304 Austenitic Stainless Steel

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Purpose：

304 stainless steel exhibits excellent corrosion resistance and surface finish. It is widely used in various industries, including aerospace, automotive, chemical, medical, food processing, and construction, due to its outstanding performance and versatility. Metallographic testing is a crucial component of quality control in the production and processing of stainless steel. It is primarily used to examine the grain structure of samples and conduct failure analysis of components. The sample undergoes cutting (using the Beta300 Pro), mounting (with the FlexPRESS Mounting Press), and grind–ing/polishing (using the Alpha610 grinder polisher). It is then electrochemically etched with a 10% oxalic acidsolution before its microstructure is examined under the MN80 metallurgicalmicroscope.

Recommended equipment and consumables (grinding and polishing consumables should be selectedbased on the specific characteris–tics of the sample).

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

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



Beta–300 Pro Automatic Cut–Off Machine

Cutting

Equipment	Beta–300 Pro Automatic Cut–Off Machine	
Cutting disc	A30 alumina abrasive cut–off wheel	Order No：01.01.360
Cutting coolant	TJ 1410 Metallographic cutting coolant	Order No：01.07.857
Fixture	Flat push fixture	
Cutting method	Vertical cutting (Z axis)	
Cutting parameters	Feeding speed	0.3mm/s
	Pulse setting	No pulse cutting
	Speed of cutting disc	2000rpm

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FlexPRESS Mounting Press

Hot mounting

Equipment	FlexPRESS Mounting	
Hot mounting resin	BB 2232 edge retention hot mounting resin	Order No：02.01.210
Heating power	100%	
Holding time	5min	
Temperature	180℃	
Pressure	150bar	
Cooling conditions	Cool to 40℃ according to the temperature	
Cooling rate	High	
Top heating	Enable	

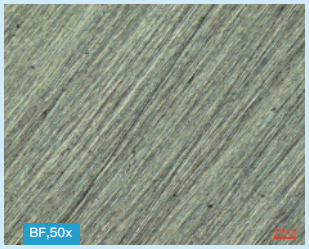
Basic guide

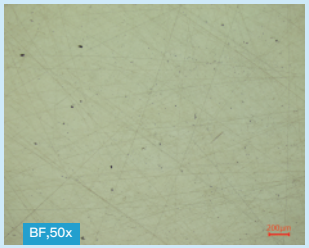
- **Cutting** 1.For Austenitic stainless steel, select A30 series alumina abrasive cutting discs. For specific models, refer to Trojan's cutting guide.
  2.Select pulse mode, with a recommended maximum cutting speed ≤ 0.3mm/s.
- **Mounting** Either high edge retention hot mounting resin or cold mounting resin can be used.
- **Grinding** 1.Start grinding with silicon carbide paper/grinding foil from P400, grinding until the sample is flat and the cutting damage layer is completely removed.
  2.After each grinding step, clean the sample, sample holder, and your hands.
- **Polishing** 1.Before starting polishing, clean the polishing cloth, sample holder, and your hands. Repeat the cleaning process after each polishing step.
  2.Polishing discs used with polishing suspensions of different abrasive sizes should not be mixed.
  3.Use alcohol and a blow dryer to clean and dry the sample surface, removing any residual water spots.
  4.After each polishing step, observe the polishing scratches under a metallographic microscope to check if the scratch size corresponds to the polishing grit and if the direction is random.
  5.After use, clean the polishing cloth with running water and a soft brush, then allow it to drain and store it properly.
  6.The polishing cloth used for austenitic stainless steel should only be used for polishing austenitic stainless steel samples and should not be mixed with cloths used for other materials.

Preparation Procedure——304 Austenitic Stainless Steel

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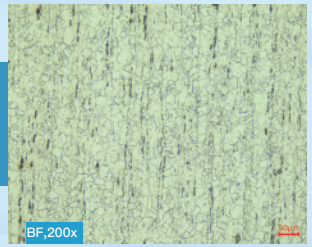
1	P400	Water	30N	50/300rpm	Until plane
2	*POS disc	9μm MD-WT Monocrystalline diamond polishing suspension	30N	50/150rpm	5min
3	SC-JP	9μm PD-WT Polycrystalline diamond polishing suspension	30N	50/150rpm	5min
4	ZN-ZP	50nm T401 Silica polishing suspension	20N	50/150rpm	1min(Wash the sample for the last 15 seconds)











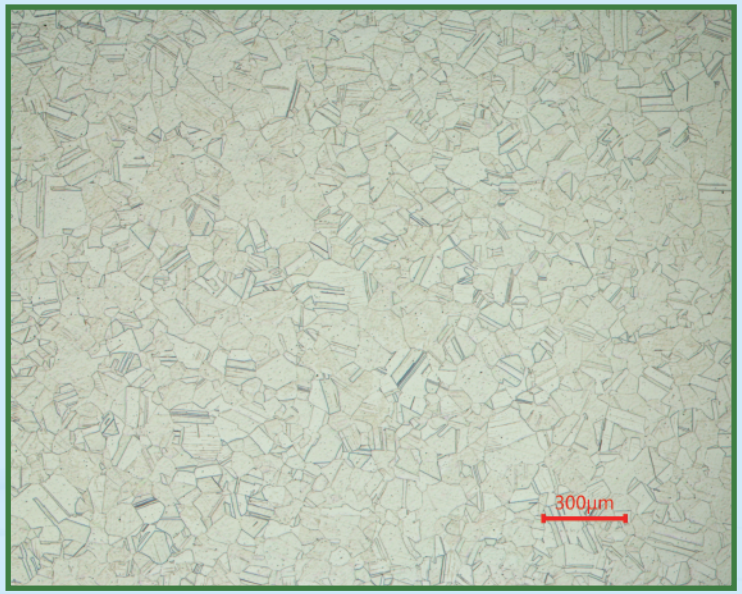
*The POS disc can also be replaced by P800 and P2000 abrasive papers.

Etch the sample for 10–20 seconds using a hydrochloric acid ferric chloride aqueous solution (composition: 5g ferric chloride, 50ml hydrochloric acid, 100ml water)

304 Austenitic Stainless Steel - Polishing defect samples

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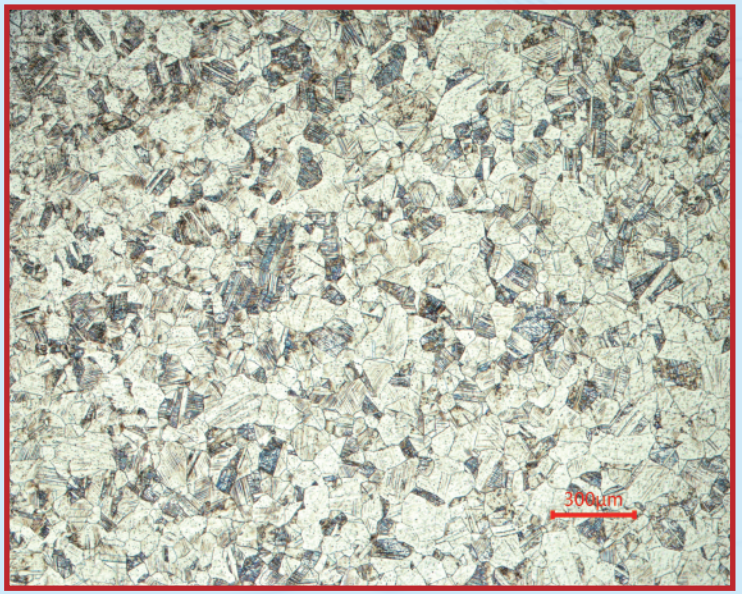
Photos of qualified polished samples



Photos after electrolytic etching with 10% oxalic acid aqueous solution (DC 5V) for 30–60 seconds, at 50X magnification

- The structure is clear, and the sample surface is clean with no scratches.

Photos of unqualified polished samples



Photos after electrolytic etching with 10% oxalic acid aqueous solution (DC 5V) for 30–60 seconds, at 50X magnification

- Excessive electrolytic corrosion time;
- Solution: Repeat the SC and ZN polishing cloth steps,perform electrolytic corrosion again, and carefully control the corrosion time.