



Tool standard Nitator AB

Introduction

The contents of this standard are developed with the Quality, Technology and Purchasing departments. Technology/Purchasing at Nitator review and approve the contents. It essentially mirrors the requirements of Nitator AB's end customer.

The tool standard is distributed internally and to the tool suppliers that Nitator AB uses.

This standard exists in order for Nitator AB and our relevant tool suppliers to carry out our shared objective to manufacture tools with minimal disruption.

The tool standard is divided into 8 parts. Each part contains the requirements and specifications that Nitator AB requires from its tool providers. The standard will be modified when necessary. The new edition can be downloaded from Nitator's website www.nitator.se.

As the proprietor, you are obliged to remove previously issued editions and to inform the affected personnel about changes.

Nitator AB archives superseded editions for 5 years in the quality department.

Note that the standard's content is confidential.

Approved by: Nitator Hylte AB

1: Purchase Conditions

Unless otherwise agreed, the following requirements are absolute:

1. Agreed delivery times refer to when the items are received by Nitator AB.
2. The tools must be fully productive in Nitator's production machines no later than ten working days prior to the PPAP.
3. Upon request from the end customer, FOT articles shall be delivered at no additional charge.
4. Internal production problems may not affect delivery time or quality.
In cases where disruptions occur, a plan for incorporation should be presented immediately by the tool supplier.
5. Schedules should be completed and sent to Nitator AB as agreed with the order and should be updated during the project.
Nikator's schedule should be used and updated by the supplier as per the agreement.
6. A draft of the assembly drawing for the tool should be presented no later than upon receipt of the tool order. 3D documentation should be attached to the agreement.
7. Complete 3D tool documentation should be sent with the tool delivery.
A separate piece list must be sent with the tool documentation.
8. The supplier must be able to functionally treat and process the NUFO documentation.
9. Nitator will pay the freight for an order unless otherwise agreed.
10. Freight relating to complaints and delays will be paid entirely by the tool supplier.
11. The shipper's consignment note should always state Nitator's order number.
12. Payment is 60 days net with 30% upon order, 60% upon delivery, and 10% upon approval of the tool unless otherwise agreed. A bank guarantee is supplied and paid by the supplier should the first 30% exceed SEK 300,000.
13. Nitator inspects the delivery precision of tool suppliers.
14. The tool supplier uses a quality system according to ISO 9000.
15. The tool supplier should work according to an environmental management system that meets the requirements in EN ISO 14001 or is certified according to this.

Miscellaneous:

Assessment of tool supplier

Nitator AB assesses suppliers on the basis of their ability to meet the applicable requirements, such as follow-up of tender processing, delivery precision and tool function.

Use of subcontractors

If the supplier intends to use a subcontractor, this should be specified in the tender and be agreed to in the order. This applies to the whole tool or tool design. Nitator should be given an opportunity to assess and approve the selected subcontractor. Nitator should be given the opportunity to follow up tool manufacture in the same way as for ordinary suppliers.

Verification of tools from supplier

Nitator reserves the right, according to the agreement, to validate tools and manufacturing on the supplier's premises together with the customer.

2: Tender

Nitator sends a specification to the tool supplier in which drawings/NUFO, press line, operations etc. constitute the specification.

The supplier must submit the following documentation to Nitator for approval:

Complete preparation layout or "strip" including tool dimensions, number of tons of press force, detailed layout, blank holder design. If required, moulding simulation shall also be carried out in consultation with Nitator.

Information between Nitator and the tool supplier should not be disclosed to third parties.

Sketch review/preparation layout

The "strip" sketch review is carried out by Nitator, at the supplier's premises or as agreed.

The functional description of the preparation layout is done by the tool supplier.

3: Start of production

Design follow-up before starting production

Nitator monitors the design as described in the work procedure below. Insight and participation by Nitator should be seen as an aid to the supplier in identifying and meeting the requirements set for tool function.

However, the responsibility for design and function remain with the supplier.

Approval of the drawing documentation does not exempt the supplier from the responsibility for the design, function and performance of the tools that the supplier is committed to in accordance with the order.

Strip review

The strip review is done before starting construction.

Design review

The design review must be carried out before manufacturing begins. The "Tool checklist" is used. The need for spare parts should be assessed at this time, with the help of the component list. In the component list, all positions recommended as spare parts should be marked with an X.

Casting model description

The casting model (styrofoam model) must be approved by Nitator. After approval, the casting model may be produced.

4: Protective regulations

Suppliers of press tools should observe the following protective regulations.

Regulations

Press tools are included under production conditions in the press or line protection system and must be adapted to these.

General instructions

To prevent accidents, press tools should be constructed and equipped according to the "tool checklist". In addition, consideration should be given to the risk of crushing from lifters, ejectors etc.

Check the casts before processing so that safety zones such as lifting lugs fulfil requirements.

All areas where there is a risk of crushing should be provided with protective sheet metal, thickness ~ 2 mm.

Pneumatic cylinders, wires, cables, position sensors and similar objects should be located and connected so that they are easily replaceable, and be provided with protection against external damage.

Requirement: Safety bolts for clamp plates should be used.

Noise reduction

To reduce the noise from shuttles, clamps and suspension screws, these should be designed according to the "tools checklist".

Cut steel should in terms of noise be provided with wave shears which may not deform the part.

Ejectors and lifters should be fitted with sound-absorbing material on the impact surfaces and designed so that they do not damage the part.

Sound-absorbing materials at die-sets for shaker channels, for example in nylon.

Lifting and stacking devices

The tools must be designed using devices for lifting and stacking that fulfil the requirements in the "tool checklist".

Threaded holes for lifting eyes should be positioned 50-100 mm from corners so that the tool gets the best balance, with the right thread in relation to ratio; at least M16.

Parts located in "wells" should have threaded holes for lifting.

Smaller tool parts that weigh more than 15 kg, or have such a shape/position that they are difficult to handle, should be fitted with threaded lifting holes.

Manual lifting

Hatches and tool parts which, from a maintenance point of view, may require manual handling when the tool is in the press, should have a weight <6 kg.

5: Inspection of tool parts

The supplier shall check and ensure that the tool complies with the Nitator

standard and other applicable documentation. This shall be verified by the "tools checklist".

Inspection of parts

For pre-series parts (100 pcs) or as agreed, the supplier must inspect, measure and verify that the parts outcome is in accordance with the drawings and applicable documentation.

At least 5 parts must be measured against the requirements of the drawing in the appropriate inspection equipment and using the specified inspection method.

We require that five measured parts, with their measurement results, be supplied together with the tool.

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Tool Standard, Edition 4, 01/10/2016

Result sample

At least 5 parts should be checked and measured for all partial requirements specified in the product definition information.

The inspection equipment and method must be checked, function tested, approved and performed by Nitator.

A capability study should be carried out for the requirements specified by Nitator.

The study must – unless otherwise agreed – be carried out by measuring the parts outcome of at least 100 parts or as agreed from the functional testing of the tool set.

The capability should be measured in terms of dimensions and measurement points prescribed by Nitator.

The measurements shall be done in a measuring machine. During the design review, Nitator shall specify which measurements these are.

The capability factor is **1.67** and is performed by the supplier.

6: Checking the equipment and press parts

Tool testing RUN@RATE(function and production testing)

a) Nitator must order the test material in good time before the test pressings are begun. The supplier should have the necessary equipment for the test run. In the press, the supplier must check and ensure that the tools function and produce parts according to Nitator's specifications. If the supplier does not have the required equipment, this should be booked at least two weeks before the date of the test run. This should be verified with the "tools checklist". To assess the parts outcome and tool function, the tools during **one** production run must produce at least 100 approved parts according to the drawings at the tool supplier's site or as agreed.

b) Together with the supplier, Nitator checks the tool or tool set's functionality in the press,

during which the following must be fulfilled:

- Safety for the operator
- Quality – that the part is within tolerance
- The tool works in automatic mode and how the part is ejected from the tool
- Inspect scrap ejection
- Nitator may possibly provide inspection fixtures to test run parts

Press tools

- All tools for the part should, if appropriate, be simultaneously set up in the presses.

The supplier should consult Nitator.

- The tools' inbuilt, mechanised equipment should be in operation: for example feedforward control/ ejector controls etc.

- During the test, Nitator assesses whether the effective rate of production, stipulated in the agreement, can be achieved.

- The test press impact on tool function and parts outcome are assessed for Nitator's production presses. Nitator may require that critical parts are tested in presses corresponding to Nitator's production presses or at Nitator's premises.

- Once an approved part has been produced, the so-called process window must be determined by increasing or reducing the blank holder force by 20% and still achieving an approved part. (Applies to tool with stripper pins).

- Five parts from each operation (at transfer), and one strip together with five finished parts on the strip should be delivered to Nitator with the tools. The parts should be marked with the tool number, material, material class and date of manufacture, as well as an approved measurement result according to the drawing

7: Press tools

General instructions

Design and manufacture of tools should be carried out as follows:

No special maintenance should be needed for a manufacturing batch, and normally only one

inspection may be required for each production run. Tools should not need to be cleaned between each production run.

Parts subject to wear must be designed so that they are easily accessible for maintenance and repairs, e.g. screws and guide pins should be removed from the same direction and it should not be necessary to remove the plates and rulers for this servicing.

NOTE very important that all parts of a tool are screwed together from the same direction.

Concealed or semi-concealed screws/control elements must not occur. Punches and dies with a foot, step or headrest must have a radius in the seat to obtain a better service life.

In places with heavy wear, such as jointed components, the inserts must be fitted and where those places might be expected, the tool should be prepared for later installation of inserts.

Radial play in stripper plates.

0.5-1 mm = Radial 0.30 mm

1-2.5 mm = Radial 0.50 mm

2.5-4 mm = Radial 0.60 mm

4-8 mm = Radial 1.0 mm

Cut-outs must comply with Volvo Standard 1 and be reviewed during the tool review.

Max. scrap size of 400x400 mm and a maximum weight of 1.3 kg.

If possible, searching in scrap, not in finished parts.

Support under the strip at the probe.

Scrap ejection (e.g. Eject tool all cutting punches)

Parts should ideally be cut loose and fall out of the following tool in the feed direction well separated from the finished part.

Forward feed control is a requirement, and should be a maximum of three stages from the end and, if necessary, ejector control.

Nitator's tool number should be stamped on Nitator's tool plate which is firmly attached to the front of the upper half of the die-set.

For moulding/bending tools, moulding tool parts should be "coated" in. This is to prevent the possibility of air bending in the tool.

All punch clip cushions should be marked with material quality and hardness values.

Adapting to presses

a) Tools shall be adjusted to the production press stated in the preparation layout.
Press data will be provided by Nitator.

b) In consultation with Nitator a review shall be carried out of press data to achieve sufficient opening of the tool halves for automatic operation; this particularly applies for tools with CD

grippers (manipulators)

c) Holders

Constructions with gas springs (in exceptional cases coil springs in consultation with Nitator).

The press's pneumatic or hydraulic holders should be used in exceptional cases or if no other options are given due to longer downtimes.

d) In the case of uneven loading on the holder cushion, the tool must be equipped with balancing pins.

Tool dimensions

Tool dimensions for each press according to press data and standard, with the exception of the minimum tool height specified in the press data.

Tools should be adapted to the smallest possible press. Max. **80%** of press force may be exploited.

Tool attachment

See relevant tool type/press data.

Pneumatic/electrical etc.

Pneumatic cylinders, wires, cables, position sensors and similar objects should be located and connected so that they are easily replaceable, and should be provided with protection against external damage.

Handling

Holes/notches in the casts for handling with forklift truck.

Lifting devices

When designing lifting lugs, balancing must be taken into account. Welded lifting lugs should be strength-estimated during design and checked after welding.

Safety palleting

Pallet surfaces are a safety requirement to achieve space for safety support in the tool during testing, adjustment and repair when the tool is set up in the press. All relief spacers for tools must have the parking position of the tool during operation painted in red.

Spacers, stacking and relief elements

Controls

In principle the following apply:

- a) Control columns shall be placed asymmetrically to prevent incorrect assembly. b) Stripper plates on their own columns should be used where possible.
- c) In tools equipped with both control columns and block controls the block controls should (sufficiently) engaged when there is lateral force in the tool.
- d) Guide plates should be of stable construction.

Spring elements

Option 1

Gas springs, for long spring paths and where greater force is required.

Option 2

In exceptional cases, coil springs are used, for example (only short movements, requirement for maximum compression e.g. 20% yellow)

At wells for spring elements, drain holes should be present.

Stamping punches/Small punches

Should be equipped with a hardened steel plate which is larger than the punch or bending punch/pad.

Shuttles

Mechanical shuttles should be used in the first instance, or as agreed.

Lubrication

Controls that are not accessible for lubrication from outside, i.e. hidden controls, should be inspected and lubricated during maintenance. For controls that are very difficult to dismantle, such as shuttles, the lubricating method and lubricant connections should be determined in consultation with Nitator.

Materials

Material recommendations should be followed during design and manufacture.

Consideration should be given to:

- annual volume
- sheet metal quality
- part shape
- sheet metal thickness

- a) Metallic construction materials

Standard materials such as FORMAX from Uddeholm or as agreed.

b) Material qualities

The following are general suggestions for materials.

Moulding tool parts.

Standard materials Rigor, Calmax, Vanadis, Sleipner, Caldie, Unimax from Uddeholm or as agreed.

Surface treated tool parts should be marked, for example, with degrees of roof sanding or similar.

Shaped steel and cut steel which is to be hardened must be designed with the appropriate thickness and if necessary cavities in the steel so that the right hardness can be achieved and cracking avoided. This applies to both rolled and cast material.

Marking of castings NOTE! The foundry states the weight of the tool part.

Tool components

Standard components which are drawn and used in the tool must comply with ISO standards. This does not apply to gas springs! Then only Kaller and Special Springs gas springs are allowed.

Painting, signage and labelling

a) Painting

Regulations.

The tools must be painted: The paint is used both as a primer and topcoat.

Note the importance of the material being properly cleaned before painting!

The tool should have a colour code which shows the weight of the tool. The code must be painted on two corners across the tool.

Colour marking of tools

Yellow = 5-20 tonnes

White = 3-5 tonnes

Red 1.6-3 tonnes

Green = 0 to 1.6 tonnes

b) Signs

Tools should be equipped with signs as follows:

- Sign for a gas spring. Only at reduced pressure.
- Sign for surface coated casting/tool steel mounted on the visible surface so that no grinding or polishing may occur after the surface treatment.
- Supplier plate and Nitator's plate.
- Tool weight and centre line of the centre of mass.
- The weight of the tool's upper part.
- Centre of mass (longitudinal) shall be marked on the upper and lower part.

8: Final delivery PPAP

Trial run

The tool supplier should be present during trial run or as agreed.

Final delivery of the manufacturing documentation

The changes that occur during the manufacturing period should be inserted on the tool drawing, preparation layout, part layout, component list and in the CAD/CAM documentation.

The drawings shall be adjusted with the changes having been made up to the delivery date, or as agreed.

CAD files should be sent in STEP.

9: Warranty

The tool supplier should provide a warranty for its tool of at least 30% of the total annual volume at full production rate. Information about the annual volume will be provided with the tender specification.