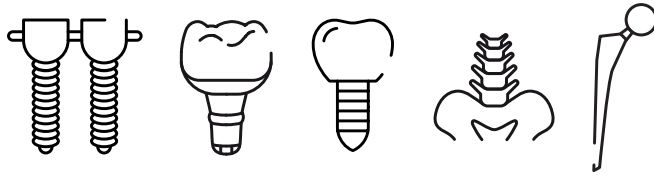


# Zapp® 9.9135HN | CoCrMo – Nickel Free

## Data Sheet | Medical Alloys

# ZAPP

Zapp is Certified to ISO 9001



### Zapp® 9.9135HN

Zapp® 9.9135HN is a cobalt-chromium-molybdenum alloy. It is characterized by high biocompatibility and high corrosion resistance. Nickel-free Zapp® 9.9135HN is particularly suitable for allergy sufferers.

This material boasts the highest wear resistance and hardness. Its vacuum melting process ensures an exceptional level of purity.

### Typical Applications

- Osteosynthesis
- Spine rods
- Dental applications

### Polishability

Zapp® 9.9135HN is high gloss polishable.

### Magnetism

Zapp® 9.9135HN is not magnetizable.

### Corrosion Resistance

Furthermore, the alloy Zapp® 9.9135HN has a low concentration of nickel, making it particularly suitable for individuals with nickel allergies. The combination of high chromium plus high molybdenum and lowest nickel concentrations gives the alloy excellent biocompatibility, making it a preferred material for surgical implants that come into contact with the human body.

### Cold Working

Cold working of Zapp® 9.9135HN is not recommended.

### Wear Resistance

The alloy has good resistance to abrasion, meaning it can withstand the friction and wear caused by contact with other surfaces. The microstructure of Zapp® 9.9135HN, which typically includes a combination of martensitic and austenitic phases, contributes to its wear resistance.

### Corresponding Standards

- According to DIN EN ISO 5832-12
- According to ASTM F1537 Alloy 1

### Availability

- Bars diameter range:  
2.0 – 16.0 mm
- Other diameters > 16.0 mm:  
available see data sheet 9.9135HC

### Typical Chemical Composition [Mass-%]

|      | C    | Si  | Mn  | Cr   | Mo  | Fe   |
|------|------|-----|-----|------|-----|------|
| Min. | -    | -   | -   | 26.0 | 5.0 | -    |
| Max. | 0.14 | 1.0 | 1.0 | 30.0 | 7.0 | 0.75 |

|      | N    | Ni  | Co   |
|------|------|-----|------|
| Min. | -    | -   | -    |
| Max. | 0.25 | 0.1 | bal. |

### Mechanical Properties

| Condition           | Tensile strength<br>Rm [MPa] | Yield strength Rp <sub>0.2</sub><br>[MPa] | Elongation A<br>[%] | Hardness<br>[HRC] |
|---------------------|------------------------------|-------------------------------------------|---------------------|-------------------|
| Annealed            | > 897                        | > 517                                     | > 20                | ~ 25              |
| Hot worked          | > 1.000                      | > 700                                     | > 12                | ~ 28              |
| Warm worked         | > 1.172                      | > 827                                     | > 12                | ~ 35              |
| Warm worked premium | > 1,172                      | > 827                                     | > 25                | ~ 35              |

### Physical Properties

|                                    |                                      |                                      |
|------------------------------------|--------------------------------------|--------------------------------------|
| Modulus of Elasticity E at 20° C   | [GPa]                                | 241                                  |
| Density ρ                          | [kg/ dm³]                            | 8.3                                  |
| Thermal Conductivity λ at 20 °C    | [W/ m²K]                             | 13.0                                 |
| Coefficient of Thermal Expansion α | [10 <sup>-6</sup> *K <sup>-1</sup> ] | 13.2<br>13.3<br>13.5<br>13.8<br>14.0 |
| Specific Heat c at 20 °C           | [J/ kg*K]                            | 450                                  |

### **Machining**

Machining Zapp® 9.9135HN can be demanding due to its high hardness and toughness. In summary, machining Zapp® 9.9135HN requires careful consideration of tool selection, cutting parameters, coolant usage, and machine stability. With proper planning and execution, high-quality components can be machined from this alloy.

### **Heat Treatment**

Solution Annealing:

Temperature: 1,075 – 1,150 °C

Holding Time: 30 Min.

Cooling: Air

### **MEDICAL ALLOYS**

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Further information regarding our products and locations are available in our image brochure and under [www.zapp.com](http://www.zapp.com)

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