Richard Stenzhorn GmbH

Hochtechnologie-Drähte

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- *operating since 1965*
- *approx. 70 employees*
- *approx. 200MT / month*
- *three shifts, sometimes 24/7*
- *machines are self-developed*
- *2300m² at location Velbert*

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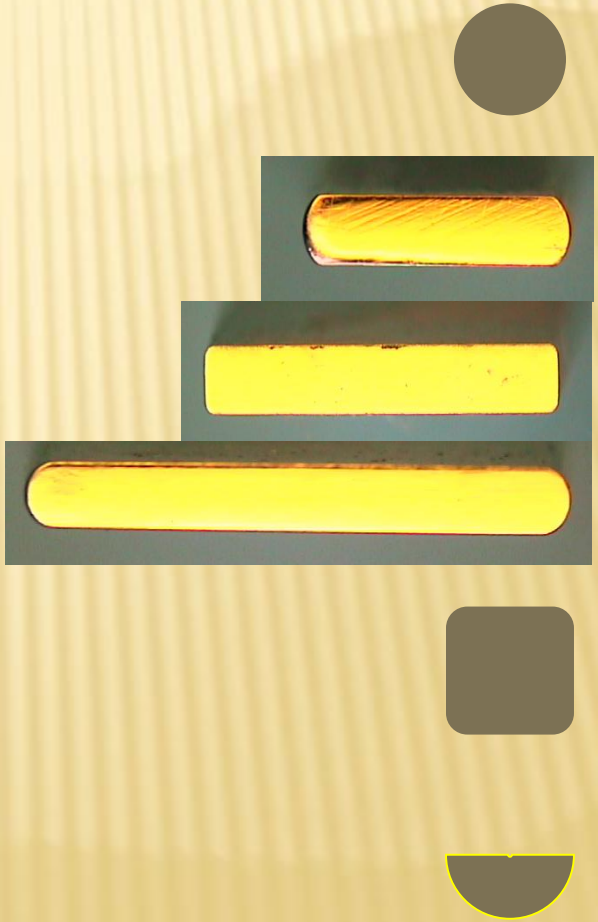
- *electrical systems*
- *electronics*
- *sensor technology*
- *satellite components*
- *control systems*
- *telecommunications*
- *medical components*
- *springs*

Wire Forms

- *Round*
- *Flat*
  - natural formed edges
  - 2 straight edges 4 corner radii left
  - rolled edges
- *Square*
  - corner radius acc. to specification
  - octagonal
- *Shaped*
  - individual special profiles



Dimensions

- *Round wire*
  - Diameter 0.1 to 4.0 mm
- *Flat wire*
  - Thickness 0.1 to 2.5 mm
  - Width 0.5 to 6.0 mm
- *Square wire*
  - 0.15 x 0.15 to 2.0 x 2.0 mm
- *Shaped wire*
  - Cross section up to 6.0 mm²

Tolerances

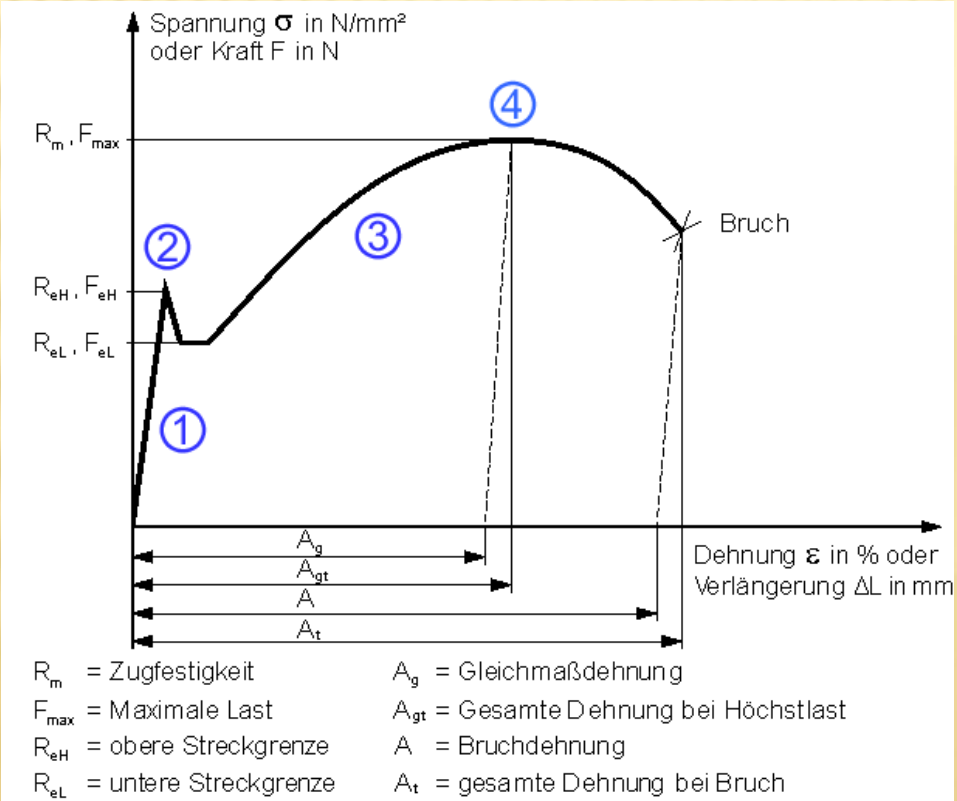
- *Dimension*
  - Round Wire
  - Flat Wire thickness ± 0.005 mm (standard 0.01 mm)
  - width ± 0.005 mm (standard 0.10 mm)
  - Square Wire ± 0.005 mm (standard 0.01 mm)
- *Tensile Strength*
  - Range of tolerances AISI: 100 MPa (standard 150 MPa)
  - Cu: 30 Mpa (standard 60 MPa)
  - Cu-Alloy. 50 Mpa (standard 80 MPa)
- *Surface Roughness*
  - Ra max. 0.1 µm (standard max. 0.3 µm)

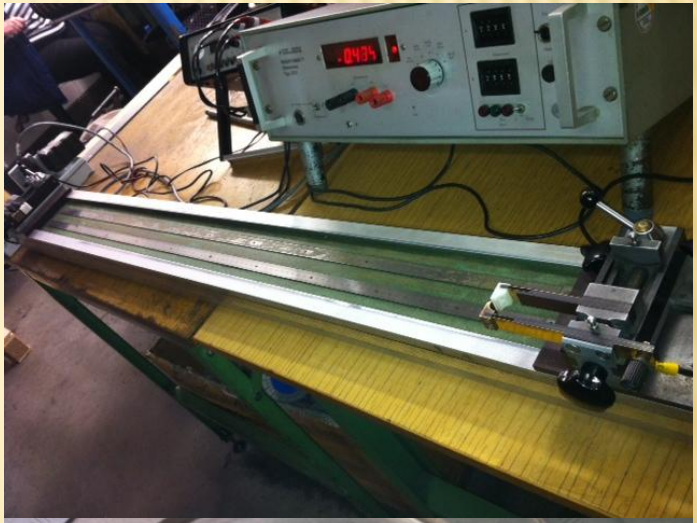
Materials

- *copper*
- *phosphor bronze*
- *brass*
- *nickel silver*
- *beryllium copper*
- *copper iron*
- *copper magnesium*
- *aluminium*
- *stainless steel*
- *heat resistance alloys etc.*

Specifications

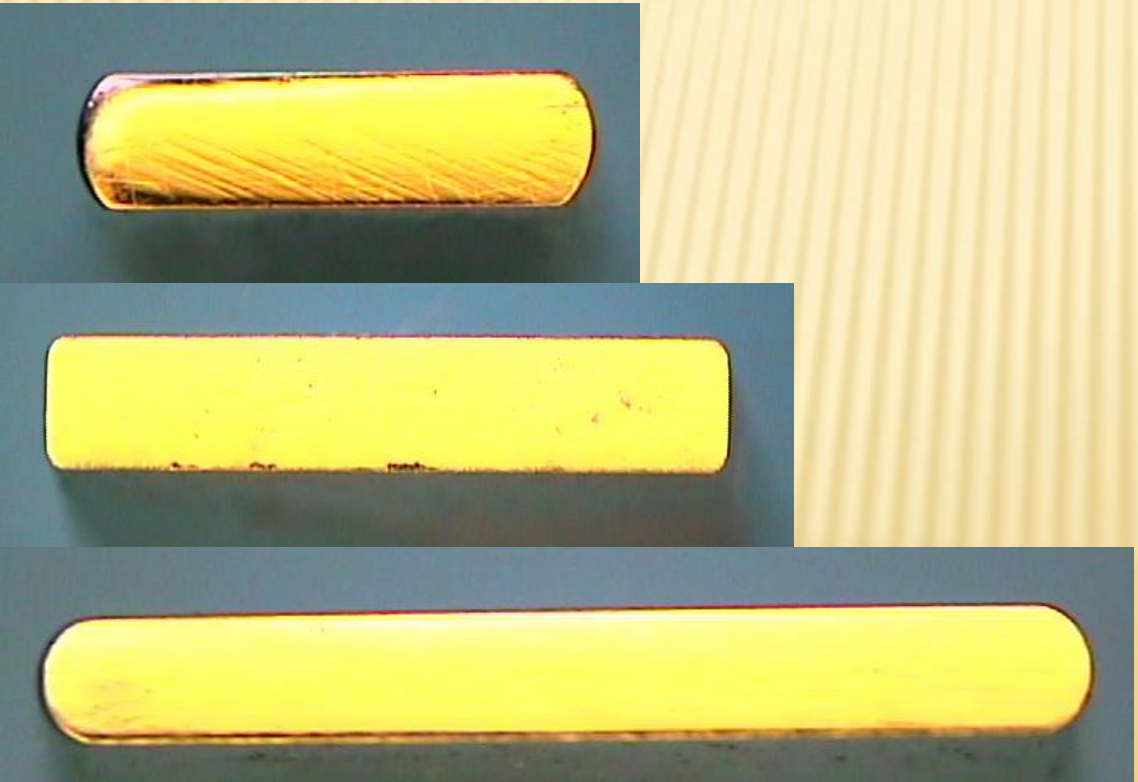
- *physical characteristics*
  - yield strength
  - elongation
  - hardness
  - electrical conductivity
  - bending value





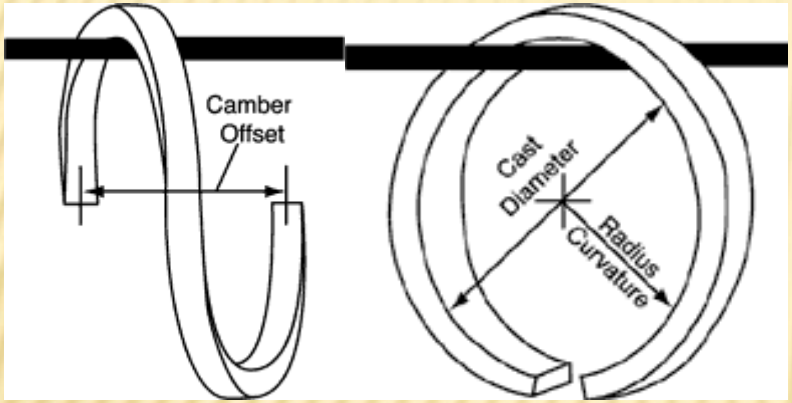
Specifications

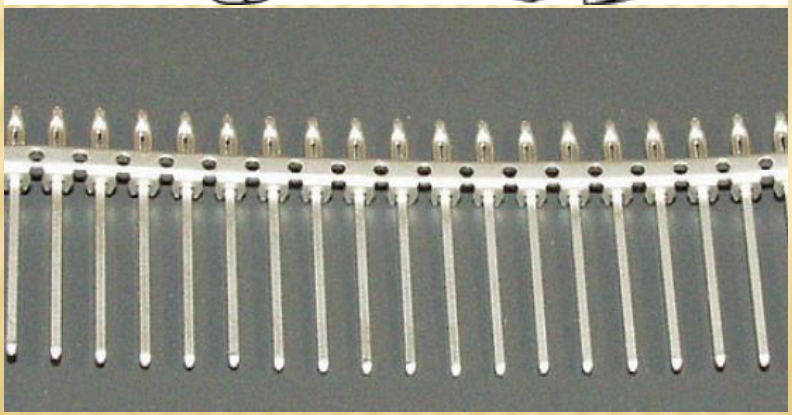
- *edge configuration*
  - natural shaped edges
  - 2 straight edges with 4 corner radii left
  - geometric radius
  - corner radius or diagonal

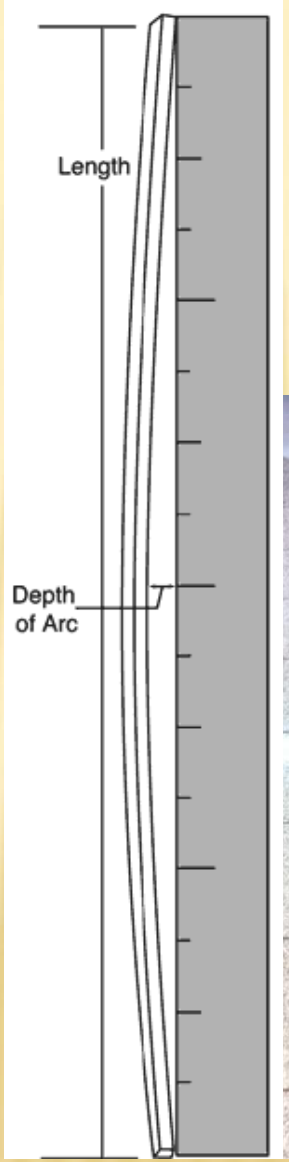


Specifications

- *straightness*
  - curvature
  - cast and camber
  - torsion







Knurling

RST advantage:

Our precise opposite or offset knurling substantially reduces the risk of breakage

Quality Management

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- *according to TS 16949*
- *incoming inspection*
- *inspections during processes*
    - *micrometer, microscope*
- *inline measuring*
- *final inspection*
    - *micrometer*
    - *microscope, cross-sections*
    - *tensile testing machine*
    - *hardness tester*
    - *devices for cast, camber and curvature*
    - *devices for bending and resilience*
    - *X-Ray for layer thickness*

Production processes

- *Drawing of round wire*
- *Rolling of flat wire*
- *Rolling of square wire*
- *Producing of profile wire*
- *Annealing of wire*
- *Spooling of wire*

Rolling of flat wire

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Drawing of round wire

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Drawing of round wire

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Drawing of round wire

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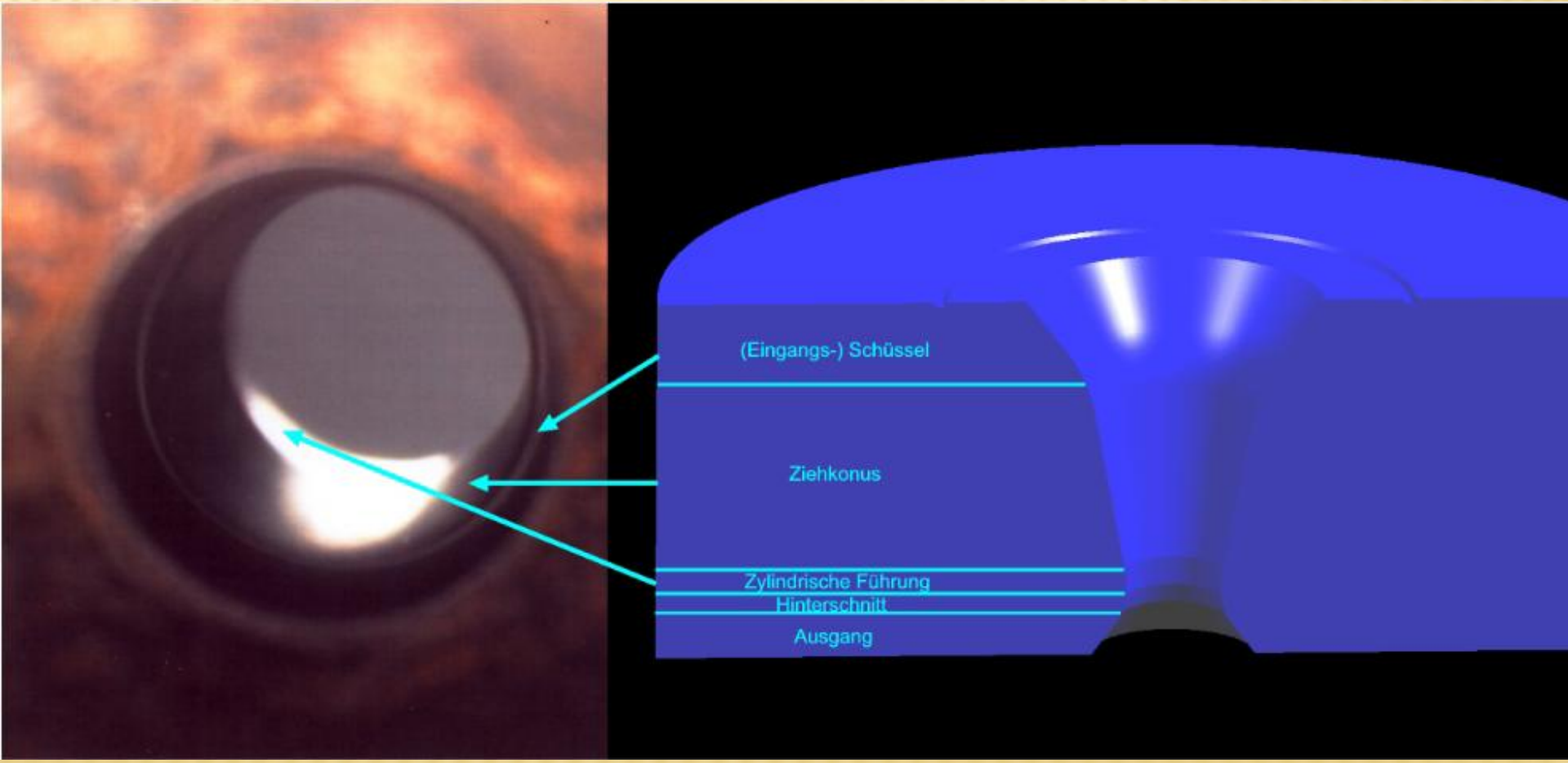

Problems with dies

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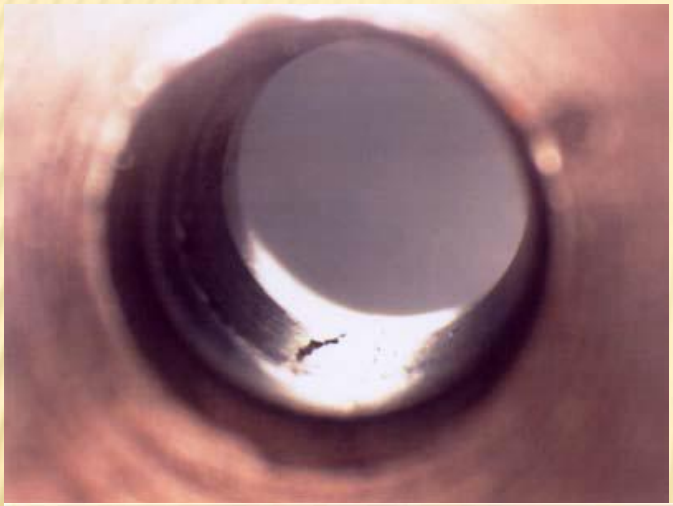

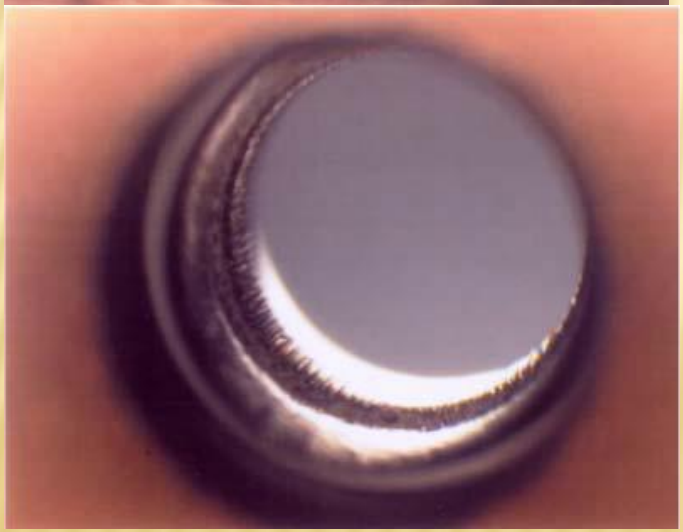

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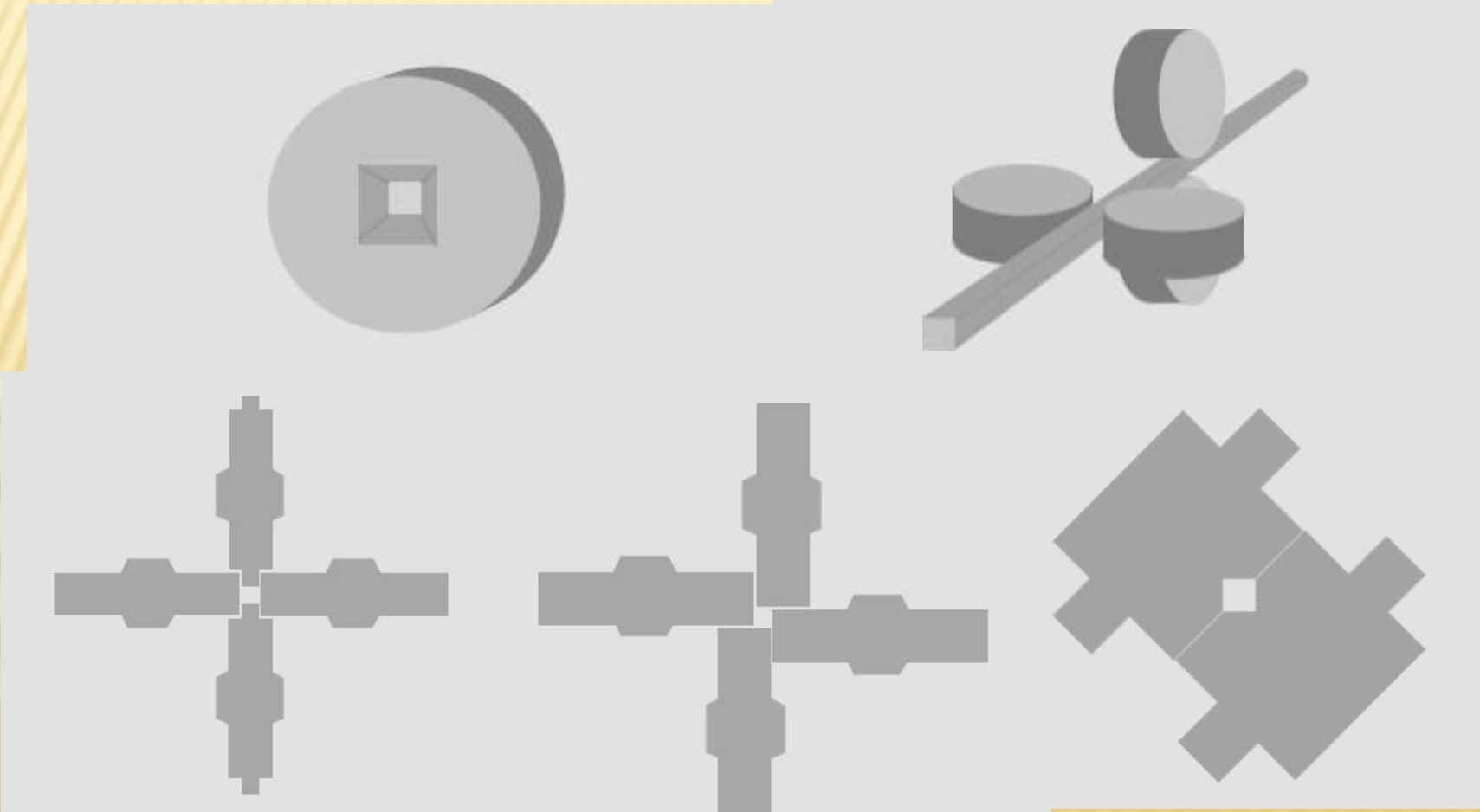
Producing of square wire



square wire

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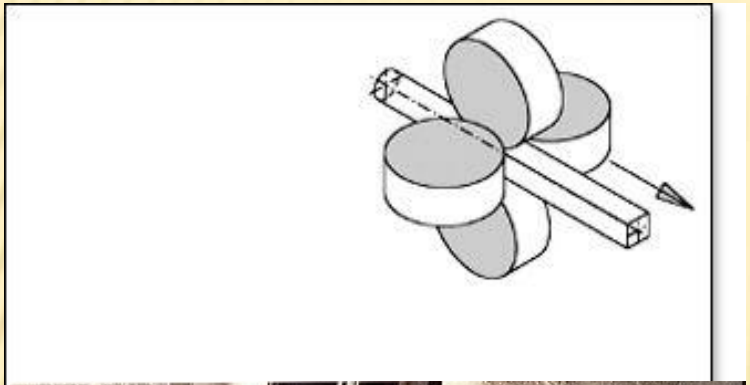

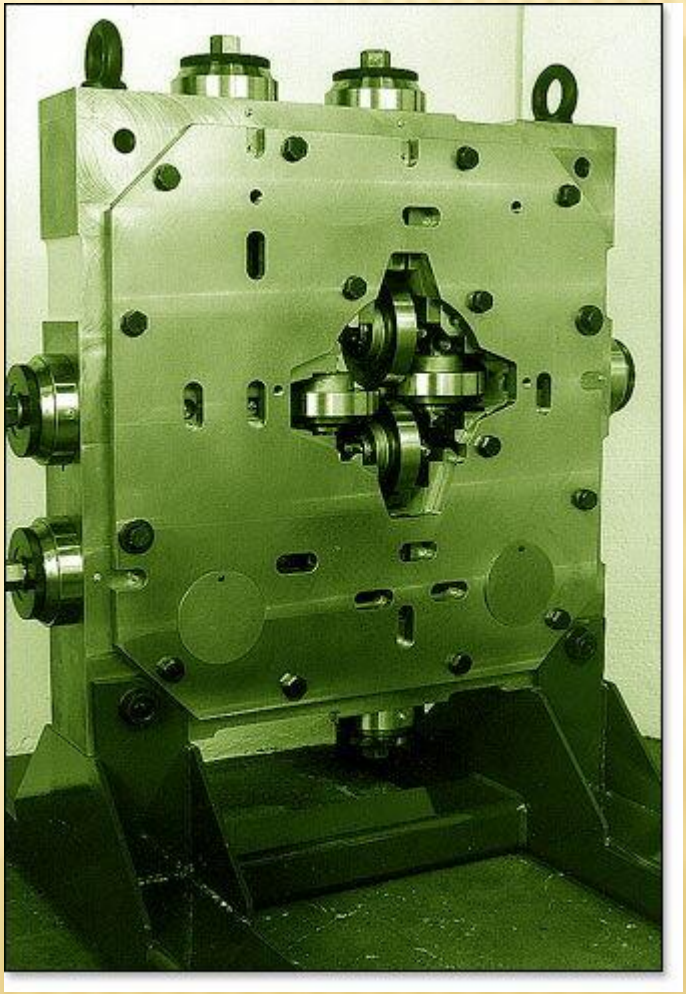

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Advantages of rolling

- *surface*
- *straightness*
- *spooling lane by lane*
- *no damages, scratches*
- *no splinters*
- *exact geometric form and areas*

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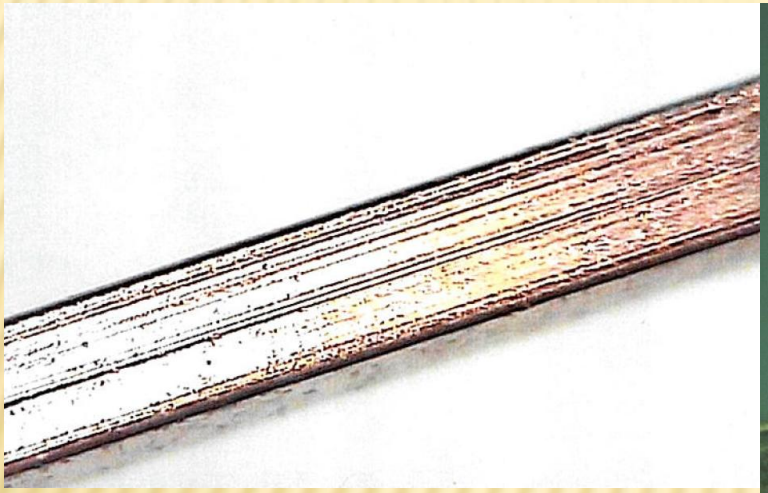
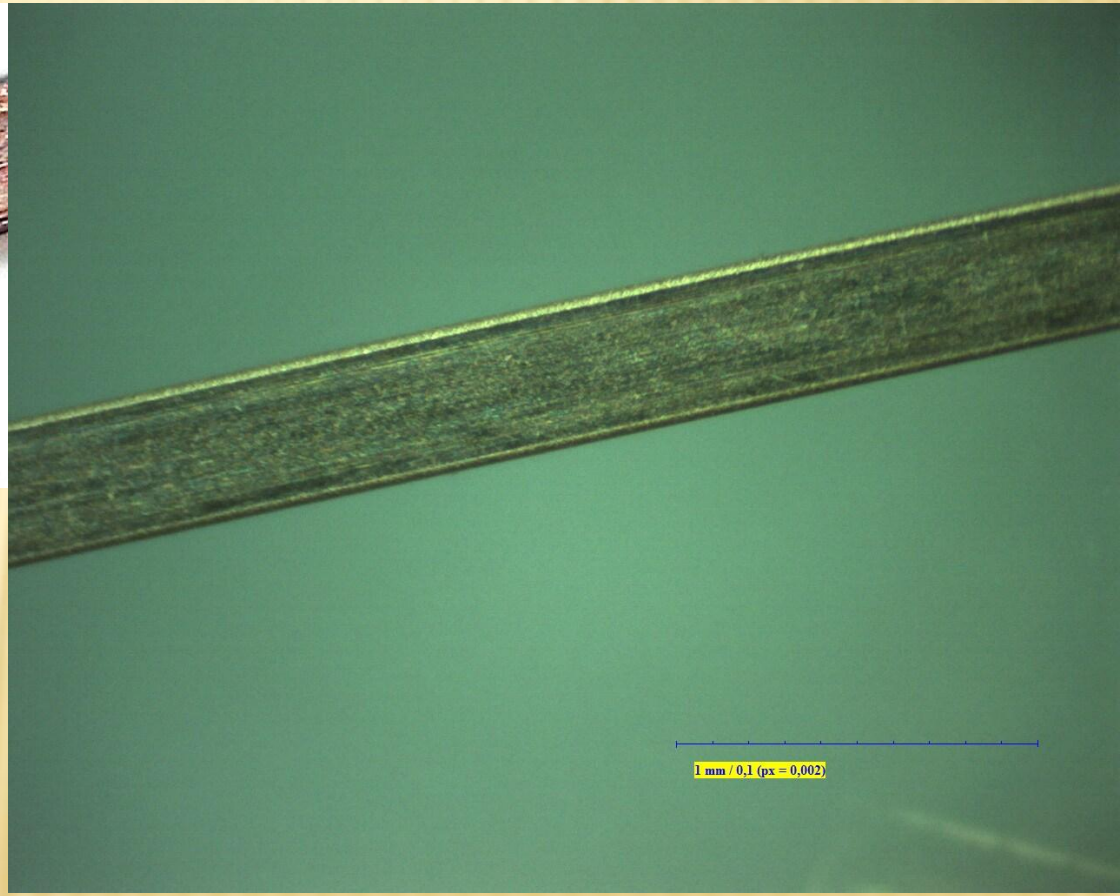
Advantages of rolling

roughness, surface, scratches





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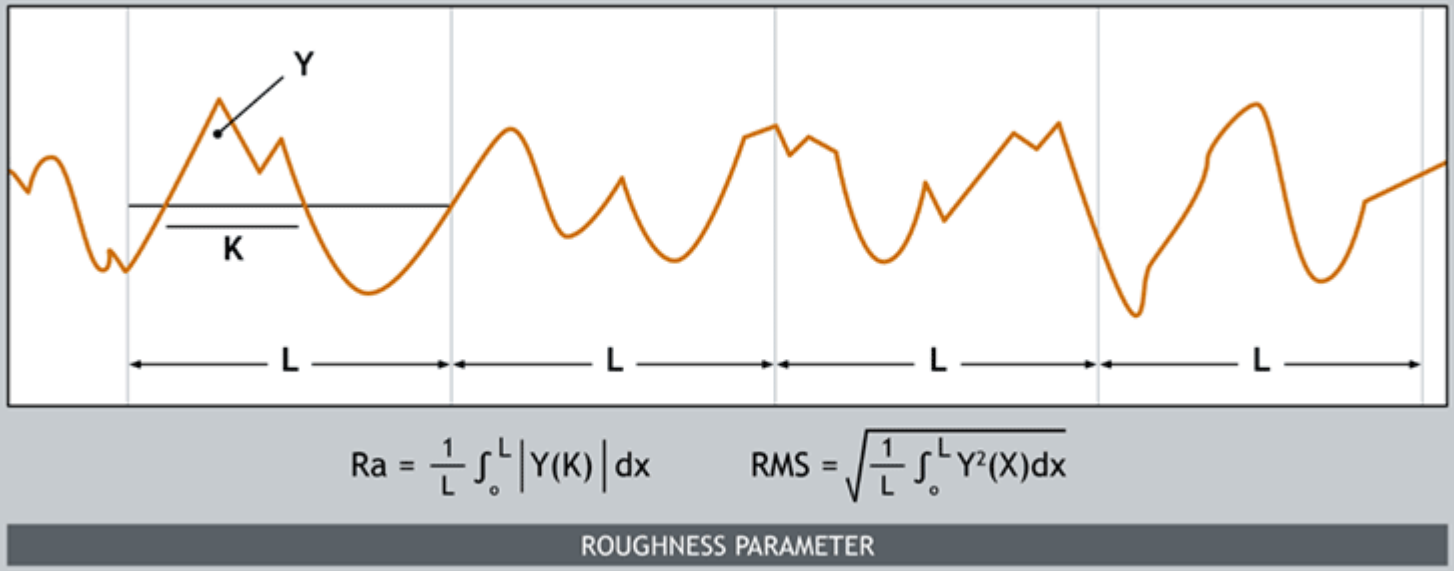
Advantages of rolling

roughness, surface, scratches



Ra Standard 0.3 µm down to 0.1µm

spooling

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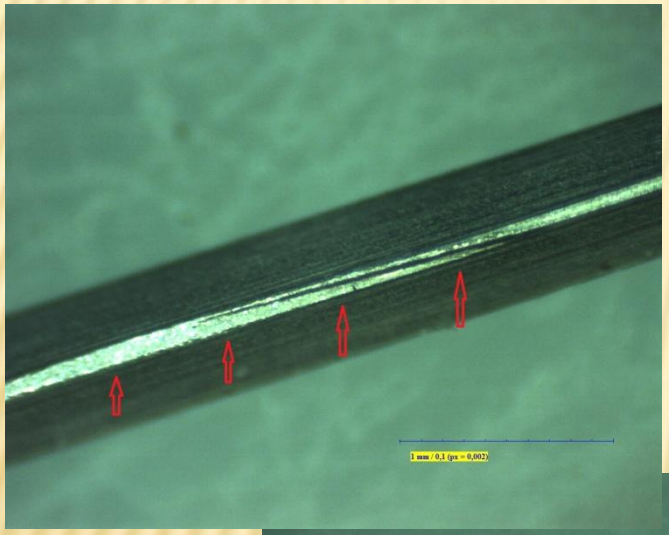
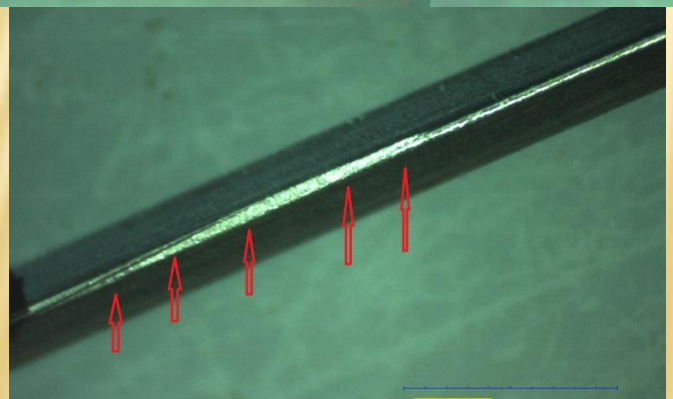
Advantages of rolling

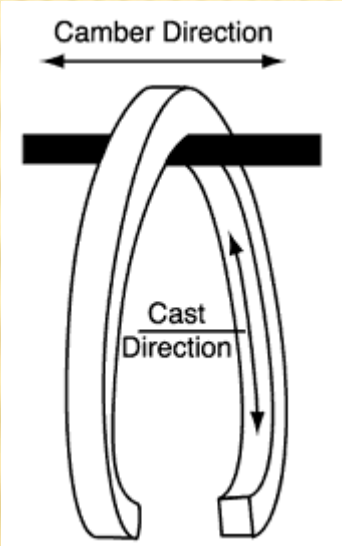
damages of wild spooling

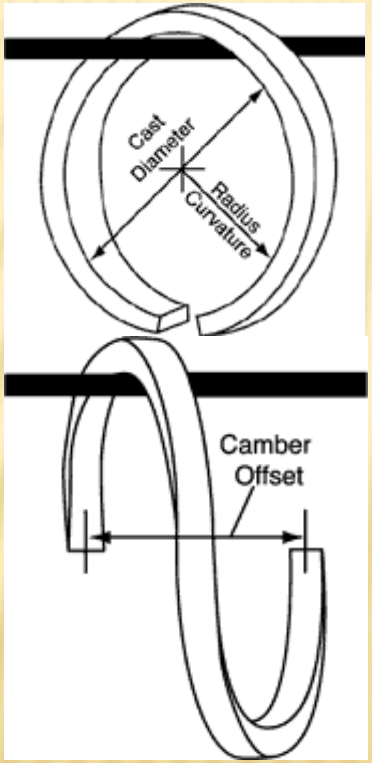


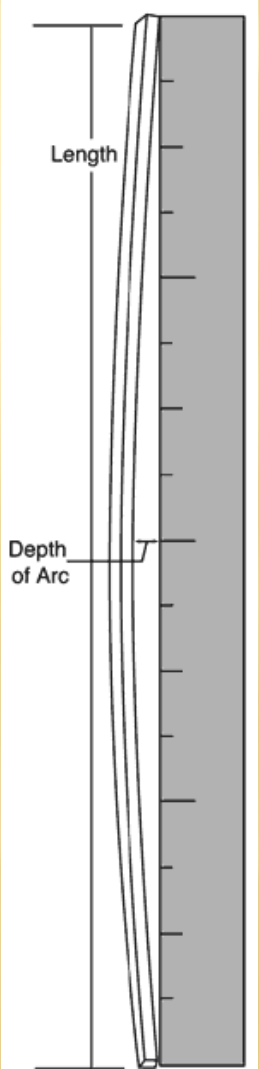


Advantages of rolling

Straightness



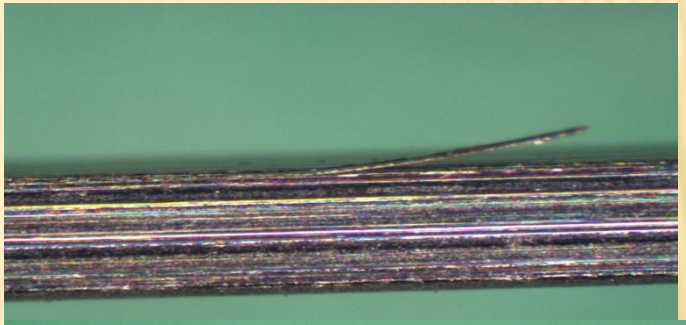


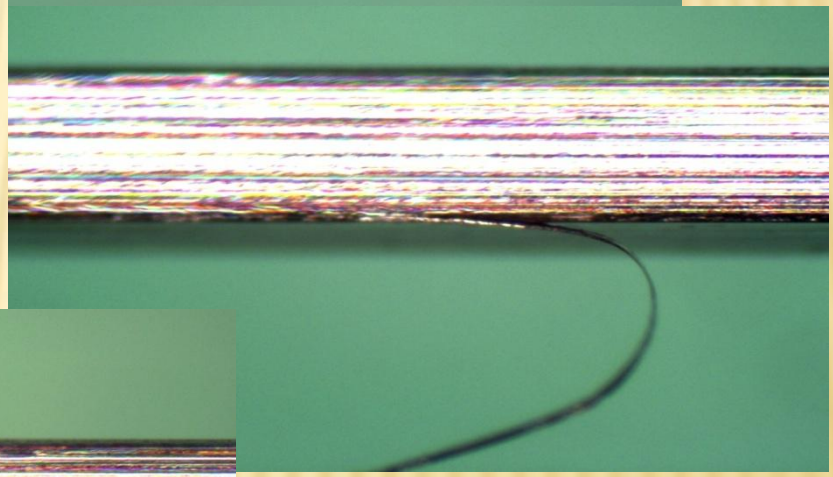


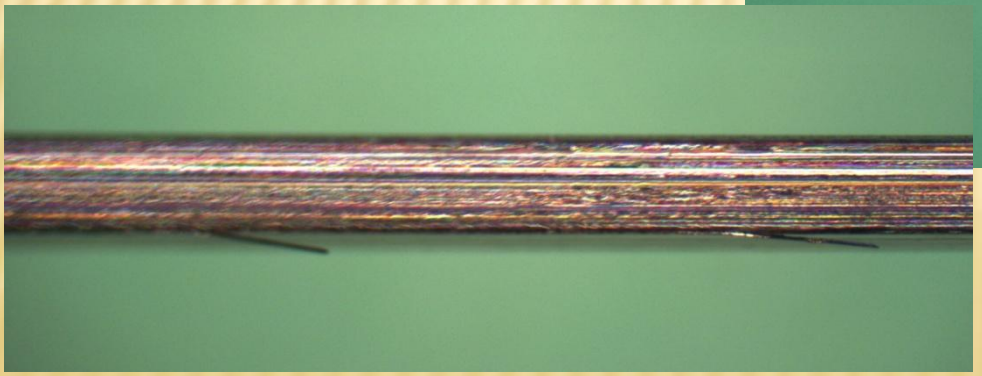
Max 25mm/m

Advantages of rolling

no splinters







production technologies

- *electroplating*
  - single layer
  - multiple layer
- *coating material*
  - pure tin
  - tin-lead-alloys
  - copper
  - nickel
  - silver
  - gold
  - combinations

production technologies

surface technics

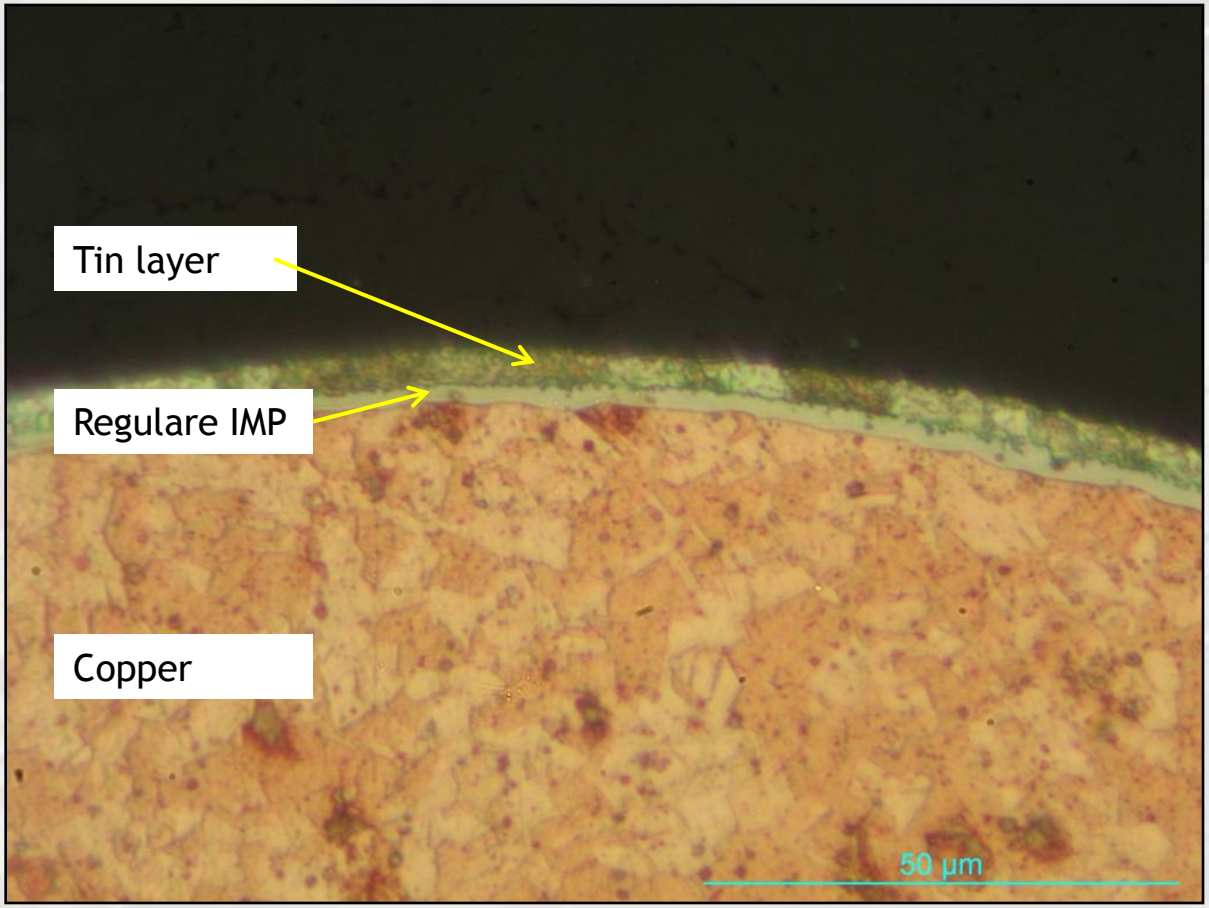
barrierlayertechnology

nickel
DC (Double Coating) – without nickel
ATB (Advanced Tin Barrier)

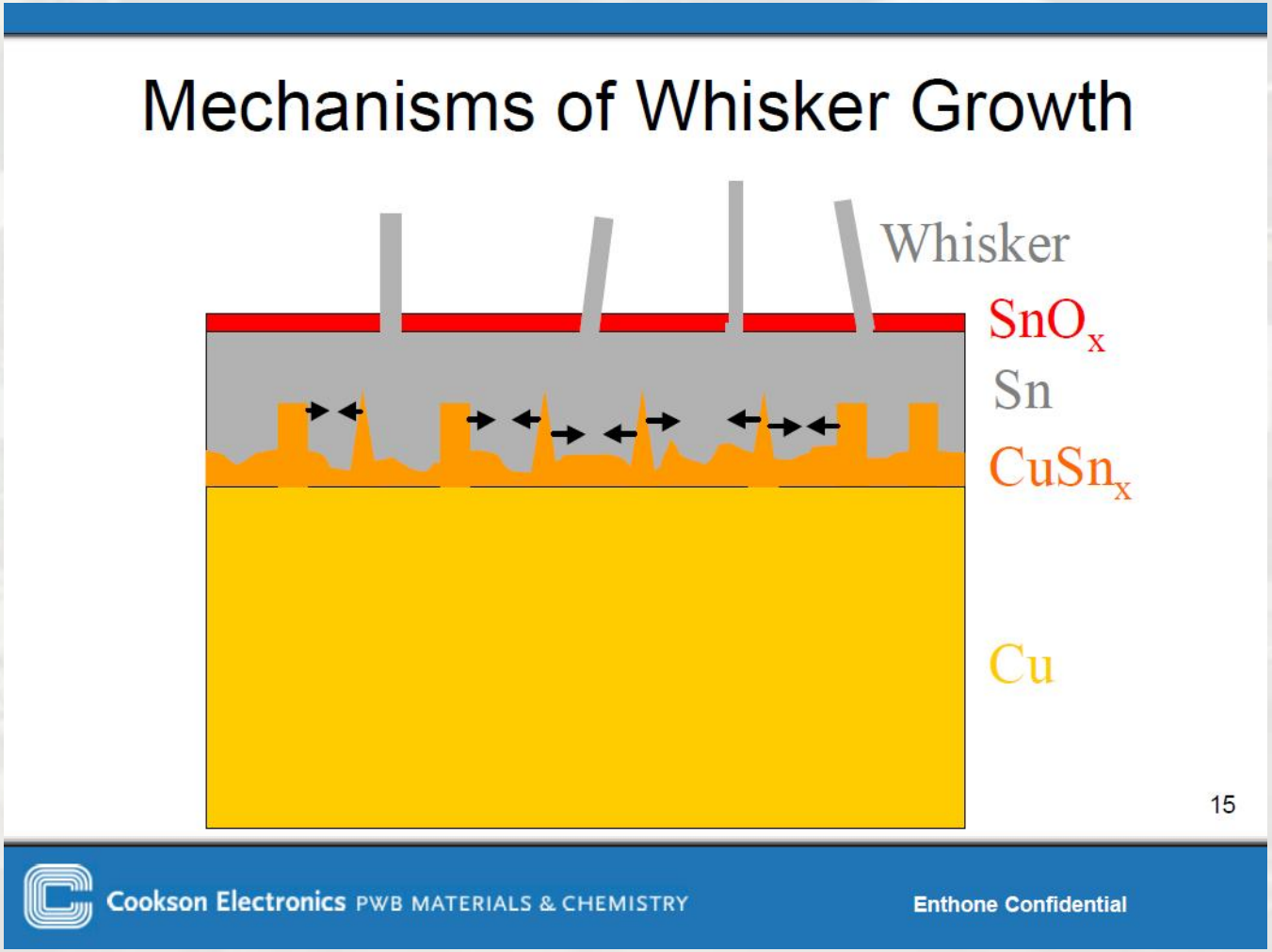
tinmodification

TT (Thermal Tin)
TH (Tin Hardness)

DC-technology (Double Coating)



Whisker


Mechanisms of Whisker Growth
Whisker
SnO_x
Sn
$CuSn_x$
Cu
15
Cookson Electronics PWB MATERIALS & CHEMISTRY
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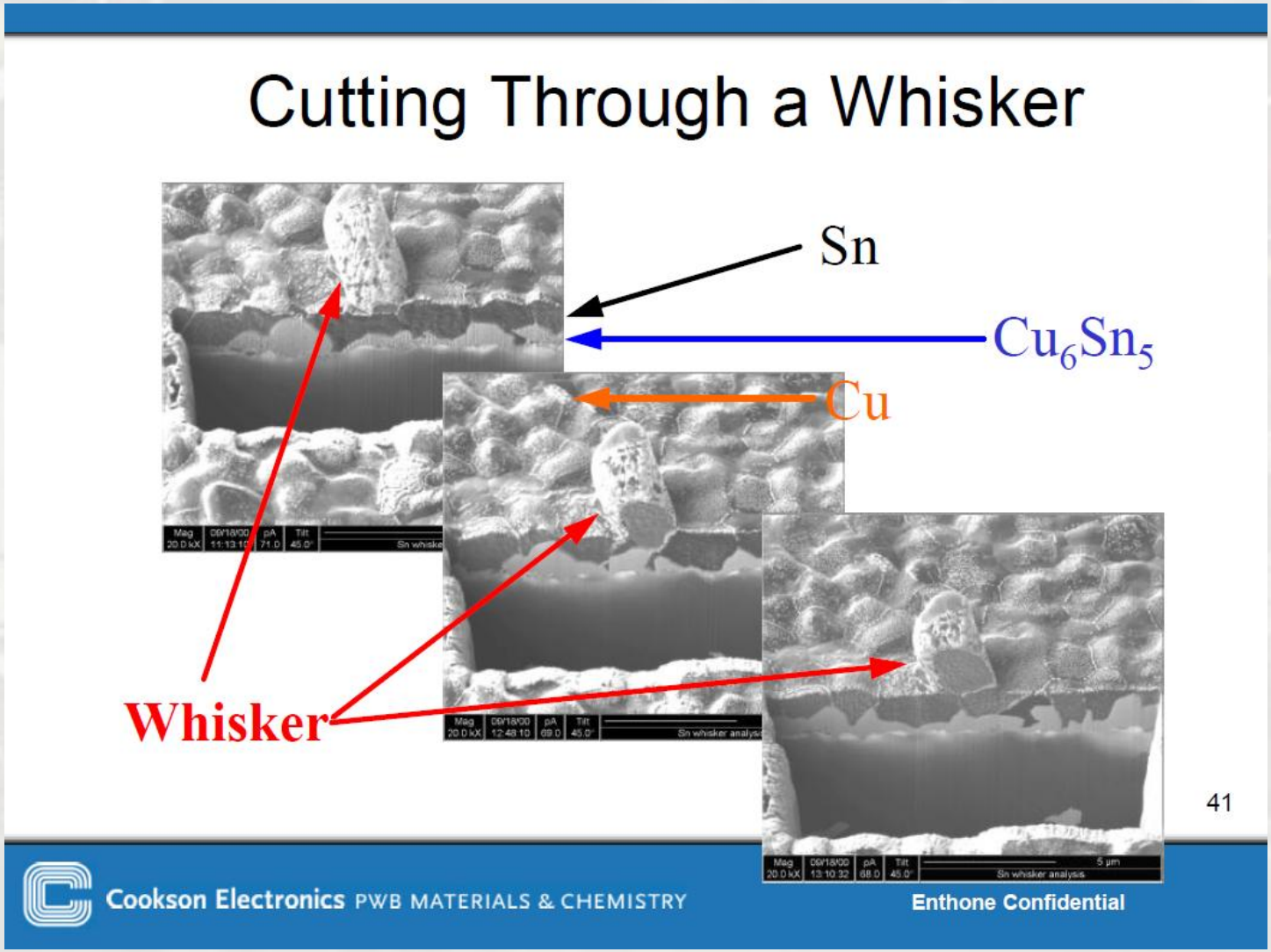
Whisker


Cutting Through a Whisker
Sn
Cu_6Sn_5
Cu
Whisker
41
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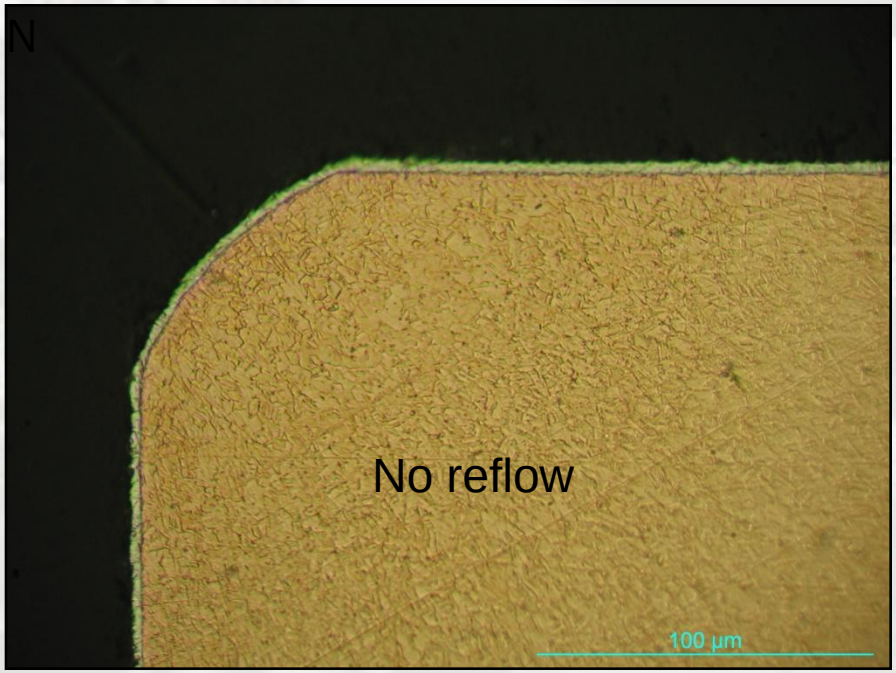
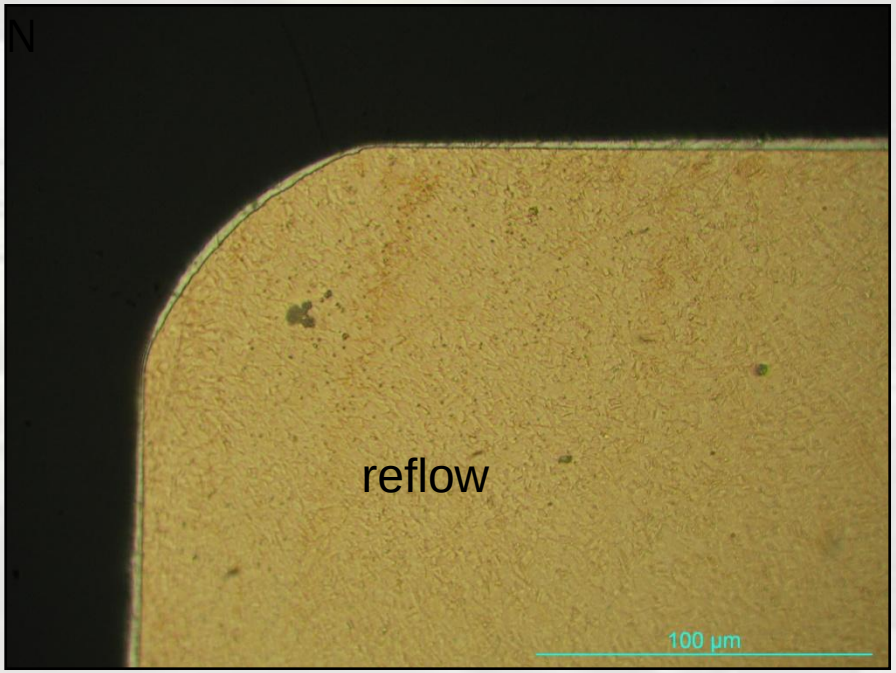
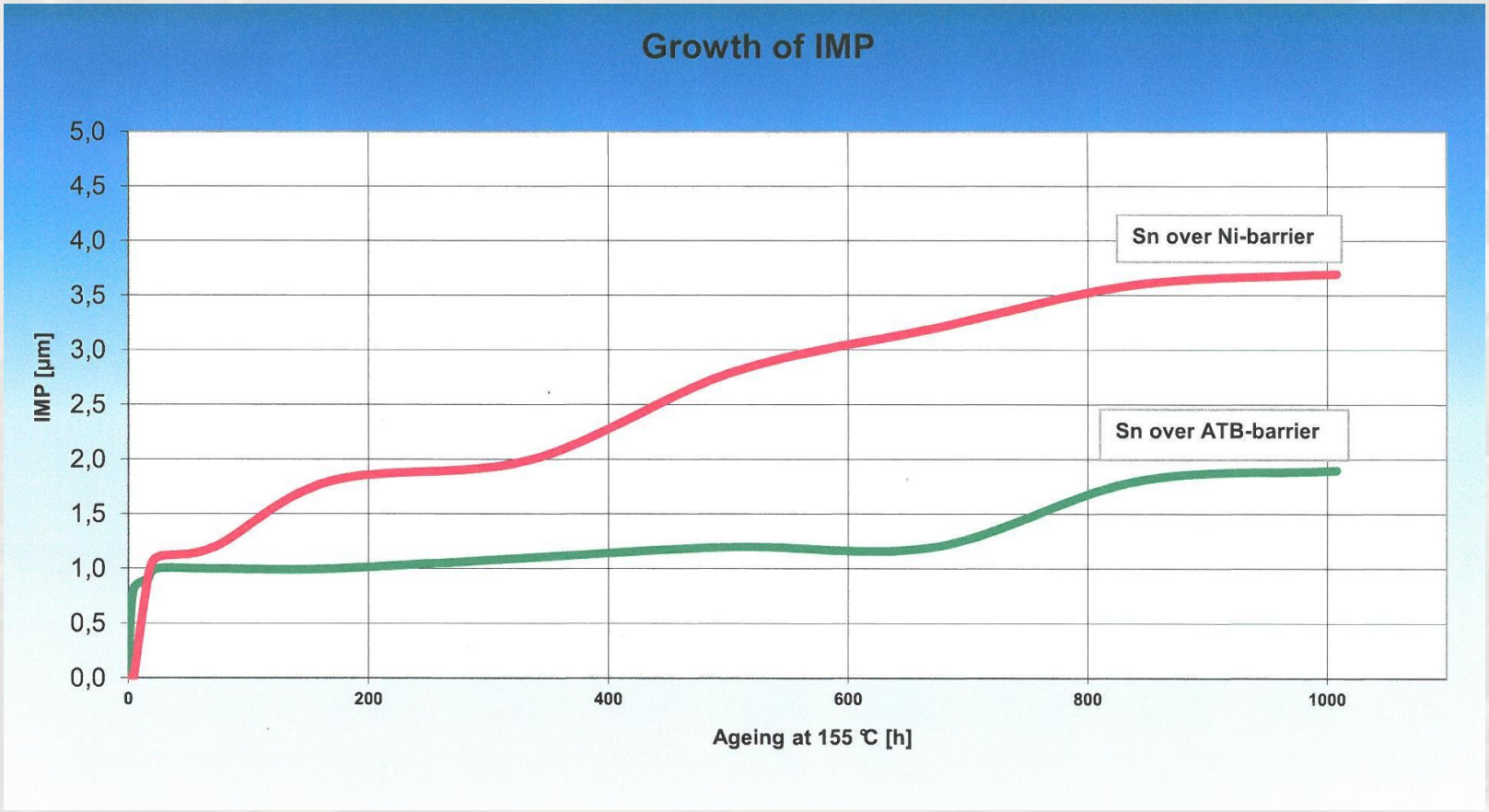
tin spreading of the reflow process





ATB™ (Advanced Tin Barrier)

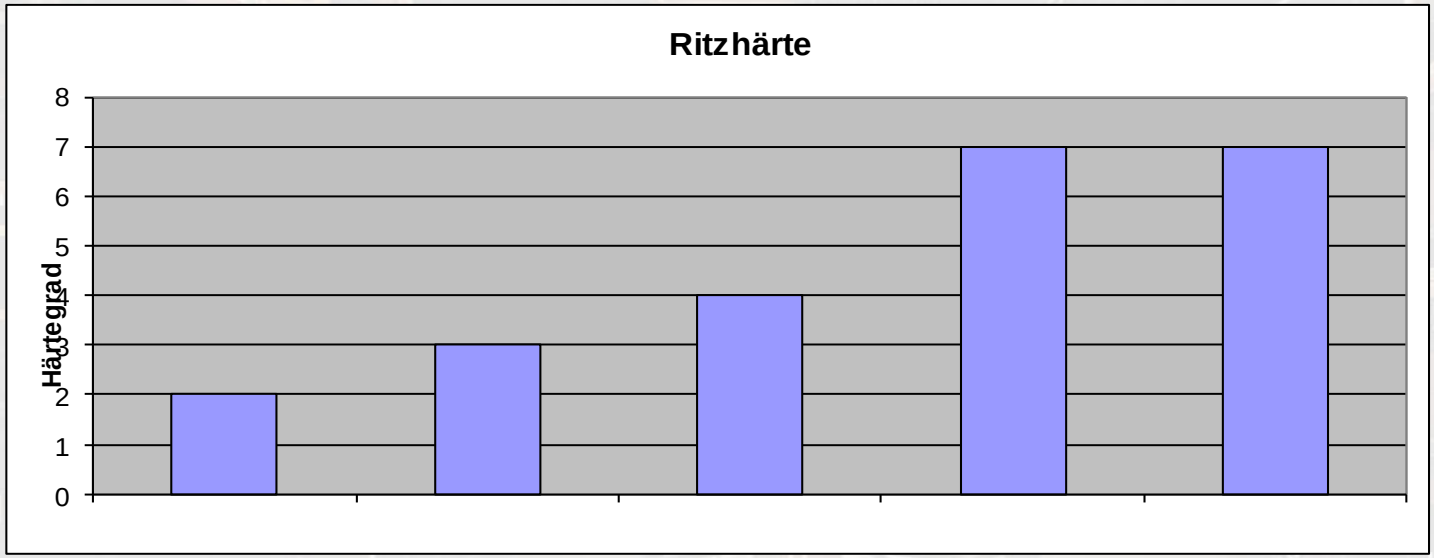


TT (Thermal Tin)

Colour of tin after temperature 8 min. 295°C

TH (TIN HARDNESS)

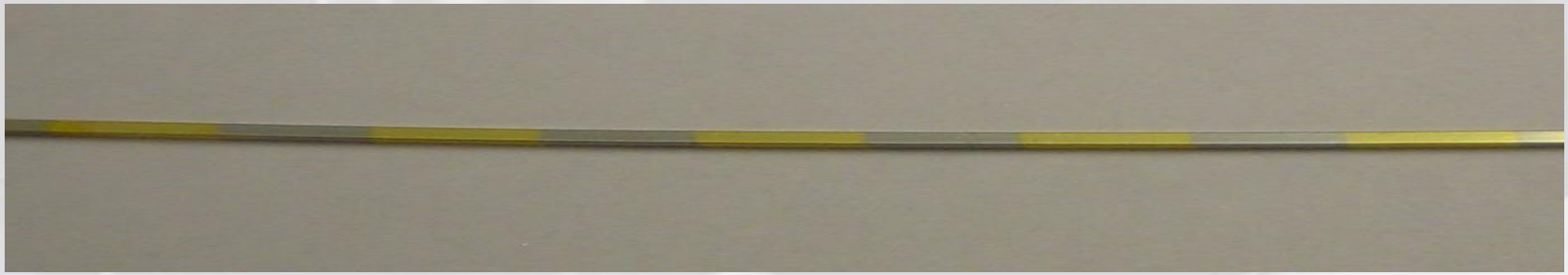
Ritzhärtetest nach Wolf-Wilburn

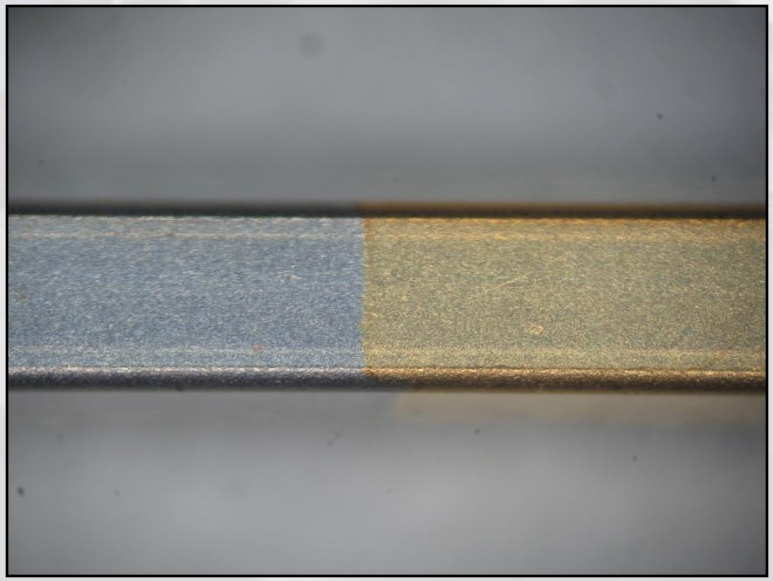


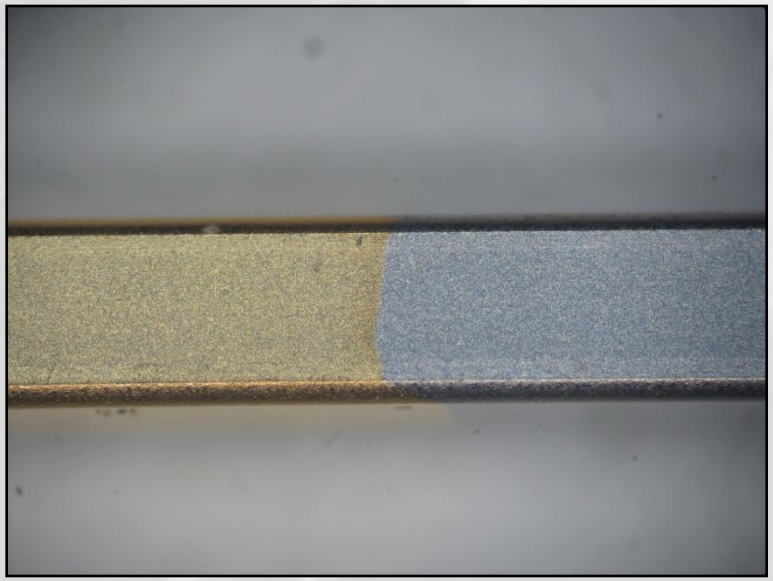
Sn matt | Sn bright | Sn reflow | Sn reflow. TH | Sn FV

advantage:
- better hardness results in better abrasion resistance
- better and longer lasting solderability

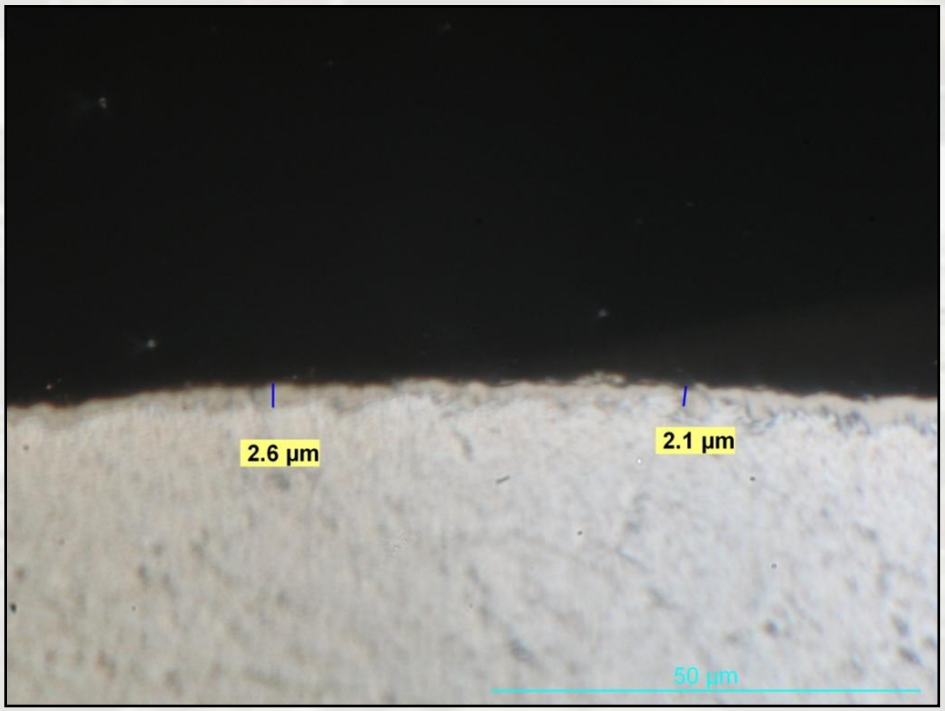
selektive goldcoating on an endless wire



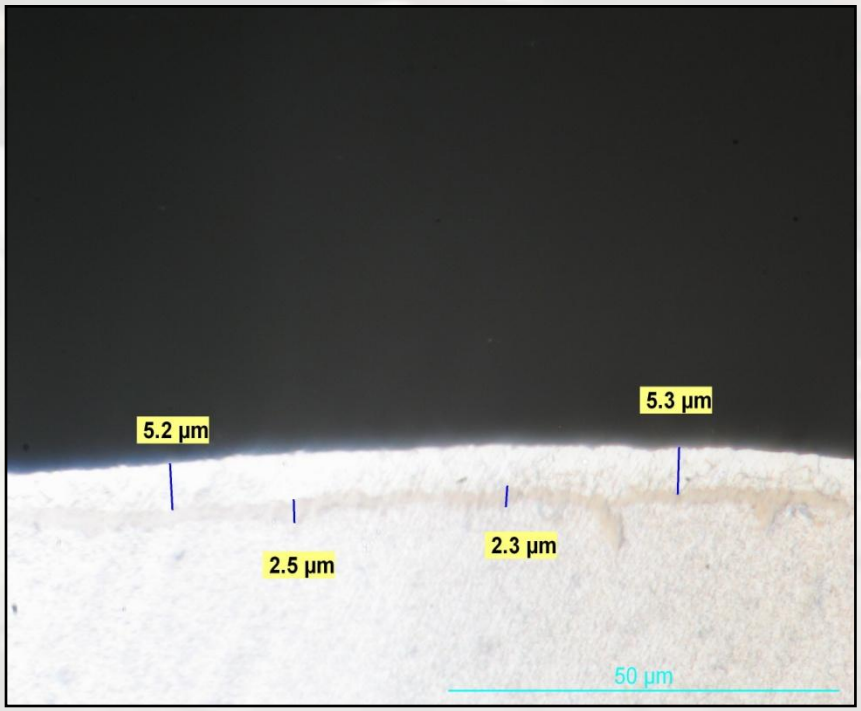




electroplated aluminium wire



Aluminium with nickel

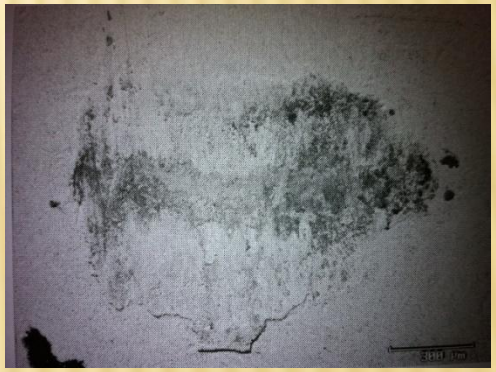


Aluminium with Ni and Sn

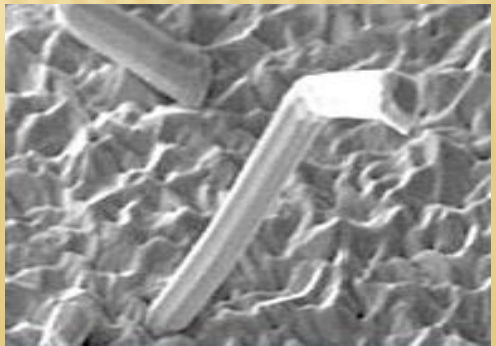
Surfaces

- *Calibration*
  - generally, all wires are being calibrated after the electroplating process in order to minimize variations of dimensions, to guarantee an exact geometric form and for an excellent straightness of wire

- *How to avoid tin abrasion*
  - ATB
  - Reflow
  - Hard tin
  - Bright tin



- *How to avoid Whisker*
  - ATB
  - Nickel Barrier
  - Reflow



Customer sample

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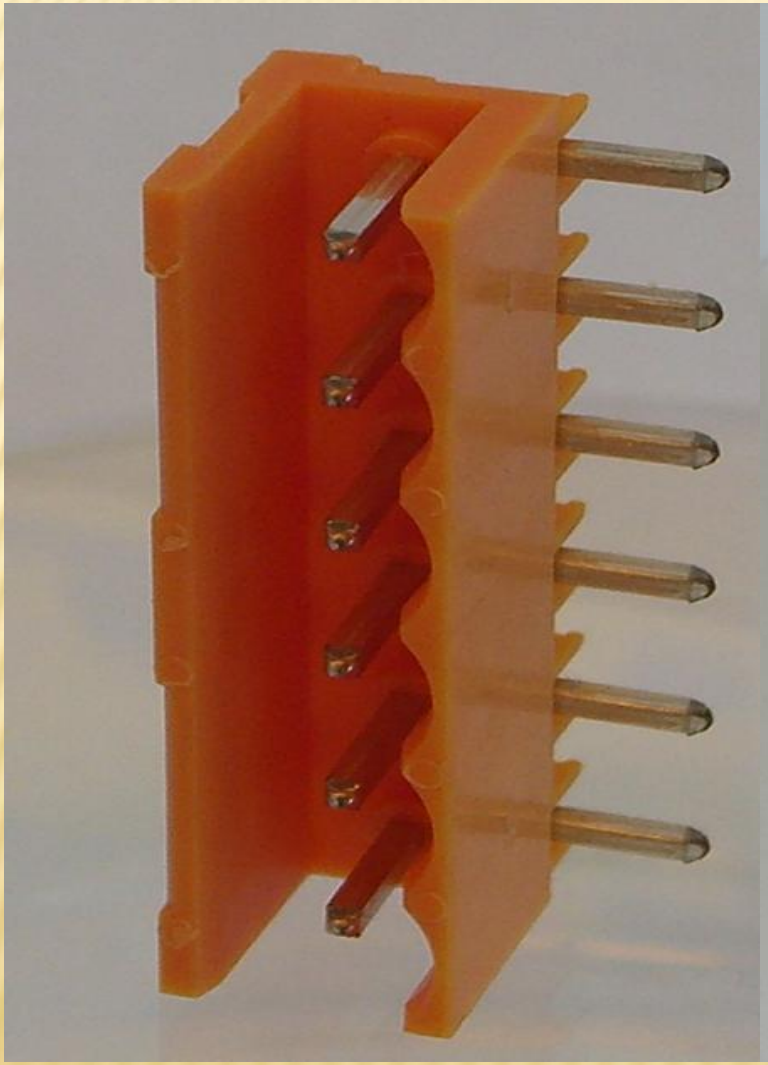

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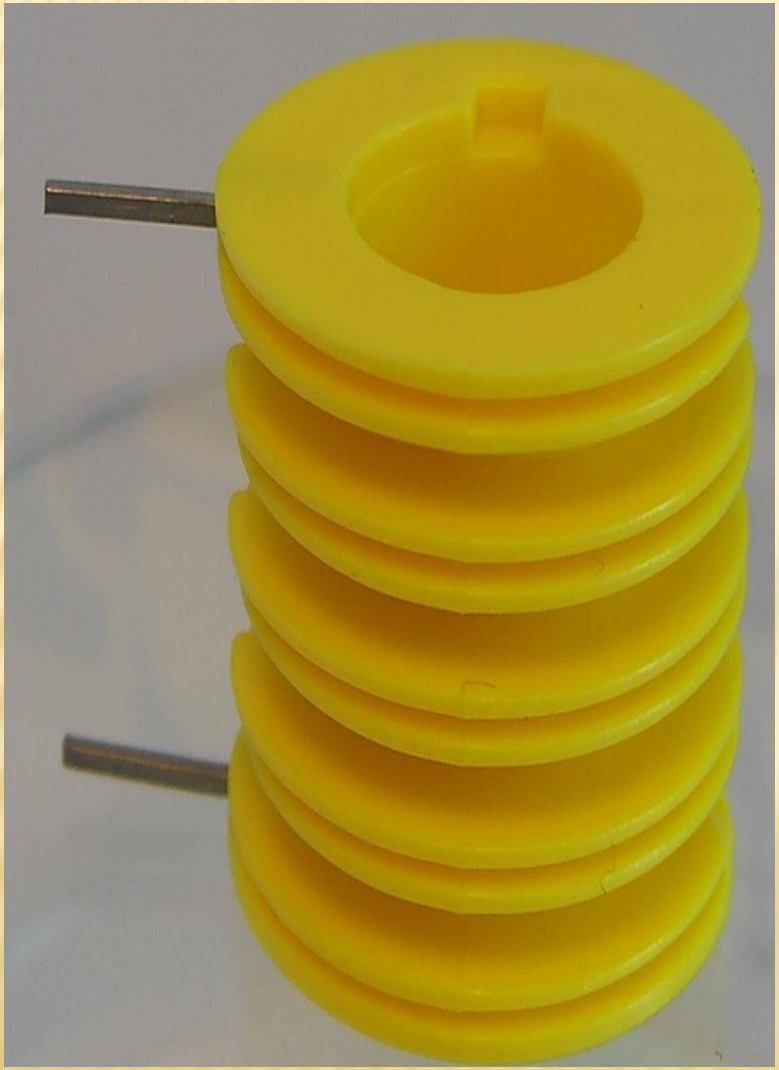

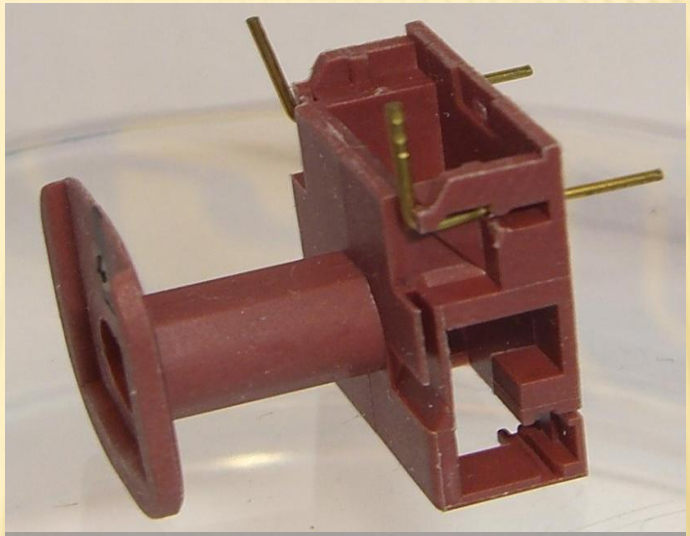

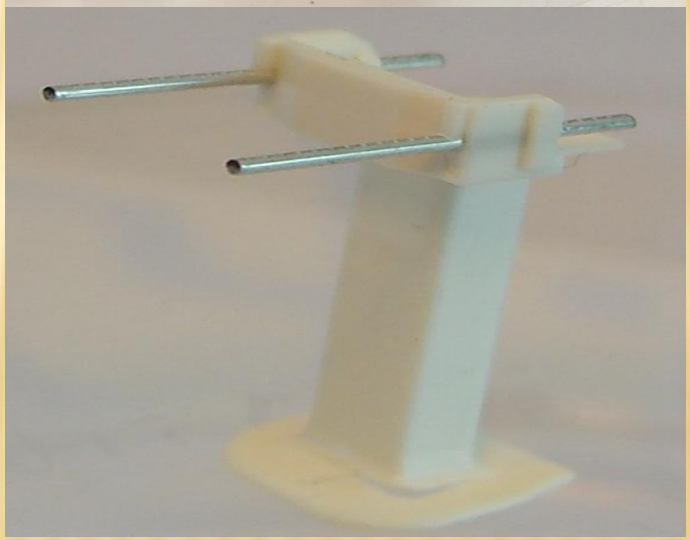

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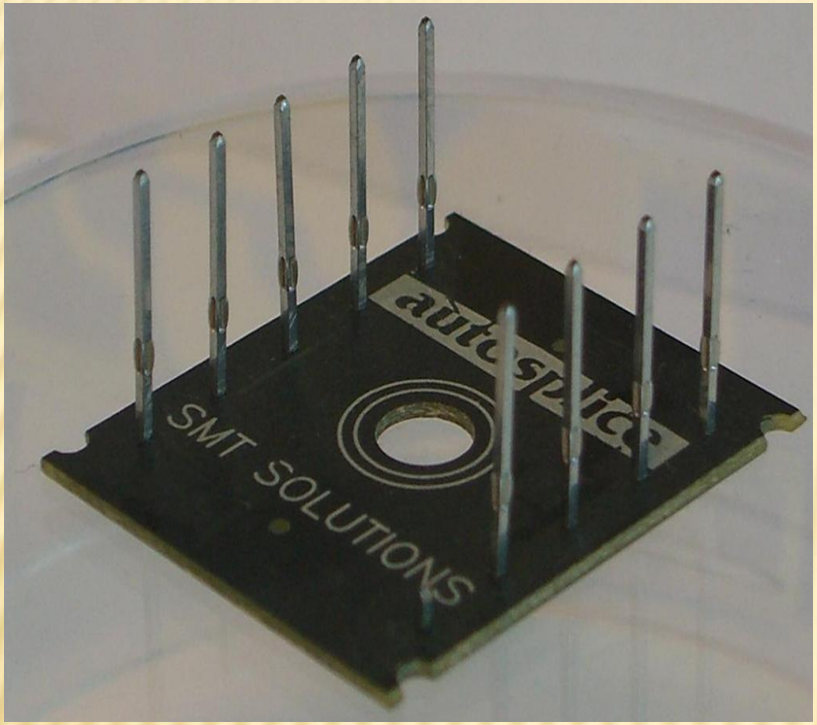

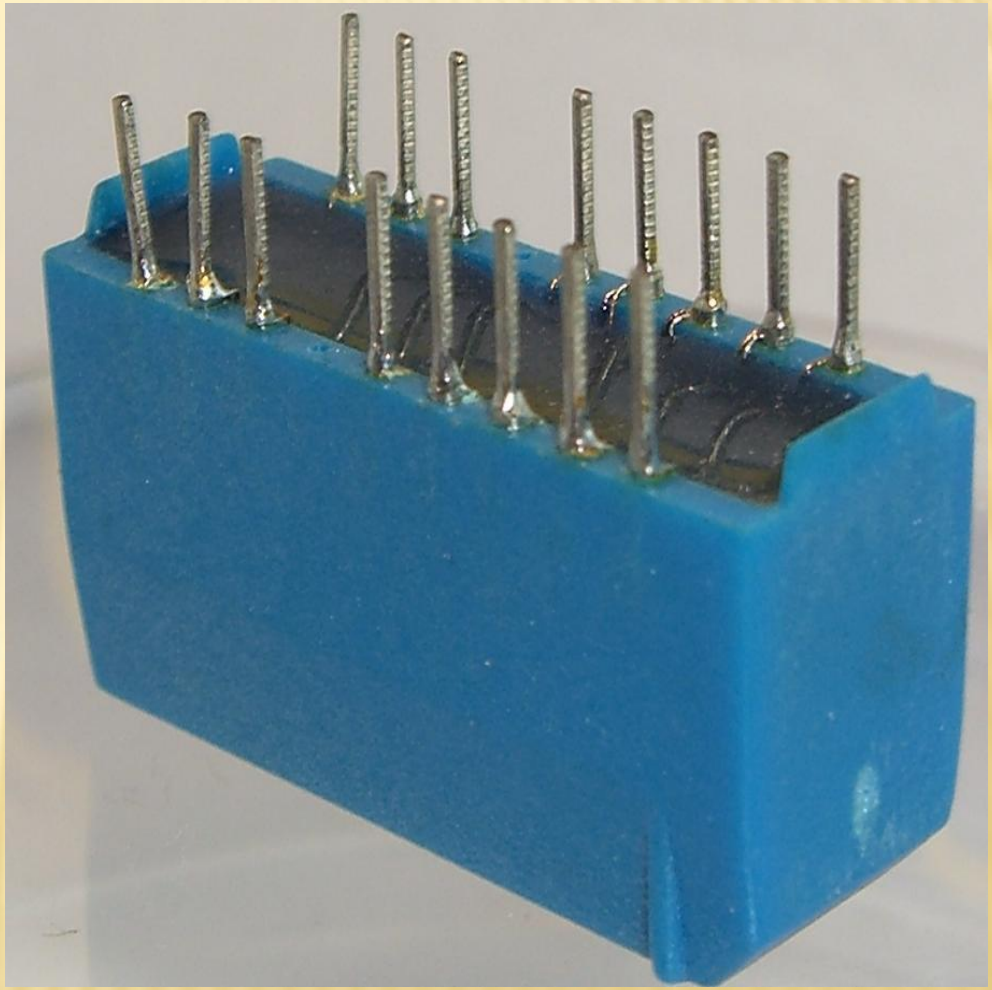

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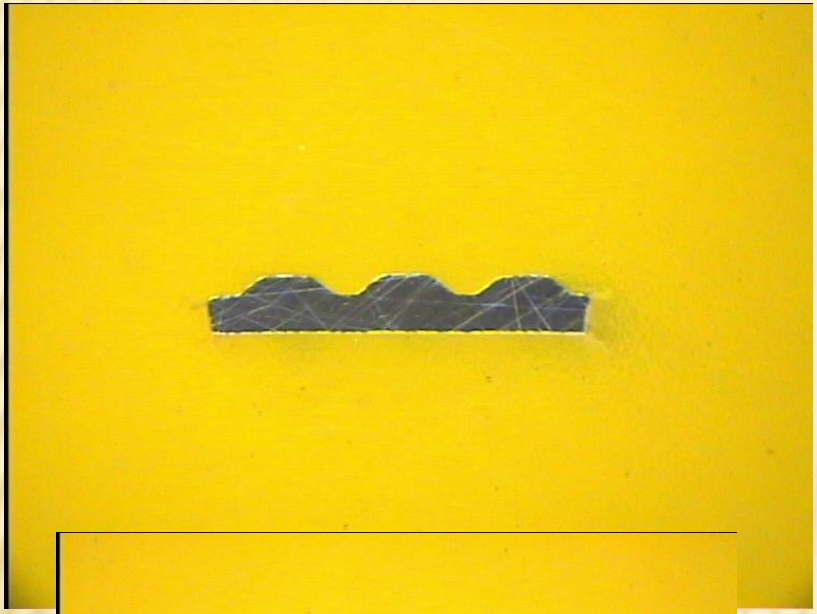

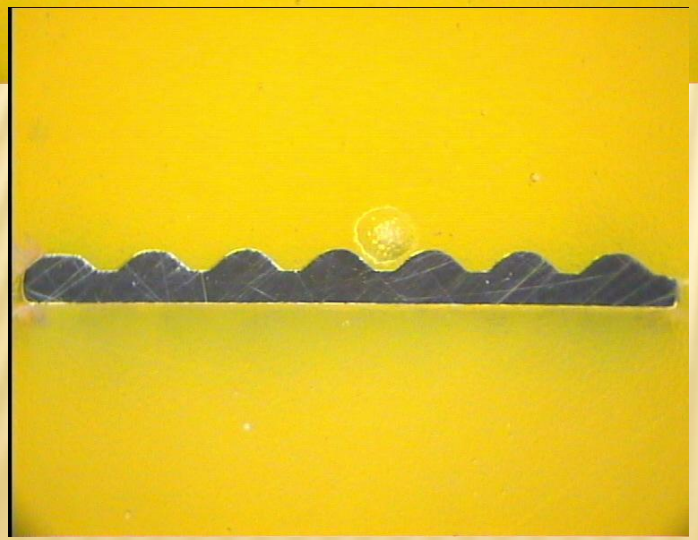

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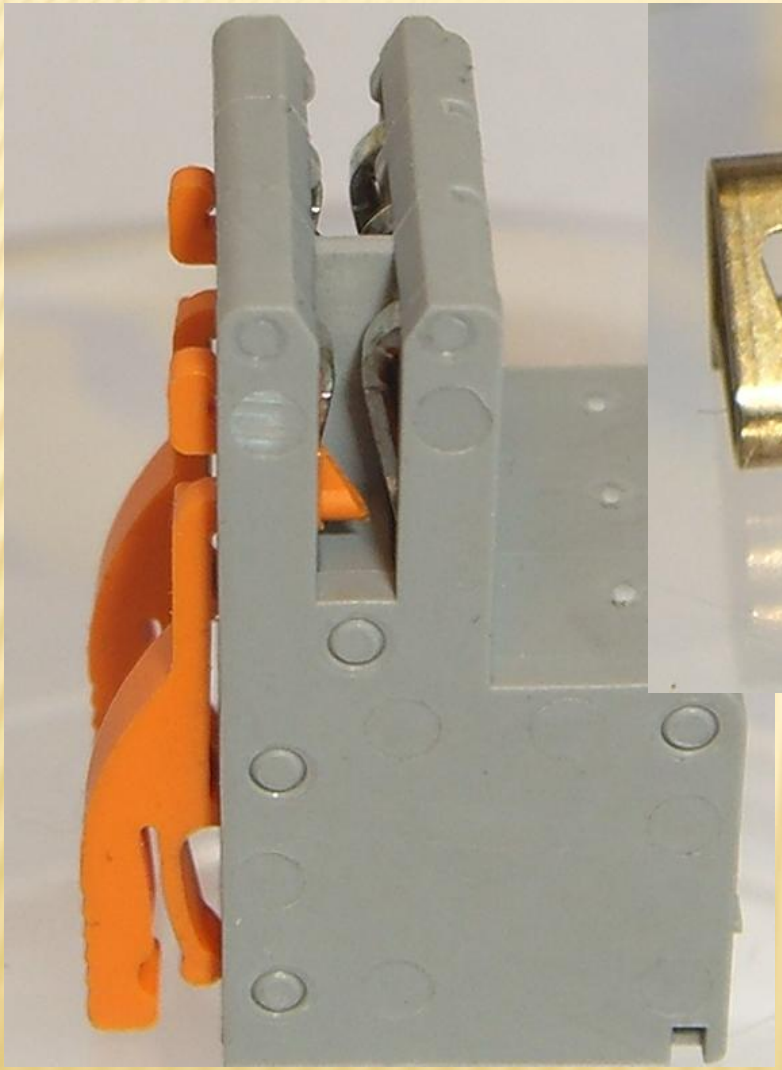

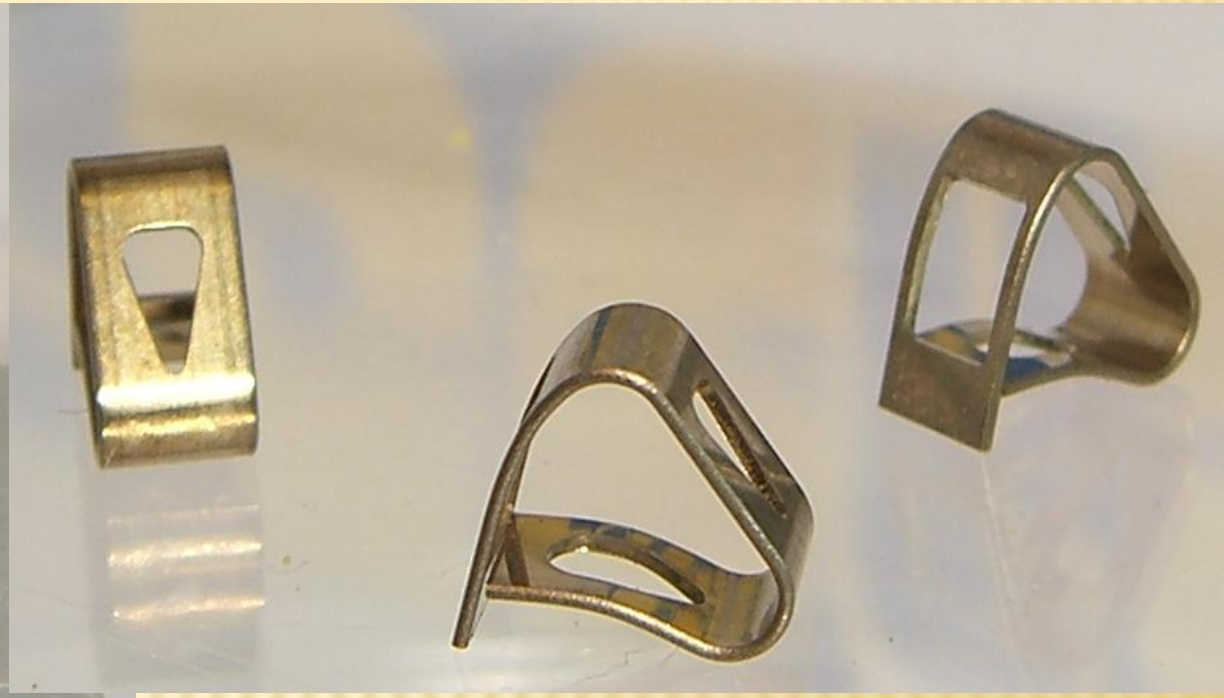

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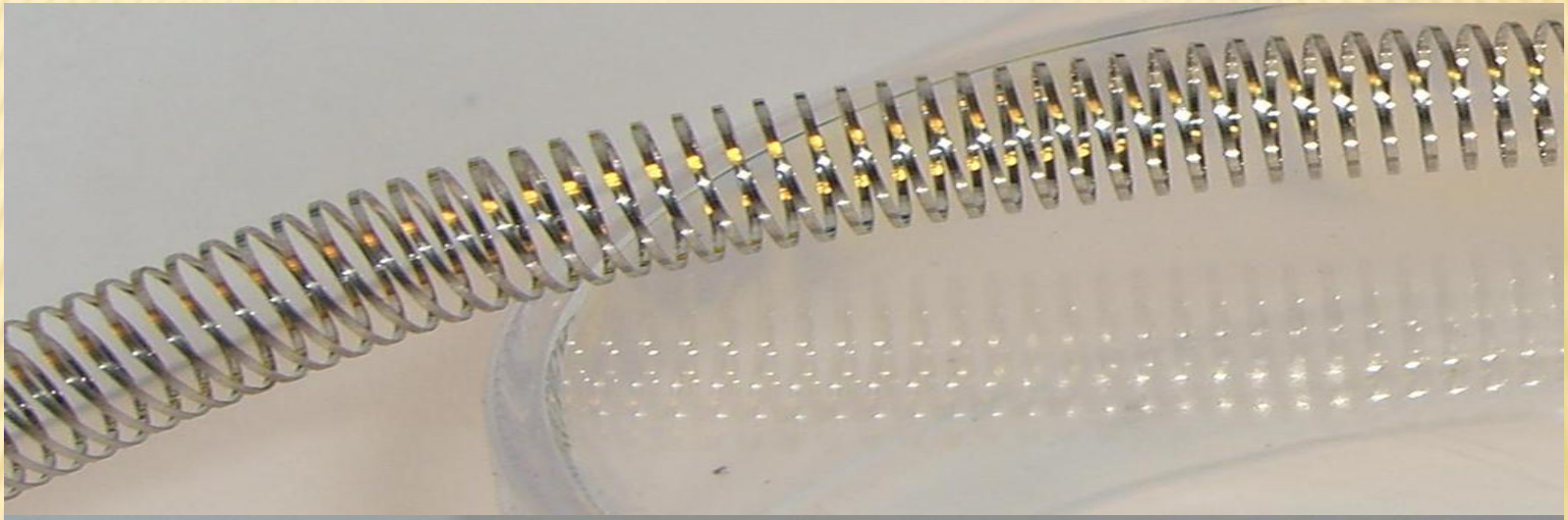

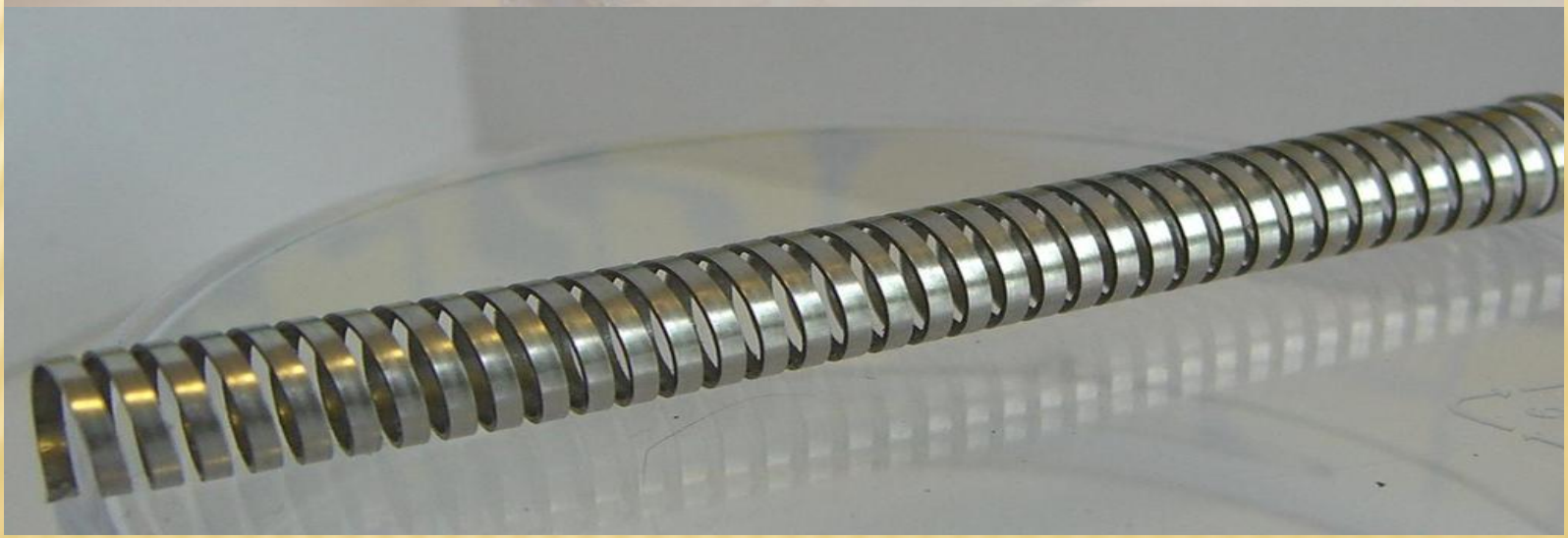

Strip or Wire ???

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- *Less scrap*
- *Better surface roughness*
- *Less inner stress*
- *Length up to 100km or 300kg per spool*
- *4 corner radii*