Titanium Alloy

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Discover the Truth of Material

Purpose:

Observe the microstructure of titanium alloys. Titanium alloy blades are increasingly replacing aluminum alloys and precipitation-hardened stainless steels as the preferred material for compressor blades in aerospace engines due to their exceptional specific strength. These blades must withstand operational loads at temperatures below 500°C while maintaining high room-temperature strength and creep resistance. Samples undergo cutting (Beta-400MA), mounting (FLEXPRESS fully automatic modular hot mounting machine), grinding/polishing (Alpha610), and etching with Keller's reagent for microscopic examination (MN80 metallographic microscope).

Recommended parameters for different specimen size				
Sample size/ diameter (mm)	25	30	40	50
Individual force loading mode, individual sample pressure force (N)	-5	0	+(5~10)	+(5~10)

*Standard pressure: ϕ30mm (adjust according to sample size).

Recommended Equipment and Consumables (select grinding/ polishing consumables based on sample conditions):



Beta-400MA Manual/Auto Cutting Machine

Cutting

Equipment	Beta-400MA Manual/Auto Cutting Machine	
Cutting disc	S10 Silicon Carbide Cutting wheel	Order No: 01.01.520
Cutting coolant	TJ 1410 metallographic cutting coolant	Order No: 01.07.857
Fixture	Fast lock vise and Vertical fixture	
Cutting method	Veritcal clamp (Z axis)	
Cutting Parameters	Feed rate	0.2mm/s
	Pulse setting	No pulse cutting
	Cutting disc rotation speed	1500rpm

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FlexPRESS Automated Modular Hot Mounting Machine

Hot Mounting

Equipment	FlexPRESS Automated Modular Hot Mounting Machine
Hot mounting resin	EP2237 Epoxy Edge-Retention Hot Mounting Resin Order No: 02.01.710
Heating Power	100%
Holding time	5min
Temperature	180℃
Pressure	180bar
Cooling Conditions	Cool to 40℃
Cooling rate	High
Top heating	Enabled

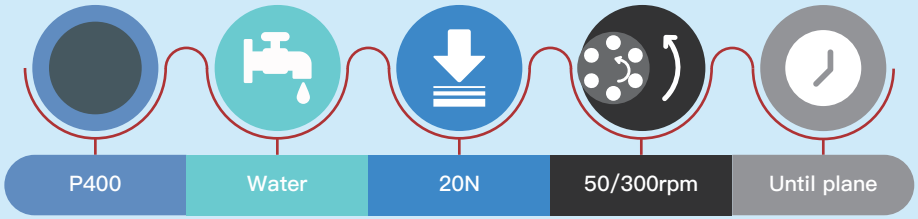
Basic Guide

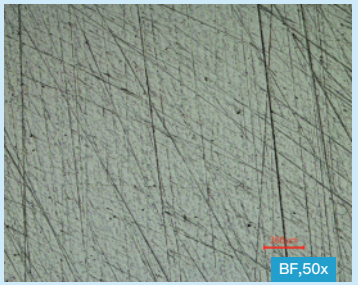
- **Cutting**
  1.Use titanium-specific resin-bonded silicon carbide cutting wheels. Refer to the Trojan Cutting Guide for specific models.
  2.Select pulse mode for cutting, with a recommended maximum cutting speed ≤0.25 mm/s.
- **Mounting**
  Use high-edge-retention cold/hot mounting resin.
- **Grinding**
  1.Begin with P400 silicon carbide sandpaper/lapping films/diamond grinding discs until the sample surface is flat and cutting damage is fully removed.
  2.Continue fine grinding with P400, P800, P2000 sandpaper or a POS disc +9μm diamond polishing suspension.
  3.Clean the sample, sample holder, and hands after each grinding step.
- **Polishing**
  1.Clean the polishing cloth, sample holder, and hands before polishing. Repeat cleaning after each step.
  2.Do not mix polishing disks with different abrasive particle sizes.
  3.Rinse the sample surface with alcohol and dry with a blower to remove residue.
  4.After each polishing step, inspect under a metallographic microscope to ensure scratch size matches the abrasive grit and direction is random.
  5.Clean polishing cloths with running water and a soft brush after use, then air-dry.
  6.Dedicate polishing cloths used for titanium alloys exclusively to such samples.

Preparation Procedure——Titanium Alloy

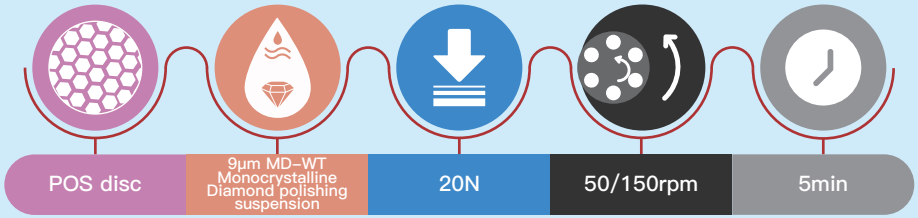
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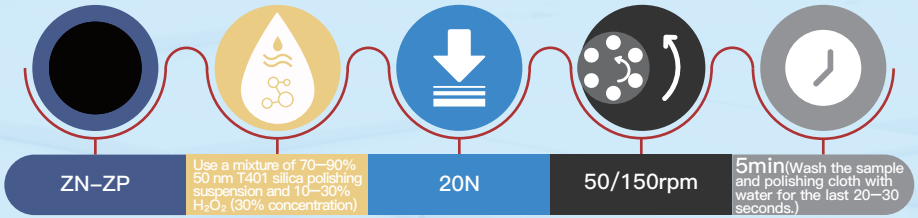


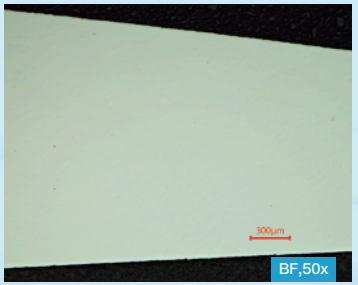
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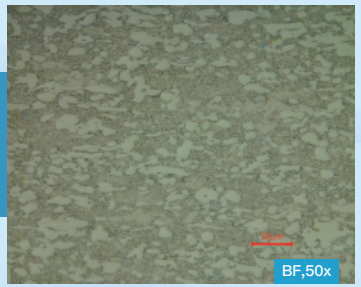


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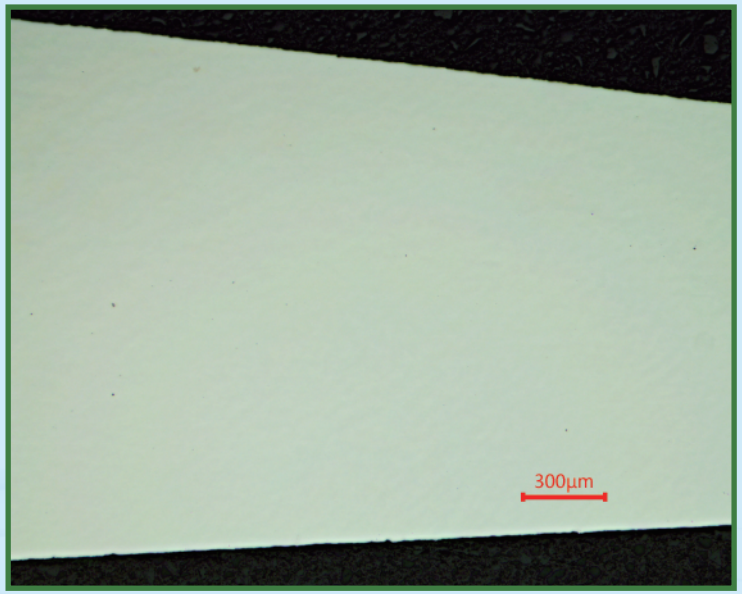
Immerse in Keller's reagent for 10—30 seconds



Titanium Alloy-Polishing Defect Sample

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Photos of qualified polished samples



Micrograph after ZN–ZP + 50 nm silica polishing suspension (50X magnification)

- Residual scratches from POS disc grinding observed on the sample surface.

Photos of qualified polished samples



Micrograph after ZN–ZP + 50 nm silica polishing suspension (50X magnification)

- Scratches were left on the sample residue POS disc after grinding;
- Solution: Increase polishing time with ZN+T401 silica polishing suspension to elimi–nate scratches.