
ELCEE
INDUSTRIAL COMPONENTS & ASSEMBLIES
ENGINEERED
COMPONENTS

ELCEE

We are your partner for engineered components and assemblies, including castings, forgings, plain bearings and welded constructions. Transforming welded assemblies into cost-effective castings and forgings is one of our strengths. We are specialised in making best-cost quality components and assemblies at production locations all around the world. Technical support, quality control and supply chain management are standard services for all our products.

ELCEE built up a wealth of specialist knowledge and expertise over many years. We work closely together during your project to understand your needs, so we can find the best and most efficient fit for your specific design. The result: the most efficient and affordable components and assemblies for your production process. ELCEE group operates from 18 locations around the world. Our sales team has a local focus to give you the best service!

"Your partner for engineered components and assemblies, including castings, forgings, plain bearings and welded constructions."

ENGINEERED COMPONENTS

ELCEE offers industrial components and assemblies produced at best-cost locations. We specialise in producing small to medium quantities of machined and assembled castings, forgings and welded assemblies. Our engineers will help to transform your components into cost-effective products. We start with your specific requirements and can manufacture in a wide variety of materials and production technologies.

CASTINGS

ELCEE supplies engineered castings of various materials e.g. steel, stainless steel, aluminium, iron and plastics. The main advantage of casting is that it is a technique to produce an end product in as few steps as possible. This makes it a cost-saving technique. It reduces labour costs and requires no or less welding and machining. Advanced castings combine exceptional strength with low weight and high formability. The weight of the product can significantly be reduced and cast parts are uniform products. All our castings are customer specific and we have no limits in casting technologies.

FORGINGS

Forgings of different materials, in small and medium quantities is what we supply. Dimensions and weight vary depending on the production process and the material. For heavy-duty parts, forging is a technique to produce an end product in as few steps as possible. Forged components are very strong, the forging process minimizes the risk of material deficiencies, cracks, etc. The forging process can relatively easily be optimised for mass production, enabling a short lead time in large series.

CNC MACHINING

In our own workshops, we machine ready-for-assembly castings and forgings. We supply a wide range of solutions for conventional, high precision and manual processing of various materials such as steel, brass, stainless steel and plastics. CNC machining helps shorten production times and optimise product quality. All our cast and forged components are preferably machined delivered to our customers ready to use.

WELDED CONSTRUCTIONS

We supply welded constructions from light constructions up to heavy steel constructions. When required we approve our welded constructions in accordance with the international standards of non-destructive testing (NDT).

ASSEMBLIES

In addition to the production of engineered components, we also supply the assembly of castings, forgings, welded constructions, plain bearings* and stainless steel fasteners* into one custom made product according to your specifications. Reduce production time and save labour costs by using our services.

*Request a copy of our brochure of plain bearings or stainless steel fasteners at www.elceegroup.com/documentation

(SILICA SOL PROCESS)

INVESTMENT CASTING

DESIGN FREEDOM AND HIGH DIMENSIONAL ACCURACY

Investment casting (silica sol process) or lost wax casting is one of the oldest casting techniques, offering unlimited freedom in terms of design and material choices. Products range from a few grams to over 150 kg.

By using wax models with water-soluble or ceramic cores, you can produce complex, internal structures in castings. As this is a high-precision technique, it is eminently suited for converting conventionally-produced products into castings, minimising the additional operations and reducing the product's final weight.

Due to the smooth finish possibilities, it is possible to produce excellent decorative structural components through investment casting. The low investment in tooling and start-up costs enables you to produce anything from a few to hundreds of thousands of pieces.

EXAMPLES

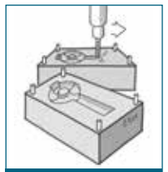
BENEFITS

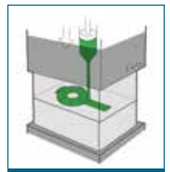
- Precise tolerances
- Fine surface structure
- Complex shapes without draft angles
- Small characters e.g. letters or company logos
- Small to large series

POSSIBLE ALLOYS

- Stainless steel and duplex grades
- Carbon steel
- Non-ferrous steel alloys e.g. aluminium and copper

PROCESS


1. TOOLING PRODUCTION


2. WAX INJECTION


3. TREE ASSEMBLY


4. SLURRY DIPPING


5. CERAMIC STREWING


6. DEWAXING


7. SHELL BAKING


8. MELTING & POURING


9. SHELL BREAKING


10. GATES REMOVING


11. GRINDING


12. MEASUREMENT CHECK

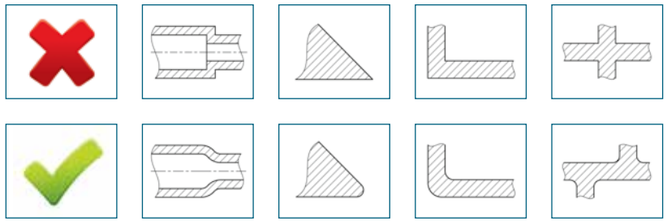
TECHNICAL SPECIFICATIONS

- The commonly used casting tolerance table for linear dimensions is CT6 according to ISO 8062 (wall thicknesses CT7)
- Weight: 0.005 - 150 kg
- Casting surface roughness: Ra 6.3 µm
- Maximum dimensions: 1000 x 620 x 380 mm

DIMENSIONS (MM)		CT6	CT7
-	≤ 10	± 0.26	± 0.37
> 10	≤ 16	± 0.27	± 0.39
> 16	≤ 25	± 0.29	± 0.41
> 25	≤ 40	± 0.32	± 0.45
> 40	≤ 63	± 0.35	± 0.50
> 63	≤ 100	± 0.39	± 0.55
> 100	IN CONSULTATION		

DESIGN GUIDELINES

- Avoid abrupt transitions and use radii
- Angle tolerances: ± 1°
- Casting wall thickness: ≥ 3 mm, locally 0.5 mm possible
- Use even wall thickness to minimise shrinkage
- Geometric tolerances required for the function, should be specified on the drawing



FINISHING PROCESSES

- Geocote
- Hot-dip galvanising
- Primer, wet painting and powder coating
- Blasting (sand/glass)
- Pickling and passivation
- Electrolytic polishing
- Vibra-polishing
- Chrome plating
- Mirror polishing
- Dull polishing
- KTL/e-coating

(WATER GLASS PROCESS)

INVESTMENT CASTING

DESIGN FREEDOM AND RELATIVELY LOW DIMENSIONAL ACCURACY

The benefits of the water glass process are the same as the silica sol process. With slightly rougher surface and lower accuracy, the water glass process is a cost efficient process to convert complex welded constructions into castings. This technology is mostly used for steel and stainless steel.

Water glass is used to cure the ceramic layers. This substance is then added to the slurry. Next the wax tree is immersed (in the slurry). The slurry continues to adhere to the wax, after which it is strewed with ceramics. It is then placed in a bath with a water chloride solution. The water glass (adhering to the wax with the slurry) reacts to this solution in the bath, curing the layer. This layering process is repeated several times until the layer is sufficiently thick for pouring. If necessary, a smoother casting surface can be achieved by using the first ceramic layers as it is done in the silica sol technique.

Water glass cast components are mainly used where heavier and/or stronger and even more complex shapes are required. Depending on the used material, sizes and weight vary, ranging from 200 grams to 150 kg.

EXAMPLES

BENEFITS

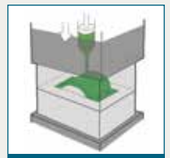
- Low cost moulding process
- Complex design without draft angles
- Higher accuracy in comparison to sand casting
- Small to large series

POSSIBLE ALLOYS

- Stainless steel and duplex grades
- Carbon steel
- Non-ferrous steel alloys e.g. aluminium and copper

PROCESS

1. TOOLING PRODUCTION



2. WAX INJECTION

3. TREE ASSEMBLY

4. SLURRY DIPPING

5. CERAMIC STREWING

6. CURING IN A CHLORIDE SOLUTION BATH

7. MELTING WAX

8. SHELL BAKING

9. MELTING & POURING

10. SHELL BREAKING

11. GATES REMOVING

12. MEASUREMENT CHECK

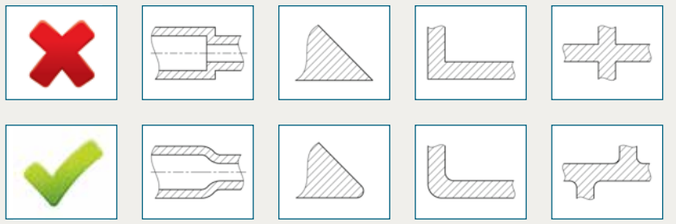
TECHNICAL SPECIFICATIONS

- The commonly used casting tolerance table for linear dimensions is CT8 according to ISO 8062 (wall thicknesses CT9)
- Weight: ± 0.2 - 150 kg
- Casting surface roughness: ≥ Ra 6.3 µm
- Maximum dimensions: 600 mm x 600 mm x 600 mm

DIMENSIONS (MM)		CT8	CT9
-	≤ 10	± 0.50	± 0.75
> 10	≤ 16	± 0.55	± 0.80
> 16	≤ 25	± 0.60	± 0.85
> 25	≤ 40	± 0.65	± 0.90
> 40	≤ 63	± 0.70	± 1.00
> 63	≤ 100	± 0.80	± 1.10
> 100	≤ 160	± 0.90	± 1.25
> 160	≤ 250	± 1.00	± 1.40
> 250	≤ 400	± 1.10	± 1.60
> 400	≤ 630	± 1.30	± 1.80
> 630	≤ 1000	± 1.40	± 2.00
> 1000	≤ 1600	± 1.60	± 2.30

DESIGN GUIDELINES

- Avoid abrupt transitions and use radii
- Angle tolerances: ± 1°
- Casting wall thickness: ≥ 4 mm
- Use even wall thickness to minimise shrinkage
- Geometric tolerances required for the function, should be specified on the drawing



FINISHING PROCESSES

- Hot-dip galvanising
- Primer, wet painting and powder coating
- Blasting (sand/glass)
- KTL/e-coating
- Geocote

SHELL MOULD CASTING

METICULOUS PROCESS WITH LITTLE NEED FOR FINISHING OPTIONS

Shell mould casting enables the manufacturer to create complex parts with thin sections and small projections. Shell mould castings also imparts high dimensional accuracy.

The Croning Process (or shell mould casting) is a metal casting process in which the mould is a thin-walled hardened sand shell created with a thermosetting resin binder, backed up by another material (often pebbles). The shell mould's internal surface is very smooth and rigid, allowing the liquid metal to easily flow through the mould cavity while pouring the casting, resulting in a very good surface finish.

Shell mould casting is particularly suited for castings under 75 kg. However, this process can be used on almost any metal that can be sand cast.

EXAMPLES

BENEFITS

- Smooth surface quality
- Thin wall thickness
- Low cost moulding process
- Higher accuracy in comparison to sand casting
- Small to large series

POSSIBLE ALLOYS

- Stainless steel and duplex grades
- Carbon steel
- Non-ferrous steel alloys e.g. aluminium and copper

PROCESS


1. TOOLING PRODUCTION


2. INSTALLING


3. TOOLING CLOSING


4. HEATING & FILLING TOOL


5. REMOVING MOULD


6. SPRAYING MOULD


7. GLUEING MOULD


8. MELTING & POURING


9. SHOT BLASTING


10. GATES REMOVING


11. MEASUREMENT CHECK

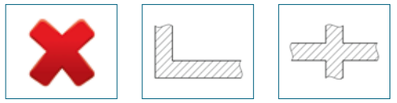
TECHNICAL SPECIFICATIONS

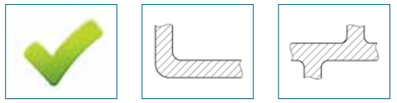
- The commonly used casting tolerance table for linear dimensions is CT9 according to ISO 8062 (wall thicknesses CT10)
- Weight: ± 0.2 - 75 kg
- Casting surface roughness: steel Ra 50 - 100 µm, Iron 25 – 50 µm
- Maximum dimensions: 800 mm x 800 mm x 300 mm

DIMENSIONS (MM)		CT9	CT10
-	≤ 10	± 0.75	± 1.00
> 10	≤ 16	± 0.80	± 1.10
> 16	≤ 25	± 0.85	± 1.20
> 25	≤ 40	± 0.90	± 1.30
> 40	≤ 63	± 1.00	± 1.40
> 63	≤ 100	± 1.10	± 1.60
> 100	≤ 160	± 1.10	± 1.80
> 160	≤ 250	± 1.40	± 2.00
> 250	≤ 400	± 1.60	± 2.20
> 400	≤ 630	± 1.80	± 2.50
> 630	≤ 1000	± 2.00	± 3.00
> 1000	≤ 1600	± 2.30	± 3.50
> 1600	≤ 2500	± 2.70	± 4.00
> 2500	≤ 4000	± 3.10	± 4.50
>4000	≤ 6300	± 3.50	± 5.00

DESIGN GUIDELINES

- Avoid abrupt transitions and use radii
- Angle tolerances: ± 1°
- Casting wall thickness: ≥ 4 mm
- Use even wall thickness to minimise shrinkage
- Geometric tolerances required for the function, should be specified on the drawing





FINISHING PROCESSES

- Hot-dip galvanising
- Primer, wet painting and powder coating
- Blasting (sand/glass)
- KTL/e-coating
- Geocote

SAND CASTING

LIMITED DESIGN FREEDOM, UNLIMITED IN SIZE AND MATERIALS

Sand casting is a widely-used technique and can be a manual, mechanical or semi-automated process depending on the quantities required. It is mainly used for grey iron, ductile iron, aluminium, steel and stainless steel varieties. The production process is quite simple. Cores are used to achieve complex shapes.

The process is called sand casting because the mould that contains the cavity into which metal is poured, is made from compressed or compacted sand. The sand contains another material that ensures it to hold its shape. Tooling is mostly made from metal or composite materials, guaranteeing a long life. Alternatively, wood tooling can be used to reduce the costs for small series. The disadvantage of wood tooling is increased surface roughness compared to aluminium tooling.

Sand casting can be used for small and large series, ranging from around 200 grams to several tons.

EXAMPLES

BENEFITS

- Small to large components
- Small to large series
- Low cost casting process

POSSIBLE ALLOYS

- Ductile cast iron
- Grey cast iron
- Stainless steel
- Carbon steel
- Non-ferrous steel alloys e.g. aluminium and copper

PROCESS


1. TOOLING PLATES

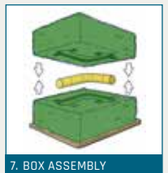

2. SAND FILLING

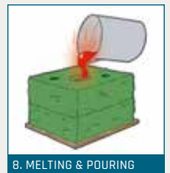

3. COMPRESSING


4. TURNING TOOL PLATE


5. REMOVING SHUTTERING

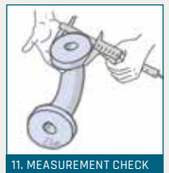

6. REMOVING


7. BOX ASSEMBLY (WITH CORE)


8. MELTING & POURING


9. SAND REMOVING


10. GATES REMOVING


11. MEASUREMENT CHECK

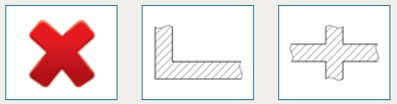
TECHNICAL SPECIFICATIONS

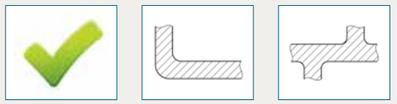
- Commonly used casting tolerance table for linear dimensions is CT10 according to ISO 8062 (wall thicknesses CT11)
- Weight: from 0.2 kg to tons
- Casting surface roughness: steel Ra 50 - 100 µm, Iron 25 – 50 µm
- Maximum dimensions: several metres

DIMENSIONS (MM)		CT10	CT11
-	≤ 10	± 1.00	± 1.40
> 10	≤ 16	± 1.10	± 1.50
> 16	≤ 25	± 1.20	± 1.60
> 25	≤ 40	± 1.30	± 1.80
> 40	≤ 63	± 1.40	± 2.00
> 63	≤ 100	± 1.60	± 2.20
> 100	≤ 160	± 1.80	± 2.50
> 160	≤ 250	± 2.00	± 2.80
> 250	≤ 400	± 2.20	± 3.10
> 400	≤ 630	± 2.50	± 3.50
> 630	≤ 1000	± 3.00	± 4.00
> 1000	≤ 1600	± 3.50	± 4.50
> 1600	≤ 2500	± 4.00	± 5.00
> 2500	≤ 4000	± 4.50	± 6.00
>4000	≤ 6300	± 5.00	± 7.00
>6300	≤ 10000	± 5.50	± 8.00

DESIGN GUIDELINES

- Avoid abrupt transitions and use radii
- Angle tolerances: ± 1°
- Casting wall thickness: ≥ 6 - 8 mm. Smaller is possible, depending on the structure
- Use even wall thickness to minimise shrinkage
- Geometric tolerances required for the function, should be specified on the drawing





FINISHING PROCESSES

- Hot-dip galvanising
- Primer, wet painting and powder coating
- Blasting (sand/glass)
- KTL/e-coating
- Geocote

HIGH PRESSURE DIE CASTING

RESTRICTIONS IN DESIGN AND MATERIALS, HIGH ACCURACY

High pressure die casting is a fast and reliable process that is used to manufacture aluminium or zinc alloy products. It is especially suitable for the production of large series metal components.

This metal casting process involves forcing molten metal under high pressure into a mould cavity. The mould cavity is created using two hardened tool steel dies which have been machined into shape, which work in the same way as an injection mould. Depending on the type of metal that is being cast, a hot or cold chamber machine is used.

The minimum production quantities depend on the product size and start from 1,000 pieces. Product weight depends on the alloy and shape and ranges from 30 grams to around 20 kg.

EXAMPLES

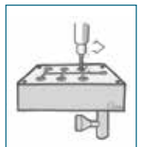
BENEFITS

- Small and complex thin-walled parts
- Consistent product quality
- High production output in large series
- Cost efficient in large series

POSSIBLE ALLOYS

- Aluminium alloys
- Zinc alloys e.g. zamak
- Magnesium alloys

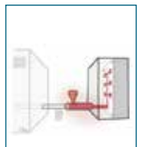
PROCESS



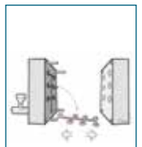
1. TOOLING PRODUCTION

2. ANTI-ADHESION PASTE

3. ALUMINIUM INJECTION



4. COOLING UNDER PRESSURE



5. PRODUCT EXTRACTING

6. GATES REMOVING

7. MEASUREMENT CHECK

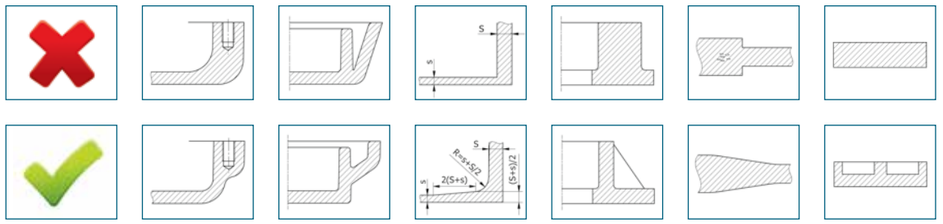
TECHNICAL SPECIFICATIONS

- Commonly used aluminium casting tolerance table for linear dimensions is CT6 according to ISO 8062 (wall thicknesses CT7)
- Weight: ± 0.03 - 20 kg
- Casting surface roughness: ± Ra 6.3 µm
- Maximum dimensions: 800 mm x 800 mm x 300 mm

DIMENSIONS (MM)		CT6	CT7
-	≤ 10	± 0.26	± 0.37
> 10	≤ 16	± 0.27	± 0.39
> 16	≤ 25	± 0.29	± 0.41
> 25	≤ 40	± 0.32	± 0.45
> 40	≤ 63	± 0.35	± 0.50
> 63	≤ 100	± 0.39	± 0.55
> 100	≤ 160	± 0.44	± 0.60
> 160	≤ 250	± 0.50	± 0.70
> 250	≤ 400	± 0.55	± 0.80
> 400	≤ 630	± 0.60	± 0.90
> 630	≤ 1000	± 0.70	± 1.00

DESIGN GUIDELINES

- Avoid abrupt transitions and use radii
- Angle tolerances: ± 0,5°
- Casting wall thickness for aluminium: ≥ 2.5 mm and ≤ 8 - 10 mm
- Minimum draft angle 0.5°
- Use even wall thickness to minimise shrinkage
- Geometric tolerances required for the function, should be specified on the drawing
- Avoid material accumulations, strength can be obtained with reinforcement ribs
- The position of the injection pins should be specified on the drawing



FINISHING PROCESS

- Technical anodising (not decorative, it becomes spotty matt black)
- Grinding and polishing
- Vibra polishing
- Primer, wet painting and powder coating
- Blasting (sand and glass)

LOW PRESSURE DIE CASTING

LIMITED DESIGN FREEDOM, MATERIAL RESTRICTIONS AND RELATIVELY HIGH ACCURACY

Low pressure die casting and gravity die casting are also sometimes called permanent mould casting. This technique is used to produce high-quality castings from aluminium, magnesium and other low-melting alloys. The tooling used for these techniques is mainly made from steel.

Molten metal is poured into the die. To ensure the mould is properly filled, the casting may be done at low pressure or using a spinning mould during the casting process to ensure the entire mould is properly filled. Complex internal cavities can be produced using sand cores or retractable metal pins.

Weight may vary from 30 grams to 80 kg. Low pressure die casting can be used for small and large series.

EXAMPLES

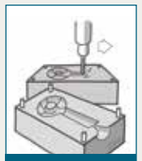
BENEFITS

- Complex internal cavities
- Consistent dimensional accuracy
- Possibility to insert metal parts in the casting e.g. bolts and pipes
- Small to medium series

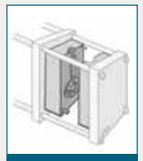
POSSIBLE ALLOYS

- Aluminium alloys
- Zinc alloys e.g. zamak
- Magnesium alloys

PROCESS



1. TOOLING PRODUCTION



2. TOOLING MOUNTING

3. TOOLING CLOSING

4. MELTING & POURING

5. EJECTING THE SOLIDIFIED CASTING

6. GATES REMOVING

7. MEASUREMENT CHECK

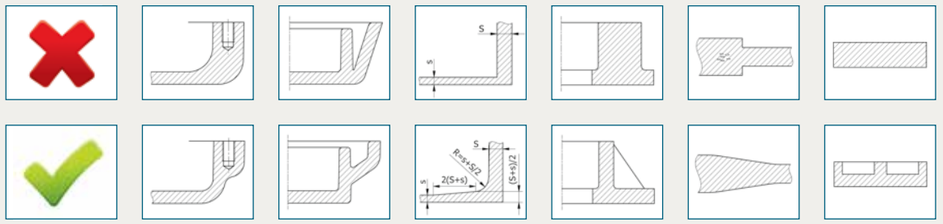
TECHNICAL SPECIFICATIONS

- The commonly used casting tolerance table for linear dimensions is CT8 according to ISO 8062 (wall thicknesses CT9)
- Weight: ± 0.03 - 80 kg
- Casting surface roughness: ± Ra 6.3 µm
- Maximum dimensions: 600 mm x 600 mm x 600 mm

DIMENSIONS (MM)		CT8	CT9
-	≤ 10	± 0.50	± 0.75
> 10	≤ 16	± 0.55	± 0.80
> 16	≤ 25	± 0.60	± 0.85
> 25	≤ 40	± 0.65	± 0.90
> 40	≤ 63	± 0.70	± 1.00
> 63	≤ 100	± 0.80	± 1.10
> 100	≤ 160	± 0.90	± 1.25
> 160	≤ 250	± 1.00	± 1.40
> 250	≤ 400	± 1.10	± 1.60
> 400	≤ 630	± 1.30	± 1.80
> 630	≤ 1000	± 1.40	± 2.00
> 1000	≤ 1600	± 1.60	± 2.30

DESIGN GUIDELINES

- Avoid abrupt transitions and use radii
- Angle tolerances: ± 1°
- Casting wall thickness for aluminium: ≥ 3 mm and ≤ 8 - 10 mm
- Minimum draft angle 1°, commonly 2° - 3°
- Use even wall thickness to minimise shrinkage
- Geometric tolerances required for the function, should be specified on the drawing
- Avoid material accumulations, strength can be obtained with reinforcement ribs
- The position of the injection pins should be specified on the drawing



FINISHING PROCESS

- Technical anodising (not decorative, it becomes spotty matt black)
- Grinding and polishing
- Vibra polishing
- Primer, wet painting and powder coating
- Blasting (sand and glass)

SINTERING

LIMITED DESIGN FREEDOM AND MECHANICAL PROPERTIES, TIGHT TOLERANCES

Sintering can be used to manufacture products with tight tolerances and a smooth surface finish. The process reduces porosity and enhances properties such as strength, electrical conductivity and thermal conductivity. This process can be used for various steel, stainless steel and bronze alloys.

Metal powder and binder materials are mixed to obtain a powder with a specific composition. This powder is then placed into a mould (negative) and compressed under high pressure. During the heating process, the binder melts and the metal powder fuses. Pressure can be used to calibrate the product or impregnate the product with oil for lubrication. The product can be deburred with vibra polishing.

The minimum product quantities depend on the product size and start at 1,000 pieces.

EXAMPLES

BENEFITS

- Cost efficient in large series
- Near to net production method; hardly any material loss
- Self-lubricating due to controlled porosity
- Possibility of complex shapes if the part is pressed in the axial direction

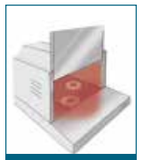
POSSIBLE ALLOYS

- Carbon steel
- Stainless steel
- Non-ferrous steel alloys e.g. copper

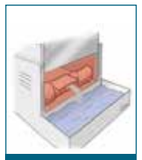
PROCESS

1. METAL POWDER MIXING

2. POWDER COMPACTING



3. SINTERING



4. HEAT TREATMENT

5. VIBRA-POLISHING

6. IMPREGNATION WITH OIL (OPTIONAL)

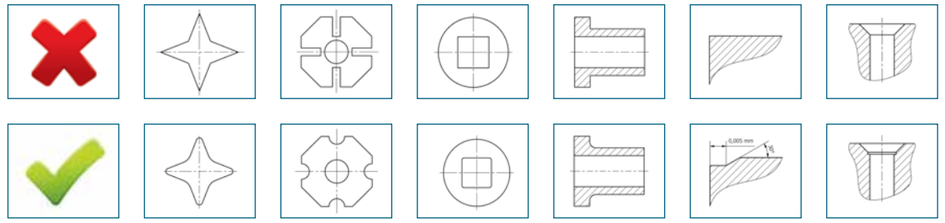
7. MEASUREMENT CHECK

TECHNICAL SPECIFICATIONS

- The largest possible dimension is about Ø 180 mm depending on:
  - Shape of the component
  - Pressure capacity of the press
  - Required material density
- The tolerance depends on the tool partitions, the pressing direction, and the material: normally between ± 0.05 mm and ± 0.75 mm
- Strength depends on a number of factors e.g. density and shape
- Weight: from a few grams to ± 1.5 kg

DESIGN GUIDELINES

- Avoid abrupt transitions and use radii
- Sharp edges can be formed by tapering the most outer corners, formed by the tool divisions. Preferably, 30° in the pressing direction
- Minimum wall thicknesses are 2 mm, depending on the design. Preferably, keep the compressed powder robust
- The draft angle for the outer contour is not necessary, draft angle on the surfaces, which are formed by the punches (± 7°)
- Holes and cavities perpendicular to the pressing direction are not possible, unless;
  - By secondary processes
  - The pressing direction can be made in various shapes, using core rods of at least Ø 1.6 mm, depending on the length of the desired hole
- Geometric tolerances required for the function, should be specified on the drawing
- The component must be designed to be able to compress the powder
- Steps, conical surfaces, markings, etc. can be made in the pressing direction



FINISHING OPTIONS

- Zinc coating
- Nickel coating
- Blackening (black oxide)

CLOSED DIE FORGING

LIMITED FREEDOM IN DESIGN AND SIZE
EXCELLENT MECHANICAL CHARACTERISTICS

Forging is a manufacturing process that involves the shaping of metal using localised compressive forces. Closed die forging produces homogeneous products, with excellent mechanical characteristics.

When the metal reaches the desired heat, it is placed in the die. The desired shape of the forging is incorporated as a negative image in the other half of the die. The raw material is pressed into the desired shape by exerting pressure on the die.

Closed die forging can be used for medium to large series. Forging weights range from 200 grams to 120 kilograms. The minimum production quantity depends on the product size, but usually starts at 1,000 pieces.

EXAMPLES

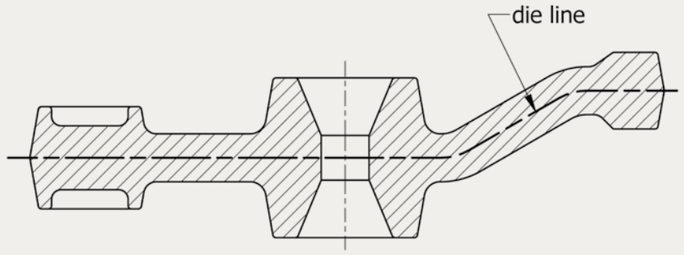
BENEFITS
- Consistent dimensional accuracy
- Homogeneous material with mechanical properties
- High production output in large series
- Cost efficient in large series

POSSIBLE ALLOYS
- Steel
- Carbon steel
- Stainless steel
- Non-ferrous steel alloys e.g. aluminium, bronze and copper

PROCESS

TECHNICAL SPECIFICATIONS

- The tolerances of steel forgings are, as per EN 10243-1, and the following criteria are decisive:
  - Forge weight
  - Shape of the tool division
  - Category of the steel (high or low alloy)
  - Form complexity factor in the norm EN 10243-1 depends on the factor between the weight of the component and the envelope weight
- Weight: 0.2 kg to 120 kg
- Maximum dimensions: length 1200 mm



DESIGN GUIDELINES

- Use big radii to avoid quick tooling wear or cracks in forgings
- Adequate draft angle of at least 3° for aluminium and 5° to 7° for steel
- Geometric tolerances required for the function, should be specified on the drawing
- The most important tolerances apply to: length, width, height, thickness and finishing of the forging edge
- Use even wall thickness to minimise shrinkage
- Forging wall thickness: ≥ 4 mm
- Ribs should be low and wide
- The various cross-sections must be balanced to prevent extreme variations in the flow of the metal
- The tooling division must be passing the centre of the forging and not along one side. From this division the forging needs to be detachable

FINISHING PROCESS

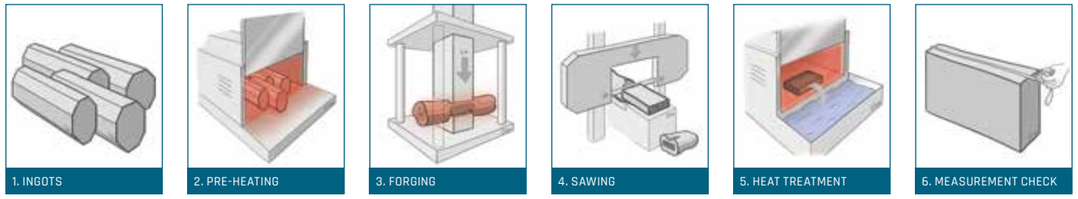
- Electrolytic zinc plating
- Hot-dip galvanising
- Primer, wet painting and powder coating
- Blasting (sand and glass)
- KTL/e-coating
- Geocote
- Vibra-polishing
- Anodising

OPEN DIE FORGING

LIMITED DESIGN FREEDOM, UNLIMITED SIZE AND SHAPE CAPABILITIES, EXCELLENT MECHANICAL CHARACTERISTICS

Open die forging is used to shape steel and steel alloys into the desired shape without the need for special moulds. During the forging process, maximum effort is made to approximate the desired shapes/sizes as much as possible. Usually the components are fully machined. Examples of open die forgings include shafts, rings and flanges.

PROCESS



TECHNICAL SPECIFICATIONS

- Weight: from 2 kg to tons
- Maximum dimensions: several meters
- Most specifications are machining tolerances

DESIGN GUIDELINES

- Avoid abrupt transitions and use radii
- Use even wall thickness to minimise shrinkage
- Geometric tolerances required for the function, should be specified in the drawing

FINISHING PROCESS

- Electrolytic zinc plating
- Hot-dip galvanising
- Primer, wet painting and powder coating
- Blasting (sand and glass)
- KTL/e-coating
- Geocote
- Vibra-polishing
- Anodising

BENEFITS

- Possibility of small series
- Low cost tooling process
- Large components up to tons
- Homogeneous material with mechanical properties

POSSIBLE ALLOYS

- Steel
- Carbon steel
- Stainless steel
- Non-ferrous steel alloys e.g. aluminium, bronze and copper

WELDED CONSTRUCTIONS

WELDED PRODUCTIONS IN ACCORDANCE WITH THE INTERNATIONAL STANDARDS FOR NDT

In addition to engineered components, we offer welded constructions produced in Europe and Asia. When required, we approve our welded constructions in accordance with the international standards of non-destructive testing (NDT). Our welding workshops are audited by Level II inspectors. Approved WPS/WPQ documentation for the most common types of materials is available.

EXAMPLES

BENEFITS

- Complex geometrie
- Unlimited in sizes
- Small series

POSSIBLE ALLOYS

- Steel
- Carbon steel
- Stainless steel
- Non-ferrous steel alloys e.g. aluminium, bronze and copper

ASSEMBLIES

OPTIMISE COSTS OF OWNERSHIP

Save production time and labour costs in your own workshop by using our close-to-production assembly and packaging services in our own workshops in Western Europe, Eastern Europe and the Far East.

Examples assemblies:
- Packaging CNC machined castings into customer specific trays
- Pressing in plain bearings into a casting
- Castings mounted together with stainless steel fasteners
- Assemble castings with third party components

EXAMPLES

BENEFITS

- Reduction of TCO
- Quality control of assembly
- Reduction of number of suppliers
- Reduction complexity inventory management
- Less re-work at errors
- Less assembly costs, material costs and tooling costs

ABOUT ELCEE

- Founded in 1923
- 300 employees worldwide at 18 locations, of which 40% for process control, production control and quality assurance
- Technical centres with state-of-the-art measuring equipment at warehouse and production locations
- Machining and assembly workshops close to our production locations in Europe and Asia
- Over 3,000 satisfied customers, amongst others industry leaders
- Strategically located warehouses in Europe and Asia

OUR QUALITIES

KNOW HOW
Thanks to 95 years of experience, we carefully accumulated knowledge and expertise for the benefit of our customers

QUALITY
Fully-equipped quality and material labs in Europe and Asia for quality assurance of products before shipment: only approved products are shipped

PRODUCTION
Over 150 qualified production locations around the globe at your disposal, selected on their strengths

LOCAL HERO
Multiple offices worldwide: ELCEE is your local supplier in a global world

COST ENGINEERING
Support, training and advice to come to the best design with the limits given and, amongst others, transform welded constructions into cost-efficient castings and forgings

SUPPLY CHAIN
Organising the supply chain from manufacturing up to your production line with short warehouse lead times to ensure a smooth supply to your location

GET IN TOUCH

Reach out to your local contact person. We are pleased to supply you with best-cost components and assemblies to optimise your production process.

www.elceegroup.com

ELCEE

INDUSTRIAL COMPONENTS & ASSEMBLIES