

04 Production

Because Engineering needs a strong base

Integrated processes such as toolmaking, heat treatments, and surface finishing, along with a sophisticated quality assurance system, all ensure reliability in all ARNOLD products and services.



Toolmaking

Our tool-making facility with the latest equipment gives optimum support to the manufacturing departments, while also ensuring flexibility and effectiveness.



Heat treatment

In-house fully automated hardening furnaces reduce transfer times and optimise internal processes.



Pressing

In the dual pressing section we can press a huge variety of products in large quantities and under constant process supervision.



Surface treatment

Our own electro-plating unit efficiently applies a wide range of standard surfaces to the highest quality.



Rolling

The existing plant and machinery can produce standard and special threads, and also components with non-detachable washers.



Ultra-fine cleaning

The latest laboratory technology and an ultra-fine cleansing system with its own clean room ensure that we comply with a high level of cleanliness requirements. **Details see page 19**



Multi-stage cold-forming

The latest forming technology (up to seven forming stages) enables us to produce cost-optimised precision and multifunctional parts.



Quality assurance

Consistently enhanced employee qualification and intelligent inspection technology (automated sorters, climatic chambers etc.) ensure high quality.

Toolmaking

Here we produce tools, machine parts as well as test and spare parts for our production departments

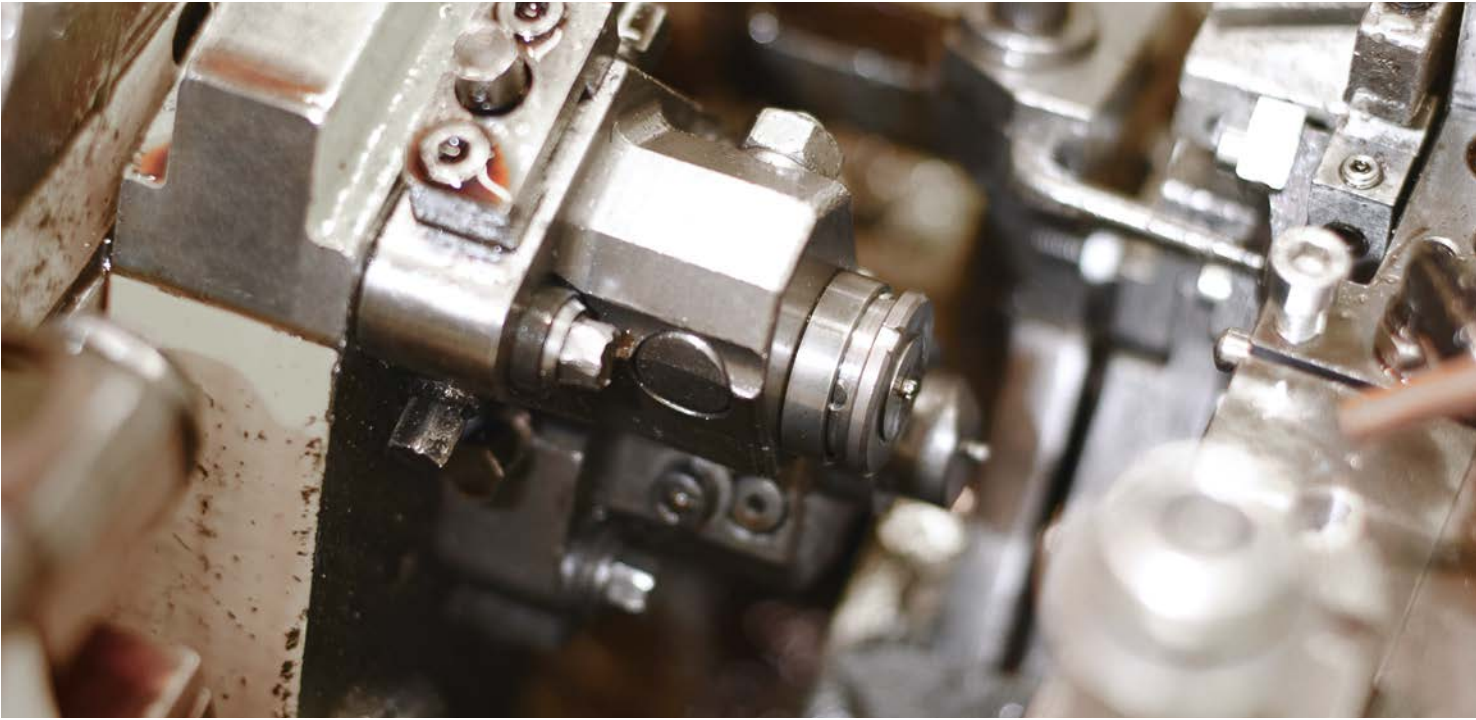
Thanks to our dedicated skilled workers, we at ARNOLD Toolmaking are able – at very short notice – to manufacture the most complex tools and machine parts for production. State-of-the-art machining facilities, consisting of 5-axis HSC milling, CNC turning, laser cutting, electric discharge machining and 3D measuring technology, are available for this important task.



Production of carbide dies by means of sinker EDM.



Control of the process by the team leader.



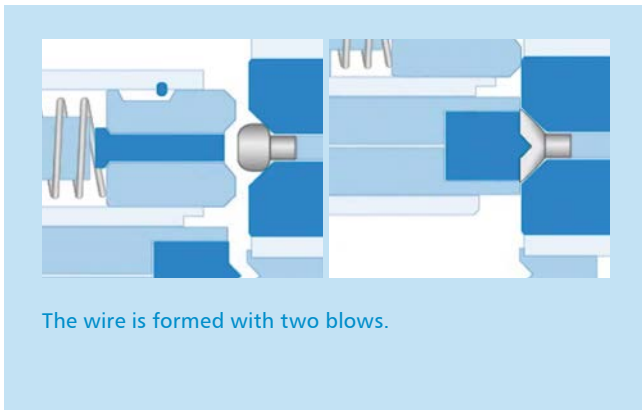
Pressing

Cold forming by pressing using the double blow cold former

In the double blow section, we can press a huge variety of products in large quantities and under constant process supervision.

First, the machine is set up ready to start the cold forming process on the double blow cold former. The wire is inserted into the machine and a light device locks it in place. The machine then makes the bolts. It does this by cutting the wire, placing it in front of a die-plate and then giving two

blows to form the shape. It is so fast that you can hardly see it with the naked eye. After every mechanical work process, the parts are washed to remove any oil or metal chips. Once dry, the parts leave the unit ready for the next step.



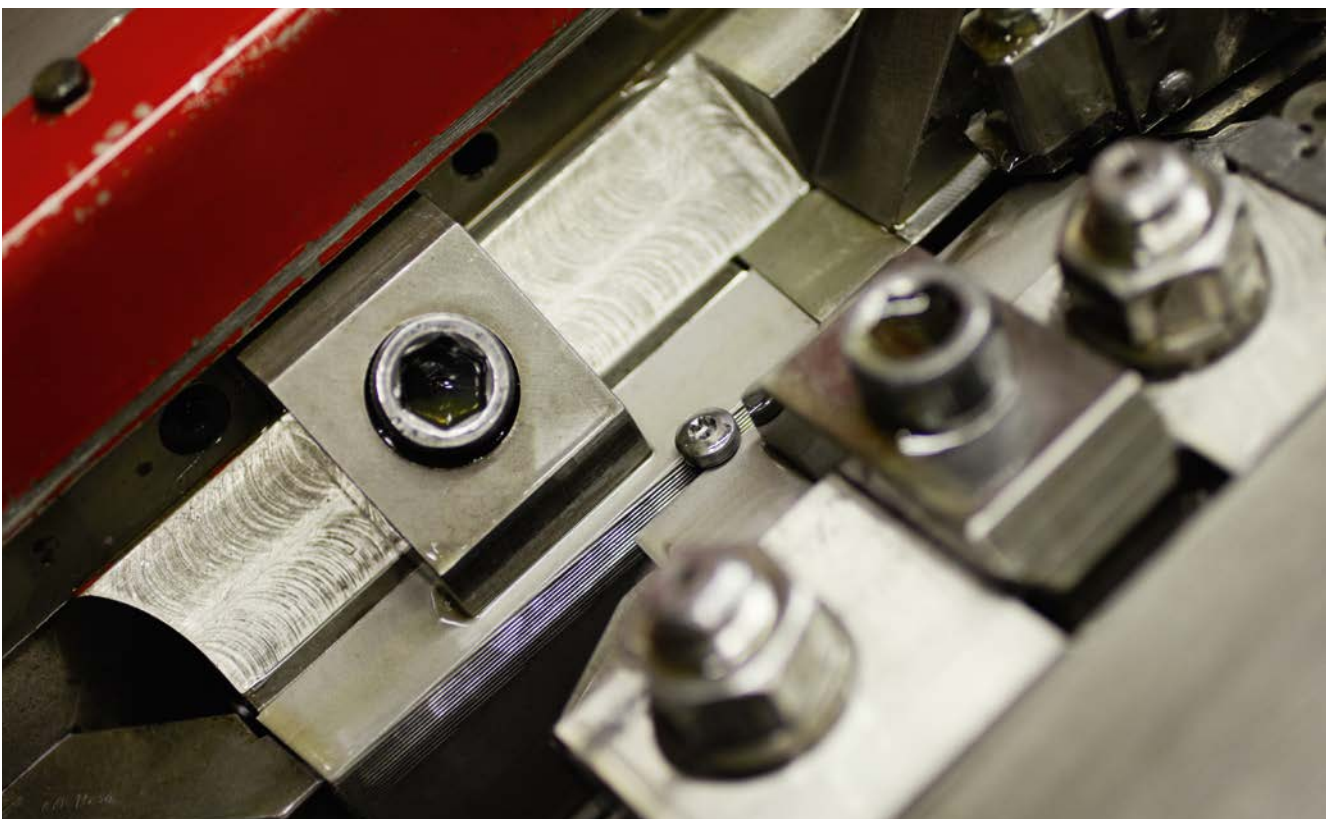
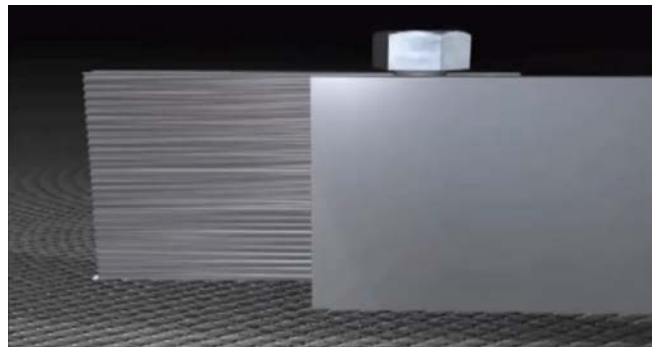
To ensure high cleanliness of the parts, all parts are cleaned after each mechanical work process.

Rolling

Cold forming by rolling

The existing plant and machinery can produce standard and special threads, and also parts with captive washers.

We transport the parts towards the flat die on a feeder rail. One side of the tool is fixed and doesn't move, and the other side constantly moves up and down. Each time it rises, it picks up a part and rolls the thread.



Multi-stage cold-forming

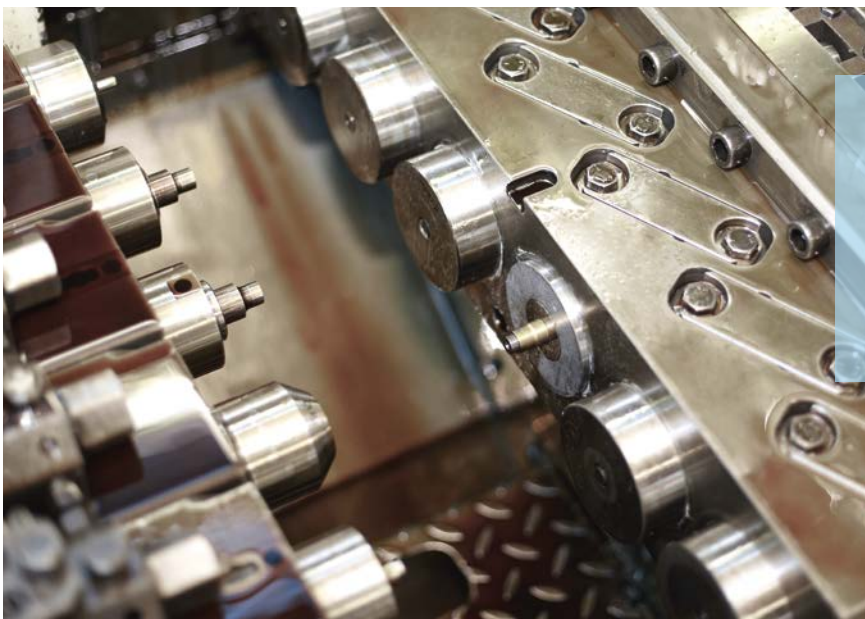
Cold forming by pressing using the multi-stage process

The latest forming technology – with up to seven forming stages – enables us to produce cost-optimised precision and multifunctional parts.

Multi-stage compressive deformation is significantly more complicated than the double blow cold former. A worker installs the tool block, which has been prepared in advance outside the ma-

chine, so that machine stoppage time is kept as short as possible. At each separate forming stage, there is always a part inside each of the tools. So the parts gradually take on their eventual

shape as they go through the various forming stages. As with everything at ARNOLD, each of the stages is entirely digitally monitored.



- + Precision and multifunctional parts at optimum cost
- + Machine stoppage times are reduced to a minimum
- + Maximum transparency and process reliability due to digital monitoring



A worker installs the tool block, which has been prepared in advance outside the machine.



The parts are gradually brought into the desired shape via various forming stages.



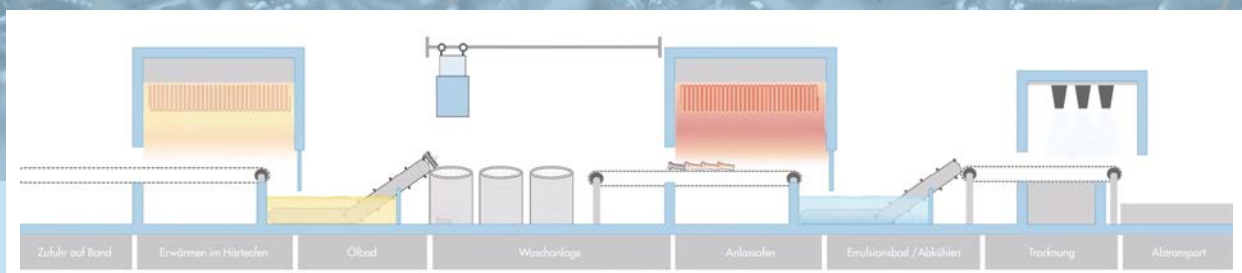
All production stages are digitally monitored and documented.

Heat treatment

Fully automated hardening furnaces reduce transfer times and optimise internal processes

We use a conveyor furnace for our heat treatment processes. A vibratory conveyor ensures that the parts are spread out evenly on the belt on which they travel into the inert gas tunnel furnace. Inside the furnace, and protected by a special inert gas, they are heated to a temperature of up to 900°C after which they are quenched in an oil bath to around 70°C. They then arrive at the washing unit, where first of all the oil is removed by centrifugal action. At a second station we wash the fasteners with water and detergent. In a third and

final step they are dried. Now the clean and dry parts move on to the tempering furnace where they obtain the required hardness, toughness and strength characteristics. Tempering temperatures are generally between 340° and 620°C. For improved handling we then cool the fasteners down to room temperature inside an emulsion bath. Finally, the hardened and tempered items are dried and then moved on for a number of different checking operations.

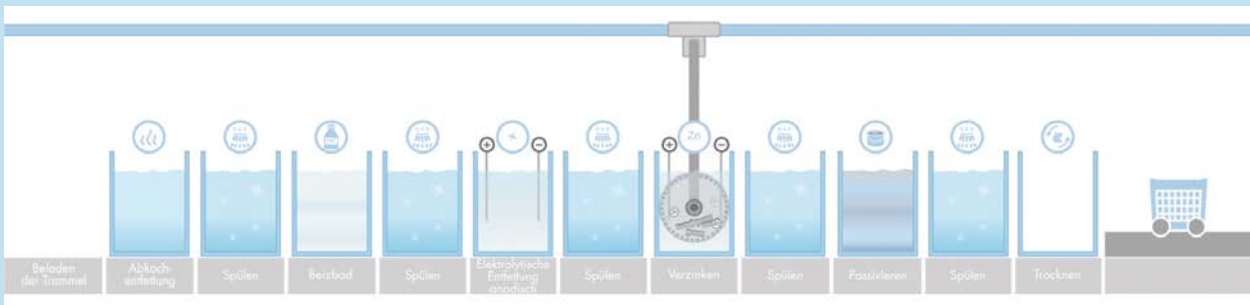
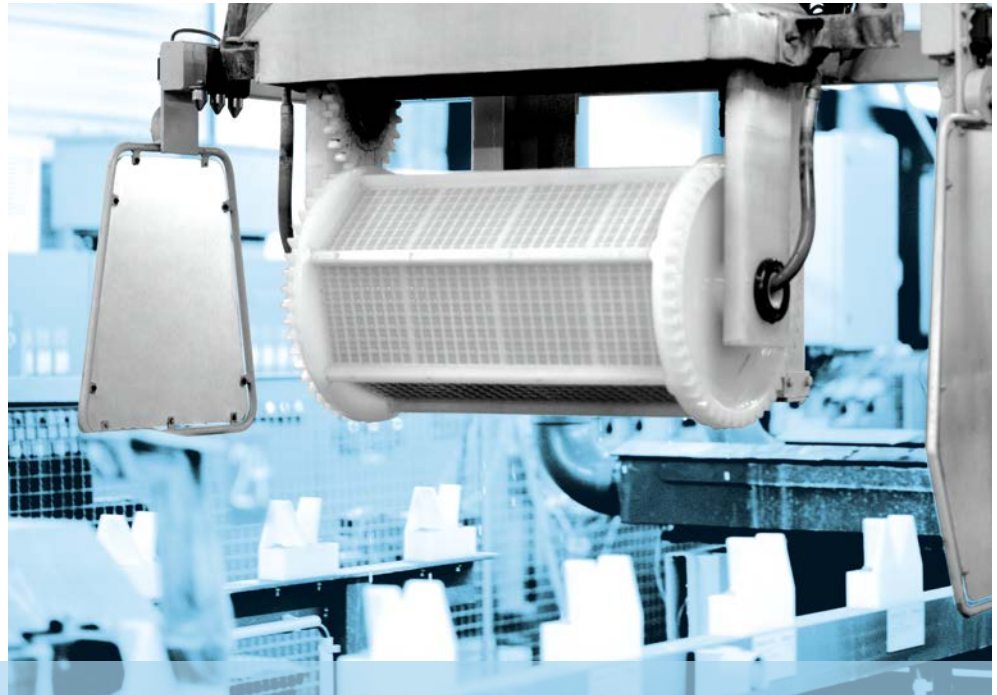


- 1) Feeding to conveyor.
- 2) Heating in hardening furnace.
- 3) Oil bath.
- 4) Washing unit.
- 5) Annealing furnace.
- 6) Emulsion bath / cooling.
- 7) Drying.
- 8) Moving on.

Surface treatment

ARNOLD electro-plating efficiently applies a wide range of surfaces in the highest quality

For surface finishing, the ARNOLD fasteners are transported through the coating unit in drums.



The process from left to right: Decoction degreasing, rinsing, pickling bath, rinsing, anodic electrolytic degreasing, rinsing, galvanization, rinsing, passivation, rinsing, drying

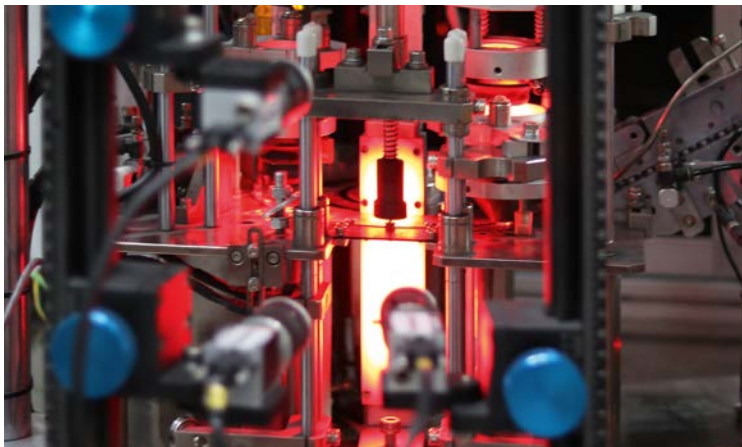
During the surface coating process, single drums transport the parts through the coating unit. First, the drum is filled with fasteners ready for decoction degreasing, a process during which oils, greases and other residual contamination are removed. ARNOLD thus ensures that the surface is clean and non-greasy. Then the items are rinsed before moving on into the pickling bath. This is where we remove oxide layers, such as rust and scale so as to produce a bright metallic surface. The items are rinsed again before they move into the electrolytic degreasing unit, our ultra-fine cleaning process which eliminates the last traces of any contaminants.

Cathodic corrosion protection

Another rinse and the ARNOLD fasteners are now perfectly prepared for the electrolytes. As a rule, we apply 8 to 16 microns of zinc to ensure cathodic protection against corrosion. Once again, this is followed by the obligatory rinsing stage. Depending on what the customer needs, a transparent, yellow or thick film is applied in the passivation process. After the final rinse, the items are dried inside the centrifugal drier.

Sortec® – Quality Assurance

Test technology for optimum safety: with the Sortec® inspection system we ensure optimised productivity in your production processes. With the visual sorting process, faulty parts can be rejected and the parts sorted according to specific characteristics.



At the final production stage, our finished fasteners are either packed straight away, or they move on to a Sortec® inspection process. During the Sortec® inspection, each part is fed on a feeder rail towards a sensor or a camera system and inspected individually.



ARNOLD relies on special cameras

As a general rule we use special cameras to check the components for faulty parts, correct size, quality, cleanliness and completeness. The results can be read and stored digitally. We can also carry out special checks, such as eddy current inspections.



The results of the Sortec® inspection can be read digitally on the touchscreen and then stored.



Almost all our parts are 100% Sortec® tested