engineering Ltd.* of core / ejector sequencing details at the GA review stage to allow *Magal Engineering Ltd.* to make any provisions necessary to accommodate them.

- Sequence details to be on a plate affixed to the tool (operators side / fixed half).

12 Electric's Core Pulling

Core Pulling

Each half of the tool with cores require a 16 way 'Harting' socket for core signals, mounted on the top of the tool, position to be determined at tool design.

RS Part Numbers

Enclosure	517-3276
HA-16-P/Base	284-8387
HA-16 Way Insert Plug	284-6678
M8 Panel mount plug	290-6376
M8 3pin straight socket	202-1885

12.1 **Electrics Hot Runner**

The hot runner heater and thermocouple wiring must be wired to a 'Hasco' 16 or 24 way socket, and wired as the specification enclosed.

Wiring Box	Part No	Plug Insert	Part No
16 pin Box	Z1310/16/1	16 pin insert	Z1229/1/16/16
24 pin Box	Z1310/24/1	24 pin insert	Z1229/1/16/24

See **Appendix 2B** for wiring details.

12.2 **Electric's Core Wiring Standard**

Core pull system

Fixed Half

24V+	24V+	24V+	24V+	0V	0V	0V	0V
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
Core 4 out	Core 4 in	Spare	Spare	Spare	Spare	Spare	Spare

24V+	24V+	24V+	24V+	0V	0V	0V	0V
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
Core 1 out	Core 1 in	Core 2 out	Core 2 in	Spare	Core 3 out	Core 3 in	Ejector

Example of box to be mounted to tool parts list below.



RS Part Numbers

Enclosure	517-3276
HA-16-P/Base	284-8387
HA-16 Way Insert Plug	284-6678
M8 Panel mount plug	290-6376
M8 3pin straight socket	202-1885

12.3 Shot counter to be fitted to each tool to be able to track number of cycles run.
Manufactured by “Progressive Components” CVEX-200 external mount

13 Hot Runners

- *Magal Engineering Ltd.* preference regarding the construction of hot runner tooling, is to specify the use of complete systems manufactured by Hasco/ Mouldmaster are the only option allowed.
- Warranty of system starts from SOP not when tool delivered.
- All systems must be of the ‘Failsafe’ type so we can still run them when one heater goes down. This must never be downgraded.
- Nozzles must always be screwed in not sliding system.
- An alternative choice of system may be considered, where *Magal Engineering Ltd.* make the choice due to a technical preference, for a particular application (i.e. Glass filled or engineering polymers).
- All system components (i.e. Heaters, thermocouples etc.) must be suitable for running with a 220 / 240v ac power supply, and all system wiring must be adequately insulated for the temperatures involved.
- Plugs and sockets must have adequate lengths of wire to allow for removal and or testing etc.
- Where hot runner is on the same side as ejection nozzles passing through the ejector plates must be inside a tube for protection.
- The nozzles may be required to have anti-stringing torpedoes fitted depending on material type. To be specified at time of tool design.
- When nozzle is normally flush with parting face it should be reduced by 1mm in length to allow for expansion when hot, this will stop the parting face being hobbled in.
- Tools processing engineering grade polymers will require insulation plates of 6mm thickness on both halves of the tool.

- The insulation plate should be 10mm smaller than the backplate width and length to prevent damage.
- Wherever practical, tool design must allow access to the hot-runner with the tool on the machine.

14 Cold Runner

- The cold runner system must be either circular or trapezoidal in cross section and be the minimum size to fill the component, in line with the material supplier's recommendation.
- The position and design of cold runners and feed points are to be agreed with *Magal Engineering Ltd.* at time of tool design, in line with the material supplier's recommendation.
- All runners must be radiused at direction changes so as to impart minimum material shear, in line with the material supplier's recommendation.
- A cold runner well should be provided at the end of each runner.
- Gates must not be positioned opposite lifters even if mould flow shows this is required point.
- Preferred Gating to be discussed at GA meeting.

15 Tool Identification

- Parts to have ID and material
- All moulds must bear a standard *Magal Engineering Ltd.* information plate in a prominent position, giving details as shown in **Appendix 1A.** and customer ownership plate **Appendix 1C**
- Each tool to be provided with a date clock.
- Tool to be clearly marked with the products material coding. Example as **Appendix 1D**
- Tool should also have re-cycle logo and supplier's code. To be agreed at GA meeting
- All of this information should be carried on inserts (where possible) which are readily accessible for changing / updating. (See **Appendix 1D**). If this is not possible, an area to be engraved will be discussed at GA meeting.
- Other inserts / engraving will be specified as required.
- On multi-impression tooling each core to be identified with a number (i.e. 3 cavities, number 1,2 & 3.) On non-operational surface.
- On handed parts, each core to be identified with a large 'L' for left and 'R' for right hand parts on non-operational surface.

16 Non -Visual Split-line

If part has this requirement try and ensure that the split-line is in such a position that should the tool or press malfunction the core will pass through the cavity without damaging the cavity.

17 Pre Delivery Requirements

- At official T 1 sampling, the Toolmaker must supply *Magal Engineering Ltd.* with a full CMM report of ISIR.
- The attached 'Tool Pre Delivery / Delivery Checklist' Shown must be completed and supplied to *Magal Engineering Ltd.* for authorisation to ship the tool from the toolmaker. This will be duly signed, accepted or rejected and returned, **PRIOR**, to any movement, of any tooling, from the toolmakers premises.
- The toolmaker to be present at first run of the tool for assistance and advice.

18 Delivery Requirements

- Two sets of complete tool drawing Prints (including a complete parts list), plus 1 off CD with a **3d Catia V5, complete tool manufacture, Solid Model, with 2d / 3d drawings also in '.stp' format.**
- Complete spares kit ordered, comprising of relative, heaters, thermocouples, seals, special pins and sleeves etc.
- The tool maintenance schedule applicable to the warranty requirements, as stated within this standard, must accompany the tool upon delivery to *Magal Engineering Ltd.* or their stated delivery address, after both dimensional and cosmetic acceptance by *Magal Engineering Ltd.*

19 Electrodes

- All electrodes produced for manufacture of the tooling, belong to *Magal Engineering Ltd.* in all cases.
- They must not be destroyed or disposed of, unless authorised by *Magal Engineering Ltd.* in writing
- In any event, electrodes must be stored at the toolmakers for a period of one year **AFTER** the 'Start of Production' date advised by the relevant Project Manager.
- The electrodes must be made available to *Magal Engineering Ltd.* upon request.

20 Tooling Warranty

- All tooling designed and manufactured for *Magal Engineering Ltd.* must be capable under normal circumstances for a full tool life of 1,000,000 shots unless otherwise stated and carry a specified full tool warranty which includes the costs of all labour, parts and outside services.
- Full tool warranty is based on the total number of Mouldings required in the first year of production.
- The quantity of mouldings for full warranty, will be defined by the relevant Project Manager at the Design review meeting and will begin from the S.O.P. in all cases and in line with the maintenance schedule supplied by the toolmaker.
- Should *Magal Engineering Ltd.* encounter a problem during the production life of the tool, which is caused by the inherent design of the tooling, the toolmaker is to work with *Magal Engineering Ltd.* to resolve the problem

21 Technical Manual.

This to include:

- Overall tool size and weights.
- Water circuit layout schematic.
- Water flow rates of each circuit.
- Hydraulic circuit.
- Hot runner layout view from parting face showing zone numbers.
- Parts List
- GA Drawings
- Limit switch wiring.
- Tool sequence
- Recommended tool maintenance schedule.

22 Shipping

Tools coming from China or the Far East.

- ✓ Tools should be drained of any water or Hydraulic fluid
- ✓ Tools must be at room temperature before applying anti-rust protection and closing tools.
- ✓ Tools should be enclosed in a bag and vacuum applied, then placed in a suitable box for the weight of the tool.
- ✓ Timber should be used that complies with exporting tools.

Tools coming from Europe.

- ✓ Tools should be drained of any water or Hydraulic fluid.
- ✓ Tools must be at room temperature before applying anti-rust protection and closing tools.
- ✓ When delivered by lorry it should have a wooded bed so tool can be blocked in as well as covered and lashed down.

TOOLING - MOULD TOOLS Pre Delivery Sign Off Sheet					
Supplier :		Part Description :			
Toolmaker :		Part No :			
Date of Review :					
Tool Try out Satisfactory : YES / NO		To Fit M /c No's :			
		Details	N/A	S	N/S
1.00 General Details and Services					
1.01 Tool dimensions					
1.02 Tool weight					
1.03 Lifting Holes Stamped with Thread Sizes					
1.04 Lifting arrangements – Centre Lift Bracket & With Suitable Eyebolts					
1.05 Press compatibility					
1.06 Fixing and clamping points					
1.07 Loading clearances					
1.08 Quick change requirements (if Applicable)					
1.09 Position of Water connections – NON OPERATOR SIDE					
1.10 Position of Electrical connections – TOP / NON OPERATOR SIDE					
1.11 Position of Hydraulic connections – NON OPERATOR SIDE					
1.12 Position of Pneumatic connections					
1.13 Schematic plate diagrams and special instructions Fitted to tool					
1.14 Component unloading and access Manual / Auto					
1.15 Robot load access					
1.16 Are Register Rings correct for machine range Required ?					
1.17 Position of transit straps ok Side to Side?					
1.18 Special Features					
2.00 Impressions					
2.01 Split lines – Parts FLASH FREE					
2.02 Shut off faces – Tool blued out & Inspected					
2.03 Draft angles satisfactory for de moulding					
2.04 Core – Slides - Function to achieve production requirements					
2.05 Core - "up and aways" Function to achieve production requirements					
2.06 Cavity Finish to Requirements					
2.07 Core Finish to Requirements					
2.08 External Springs, Ball catches or Clip Retainers on all Core OUT POSITIONS					
2.09 Special features					
3.00 Ejection					
3.01 Machine Ejection (if Applicable)					
3.02 Travel					
3.03 Micro switches Fitted – Balluff Type with waterproof cable glands fitted					
3.04 Do Electrical switches terminate with 24 pin Harting socket as Specified					
3.05 Are Micro Switch Positions Fully Adjustable In Forward Position					
3.06 Are Suitable Ejection Hydraulic Cylinder Guards Fitted					
3.07 Do Ejection Hydraulics Terminate with a suitable Manifold – Non Operator Side Of Tool					
3.08 Are the Correct Hydraulic Termination Fittings Fitted to Tool - Sterling Flat Faced Male / Female and painted correct colour.					
3.09 Special Features					
4.00 Cooling					
4.01 Are Correct Manifolds Fitted to NON OPERATOR SIDE					
Legend:- N/A = Not Applicable S = Satisfactory N/S = Not Satisfactory			Sheet 1 of 3		

TOOLING - MOULD TOOL Sign Off (continued)

	Details	N/A	S	N/S	
4.02	Correct Terminations fitted for the machine range – Walther / Dixon				
4.03	All Water pipes clear of lifting Positions				
4.04	System Tested and Leak Free				
4.05	Flow rate for each circuit to be supplied when tool delivered.				
5.00	Runner / Gate details				
5.01	Hot Runner Supplier				
5.02	Bush specifications				
5.03	Number of Hot runner drops				
5.04	Runner details				
5.05	Gate details as per mouldflow or subsequent agreement.				
5.06	Insulation requirements Fitted (If Required)				
5.07	Electrical specification Socket and wiring Correct & painted colour code.				
5.08	Valve Gate Wiring Plug Fitted & Wired Correctly				
5.09	Inlet Sprue Bush Rad Checked at 12.7 mm Spherical				
5.10	Special features				
6.00	Additional Items				
6.01	Shrinkage factor supplied Checked & Correct to Requirements				
6.02	Vent Groove machined into Cavity as Specified				
6.03	Tool steel specification and supplier certification IN Delivery Pack				
6.04	Tool steel heat treatment and certification IN Delivery Pack				
6.05	Date stamp details, cavity Ident - position On Parts To Requirements				
6.06	Part No details , LH / RH ident position On Parts To Requirements				
6.07	Tool Maintenance Requirements Included within the Tool delivery Pack				
6.08	Eye Bolt & Centre Lift Test Certification Within Delivery Pack				
6.09	All Spare Parts Supplied as Required (If Applicable)				
6.10	2 sets of FULL Tool Drawings Supplied with Delivery Pack				
6.11	Full 3d Model In Catia V4 / V5 Supplied within Delivery Pack. Solid model with 2D/ 3D DRGs in STP format				
6.12	Tool Label Fitted displaying Part No & Tool Description				
6.13	Tool Dimensional Report Supplied & approved				
6.14	Part Weight Test Carried out Satisfactory and Recorded				
6.15	Final Trial Machine Parameters supplied				
6.16	Parts Manufactured at Toolmakers Approved By <i>Magal Engineering Ltd.</i> Quality / Customer				
6.17	Approved welded areas (if any) marked on tooling drawings				
6.18	All Required Graining To areas required - Totally Satisfactory & Signed Off By Customer (Completed at Manufacturing Toolmaker)				
6.19	Parts measured and acceptable to gauge at the toolmaker				
6.20	Schematic plates fitted to tool – water, hot runner, hydraulics etc.,				
6.21	Tool must be dry cycled 500 times at correct temperature and then Stripped down and check for any wear.				
Legend:- N/A = Not Applicable S = Satisfactory N/S = Not Satisfactory		Sheet 2 of 3 mldtool.xls			

Appendix 1A

Detail of information plate to be displayed on all tools. (scale to suit application)

Magal Engineering Ltd.

Magal Tool No. : _____

Part Description / Name : _____

Engineering Level : _____

Component : _____

Total Wt. : _____ Tonnes. F / Half Wt. : _____ Tonnes. M/ Half. Wt: _____ Tonnes

Dimensions. : W _____ x L _____ x M/H _____ (mm).

To Fit M/cs. : _____

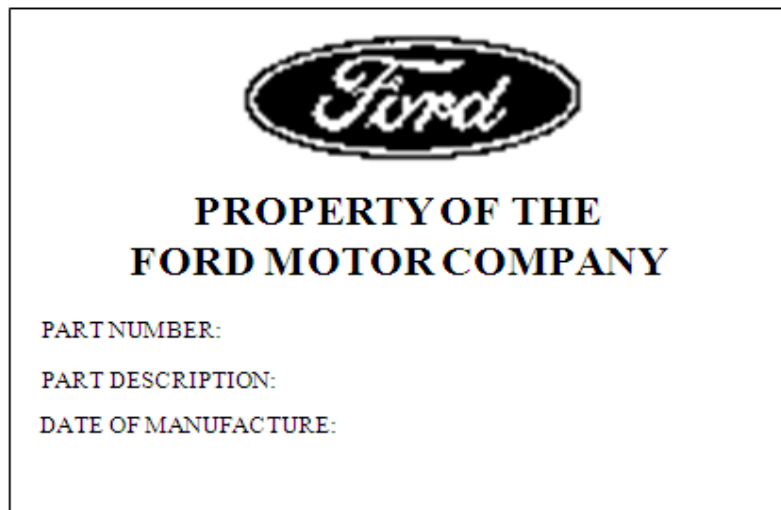
Manufacturer : _____ Year : _____

Material: brass or black anodised aluminium, 2mm thick, screwed or riveted to the operator's side of the tool.

Appendix 1C

The customer ownership of the tool should be identified by a plaque riveted to the side of the tool which carries the customer name, logo, the part number / part description and tool manufacture date.

See below for example of Ford ownership plate.



Appendix 1D

- Date clock to be used (Hasco)
- 5 years supply of date codes required with tool



Materials Identification

All cavities on all tooling must bear the appropriate identification symbol for the material being processed.

Alternatively the identification symbol should be stamped or engraved on a removable insert in the tool, as agreed at the GA meeting

> PP < or > HD < etc. etc.

These are only examples. Components should be marked on non-visual / operational faces, or as agreed by *Magal Engineering Ltd.* Technical Dept.

Tool should also have on it customer logo, part number, vendor identification number and recycle logo.

Appendix 2B

Insert part number Z1229/1/16/16								
1 +	2 -	3 +	4 -	5 +	6 -	7 +	8 -	
9 +	10 -	11 +	12 -	13 +	14 -	15 +	16 -	
Zone 1		Zone 2		Zone 3		Zone 4		

Pins 1, 2, 3, 4, 5, 6, 7, 8, Heaters

Pins 9, 10, 11, 12, 13, 14, 15, 16 Thermocouples

Insert part number Z1229/1/16/24												
1 +	2 -	3 +	4 -	5 +	6 -	7 +	8 -	9 +	10 -	11 +	12 -	
13 +	14 -	15 +	16 -	17 +	18 -	19 +	20 -	21 +	22 -	23 +	24 -	
Zone 1		Zone 2		Zone 3		Zone 4		Zone 5		Zone 6		

Pins 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, Heaters

Pins 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, Thermocouples

1+		3+	Insert part number
2-		4-	

Pins 1, 2 Thermocouple

Pins 3, 4 Heater

Tools with one or two zones are to use the single zone insert.

Tools with three to four zones use the 4 zone insert.

Tools with four zones and above use the six zones insert.

SUPPLIER DETAILS

Helipebs controls Ltd

Sisson Road
Gloucester GL2 0RE
Tel 00 44 (0)1452 423201
Fax 0044 (0)1452 307665

Parker UK Suppliers

Hymid Hydraulics
No 9 Glenbarr Ave
Leicester.
Tele: (0044) 01162518888

Hasco Internorm Ltd.

Hasco House
London Road
NN11 4SE
Daventry
UK
Tel: 0044 (0)1327 876018

Mouldmasters UK

PO Box 15741
Shirley, Solihull
West Midlands
B90 9GT
UK

Nickerson Europe Ltd.

24 Brunel Road
Earlstrees Ind. Estate
Corby, Northants
NN17 4JW
Phone: 01536 206653
Fax: 01536 202196
Email: info@nickersoneurope.co.uk

Die Mould Service Co (DMS)

Aintree Road
Perivale, Greenford
Middlesex
UB6 7LA
Phone: 01494 523811
Fax: 01494 452898

Hales Tool & Die Ltd.

Heybridge House Ind. Estate
Unit 10
The causeway
Maldon, Essex
CM9 4XL

Amendments