

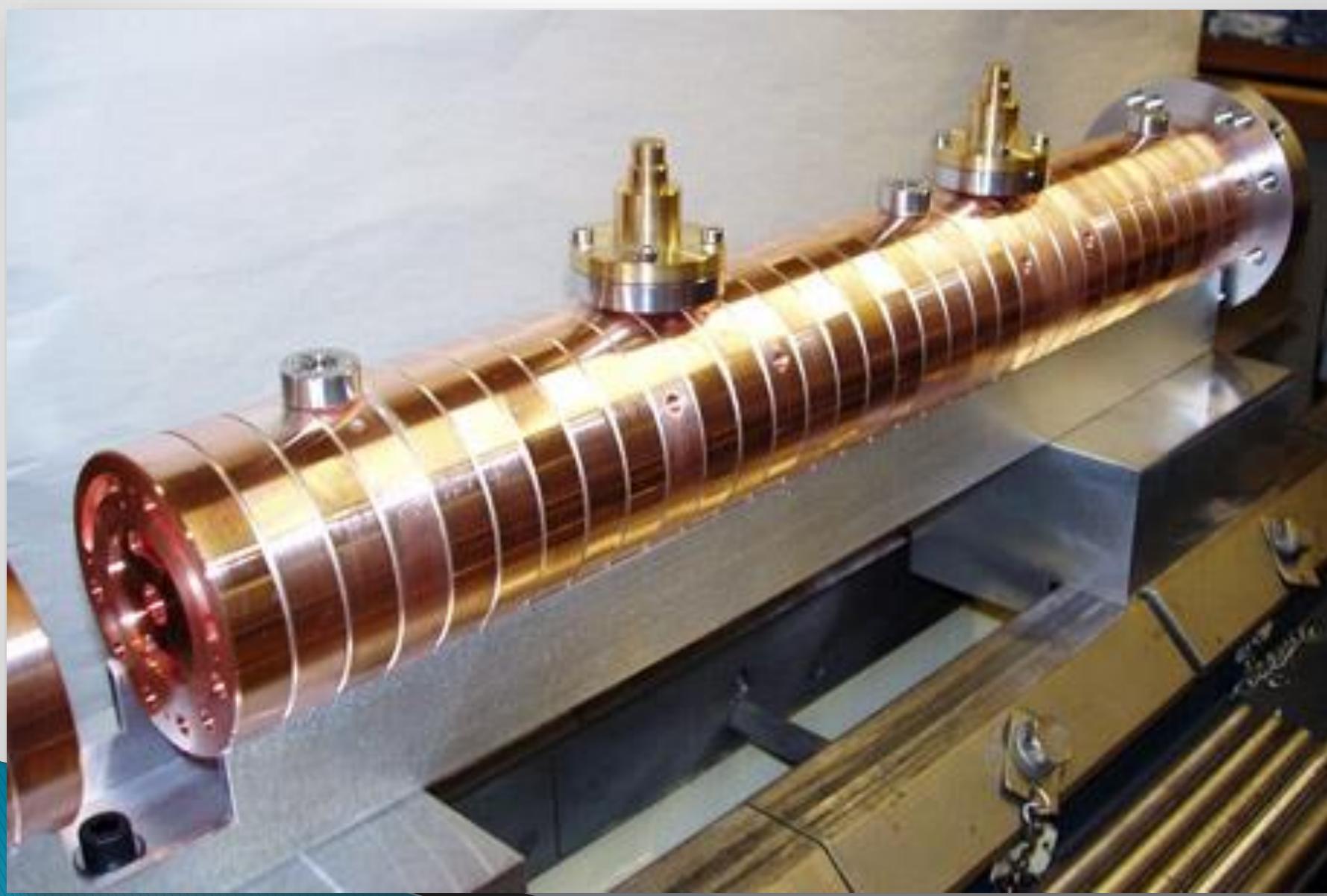


# Fabrication of Copper Accelerator Structures

V. Danielyan

V. Avagyan, A. Simonyan, V. Dekhtiarov,  
T. Mkrtchyan, V. Vardanyan

# Copper Accelerator Structure



- ▶ Technology
- ▶ Materials
- ▶ Machines
- ▶ Measuring equipment
- ▶ Other equipment and tools

# Technology

- *CNC Machining of Copper Cavity*
- *Surface Finish*
- *Chemical Cleaning of Cavity*
- *Annealing and Brazing of Copper Cavity*
- *Final Cleaning*
- *RF Tuning*

# Oxygen-free copper

C10100 OFE OK

Melting temp.-1083°C

Content of oxygen-0.0003%

Density -8.940 g/cc

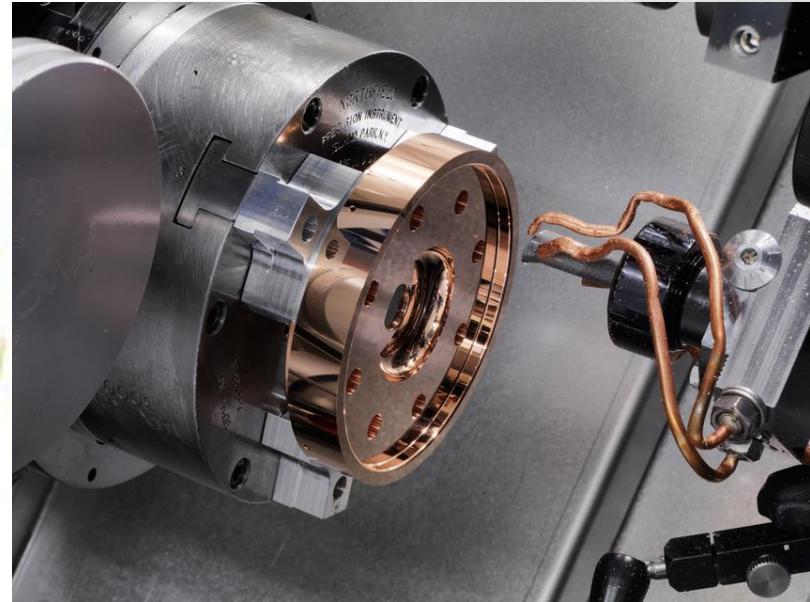
Electrical resistance- 0.0170 $\Omega\text{m}^{\ast}\text{m}$



# Necessary Equipment & Tools

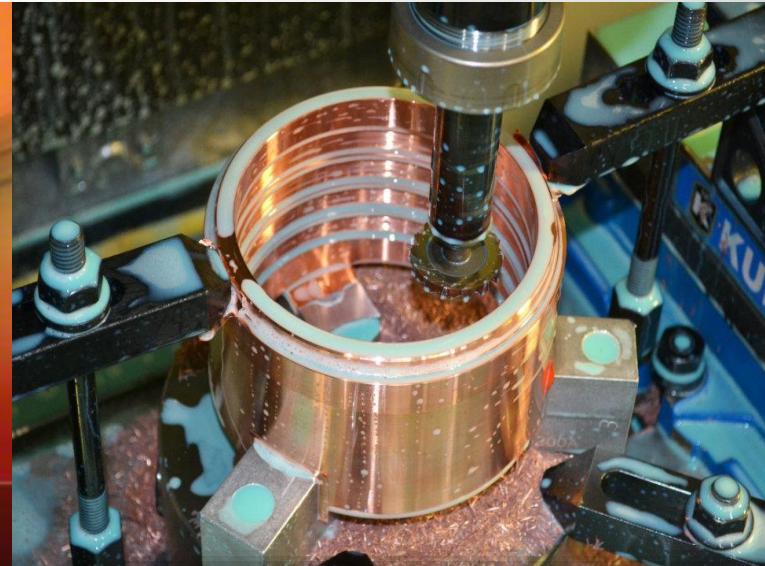
- ▶ **Machines & Tools**
- ▶ Dimension & Parameters
- Control Tools
- ▶ Annealing Furnace
- ▶ Hydraulic Press
- ▶ Brazing Equipment (2 options)

# Lathe 16R20P



- ▶ Grade of accuracy cost (8-82) – A
- ▶ Revolution of spindle – 3000r/m;
- ▶ Distance between centers – 1000 mm;
- ▶ Surface roug. after fin.– Ra 0,63
- ▶ Weight – 3005kg

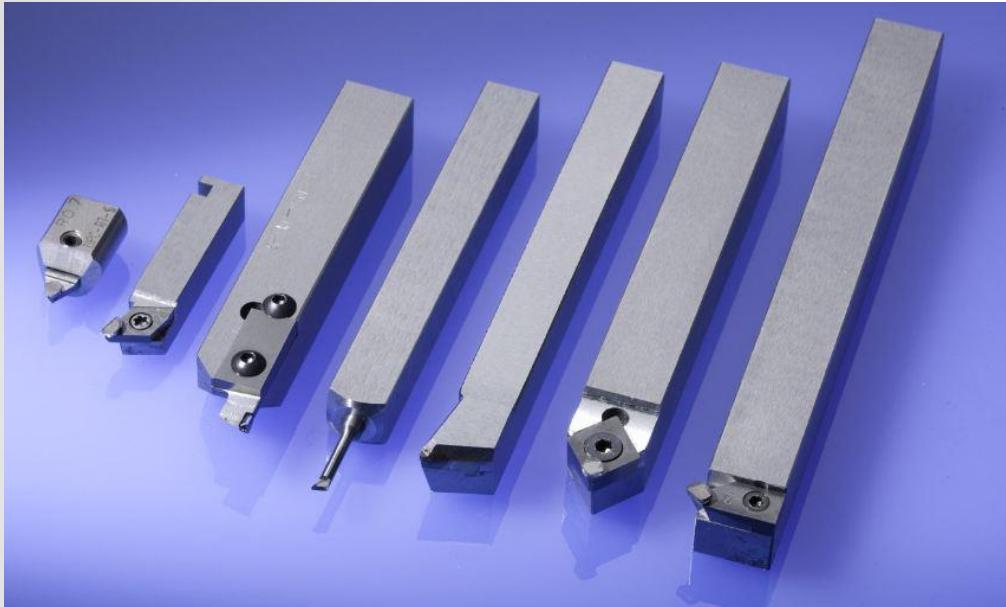
# CNC Vertical Milling Machine



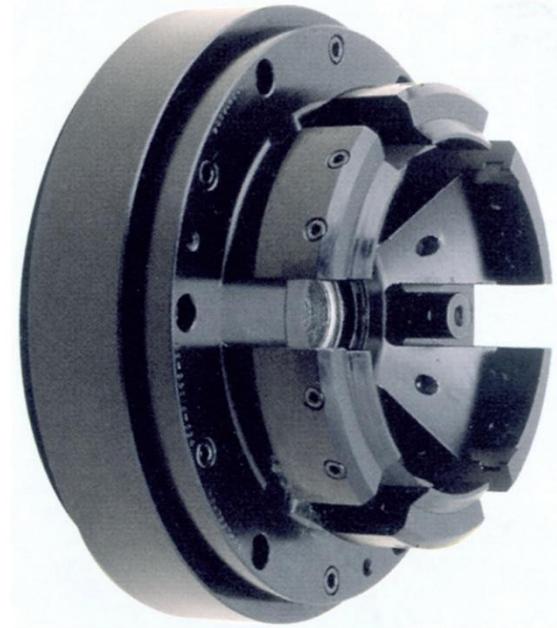
- ▶ Table Length- 1213mm;
- ▶ Table With- 267mm;
- ▶ T-Slot With-16mm;
- ▶ Max Weight on Table – 454kg
- ▶ Positioning –  $\pm 0.0102\text{mm}$
- ▶ Repeatability –  $\pm 0.0051\text{mm}$
- ▶ Weight – 1800kg:



# Machine Tools



Diamond  
cutting tools



Precision  
chuck

# Necessary Equipment & Tools

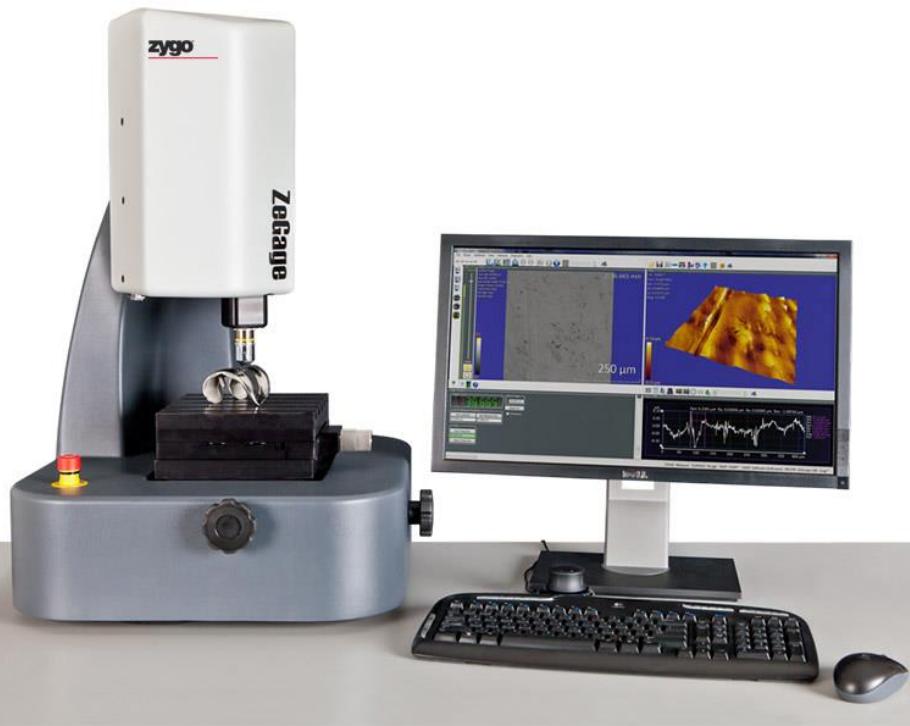
- ▶ Machines & Tools
- ▶ Dimension & Parameters
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# Metallographic Microscope

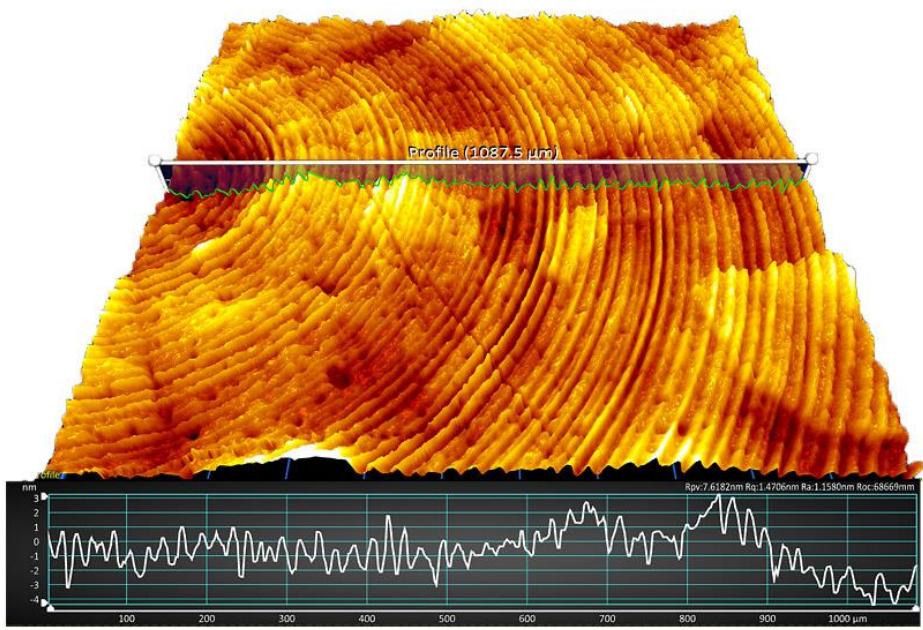


Characteristics	MMT.B.100.1600.000.HE
The increase in general, ratio	50x – 1600x
Eyepieces	WF 10x-18/18ММ, WF 10x-18/18ММ(with scale), WF 12,5x/14ММ, WF 16x/13ММ
Planochromatic eye pieces	5x/0,12 20x/0,35 40x/0,65 100x/1,25
Nozzle	trinocular 30 ° tilt adjustment of ± 5 diopters
Revolving device	4 lens exact fixation
Location, mm	top
The size of the object stage, mm	180x165
The range of movement, mm	50x40
Turning inserts, mm	10, 20, 40
Backlight	halogen lamp 30W, smooth adjustment of brightness
Filter	blue, green, red, white filter
Polarization	
Digital camera	CMOS 9Mpx
The size of matrix	1/2,5"
The size of pixel micron	2,2x2,"micron
Reported resolution	2560x1922

# Surface Analyzer



Horizontal meas. range X - 203 mm  
Horizontal meas. range Y - 203 mm  
Vertical measuring range Z - 89 mm  
Measuring resolution XYZ - 0.5 μm  
measuring range Ra - 3 nm  
Max weight of the part - 54 kg



# Necessary Equipment & Tools

- ▶ Machines & Tools
- ▶ Dimension & Parameters
- Control Tools
- ▶ Annealing Furnace
- ▶ Hydraulic Press
- ▶ Brazing Equipment (2 options)

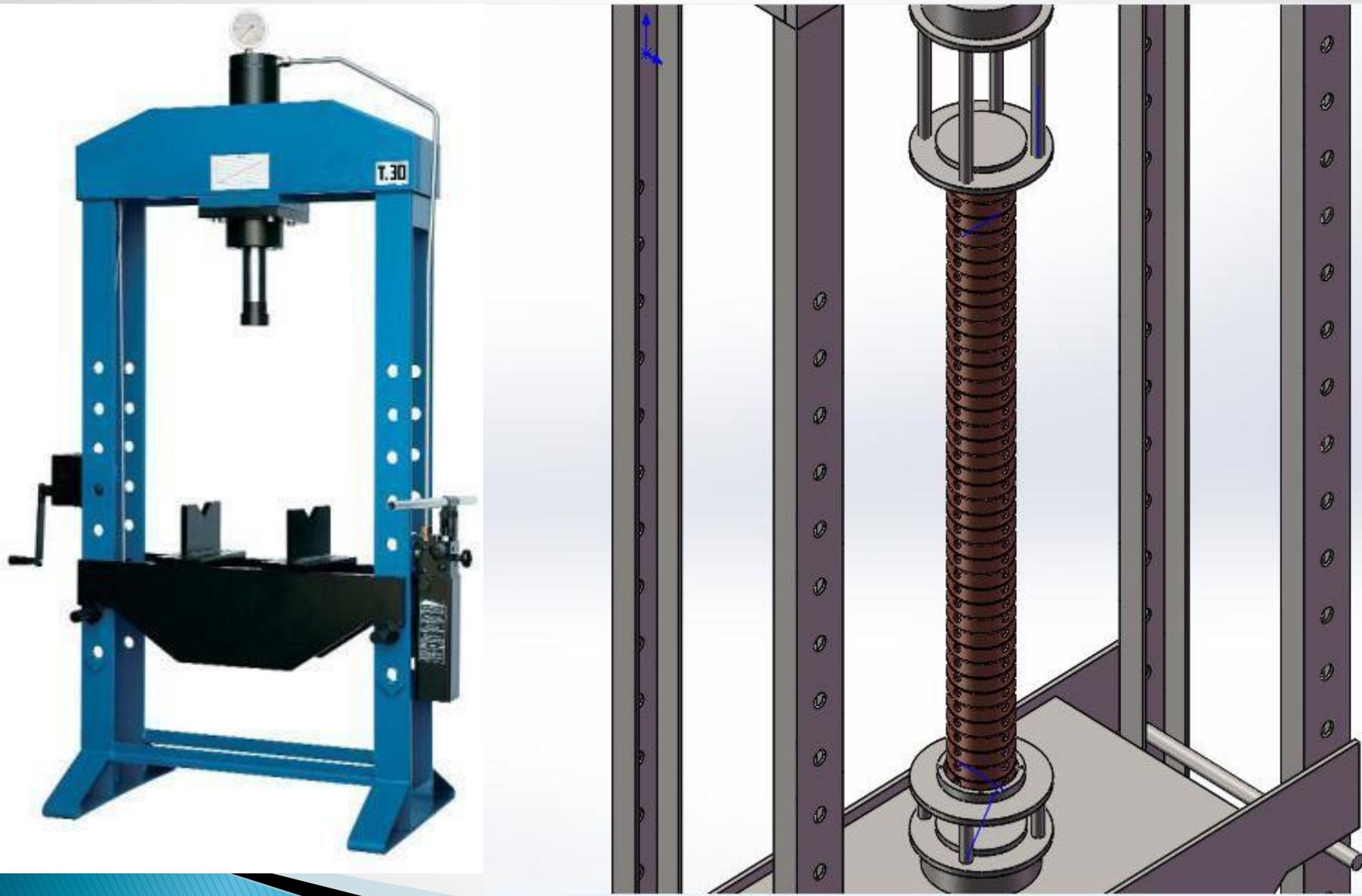
# Annealing Furnace



# Necessary Equipment & Tools

- ▶ Machines & Tools
- ▶ Dimension & Parameters
- Control Tools
- ▶ Annealing Furnace
- ▶ Hydraulic Press
- ▶ Brazing Equipment (2 options)

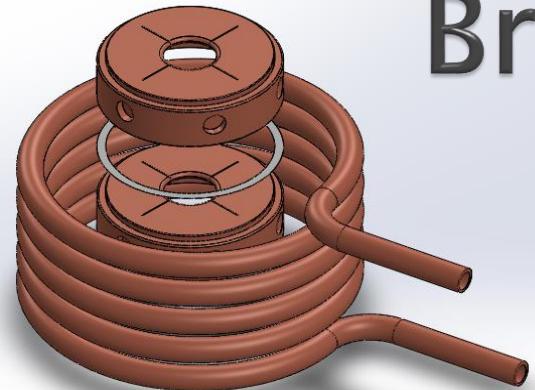
# Hydraulic Press



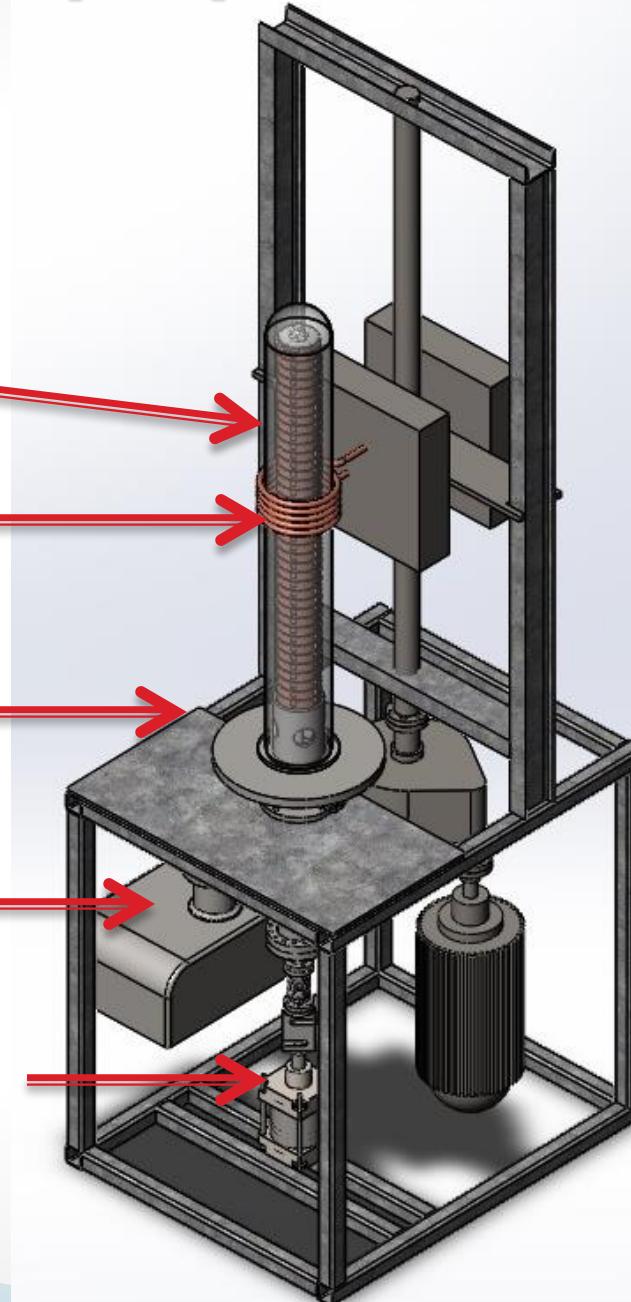
# Necessary Equipment & Tools

- ▶ Machines & Tools
- ▶ Dimension & Parameters
- Control Tools
- ▶ Annealing Furnace
- ▶ Hydraulic Press
- ▶ Brazing Equipment (2 options)

# Brazing Equipment



- ▶ Lifting Mech.
- ▶ Heating System
- ▶ Main Frame
- ▶ Vacuum System
- ▶ Pneumatic System





# ORGANIZATION STRUCTURE

- ▶ Cavity structure design – *A. Tsakanian, A. Vardanyan*
- ▶ Technical documentation – *V. Dekhtiarov*
- ▶ Mechanical and thermal processing – *A. Simonyan*
- ▶ Electronic and electrical part – *T. Mkrtchyan*
- ▶ Chemical cleaning – *V. Dekhtiarov*
- ▶ Vacuum brazing – *V. Vardanyan*
- ▶ Final cleaning and RF tuning – *DESY*
- ▶ Technical control – *B. Grigoryan, S. Naghdalyan, H. Gagayan*
- ▶ Coordination – *V. Danielyan*
- ▶ Head – *V. Avagyan*

# THANK YOU FOR ATTENTION