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Technical Specification for Low Background Double Tilt Holder (Spare parts for Field Emission High-Resolution TEM)

Sr. No.		Compliance (Yes/No)	Additional Details
1	The double-tilt low background specimen holder is designed for use with the Tecnai, Talos & Titan transmission electron microscopes equipped with the CompuStage. This holder provides, in addition to the normal movements of the goniometer stage, a second tilt, beta, about an axis at right angles to the stage tilt. The detailed specifications are as follows. **1. Specimen dimensions and mounting** The double tilt low background holder will accept: 1. 3.05 mm diameter grid supported foil; 2. Disc shaped specimens, secured in place by means of a hex. specimen securing nut. Maximum edge thickness is 0.34 mm. The specimen is clamped in the carrier using the hex. specimen securing nut. Specimen displacement The maximum travel of this holder depends on the type of microscope, the pole pieces present, and the use of detectors in the objective stage. All these parameters are used by a combination of software and hardware protections to determine the safe maximum travel. **2. Maximum visible area** 1. The maximum visible area of the specimen at 0 degrees for both alpha and beta tilt is 2 mm · 0.1 mm. 2. When both X and Y movements are set to mid-position, the centre of the grid may be 0.3 mm displaced in the X direction.		

First tilt	0° second tilt	30° second tilt
0°	2.00 mm	1.30 mm
15°	1.86 mm	0.90 mm
30°	1.45 mm	0.70 mm
35°	1.25 mm	0.20 mm
45°	0.65 mm	0.00 mm
60°	0.00 mm	

Table 2-1 Maximum visible specimen area versus tilt angle

3. **Beta tilt**
   1. Maximum tilt angle +30 degree to -30 degree
   2. Maximum beta tilt speed 1degree/sec
   3. Smallest possible angle displacement 0.025 degree
   4. Position read out 0.05 degree on the Display Monitor
   5. The maximum displacement when tilting over the full beta tilt range may not exceed more than 25 cm at a magnification of 4000x (measured on the main screen)
   6. The maximum displacement when reversing the beta tilt angle may not exceed more than 1 cm at a magnification of 4000x. (measured on the main screen).
4. **Astigmatism and spot displacement**
   Any change of astigmatism introduced by the holder is less than 0.24 um • Select a spot size of about 1 um and measure the spot displacement when inserting the holder. The spot displacement must be less than 0.2 um at 120 kV.

5. **X ray safety**
   The X ray safety demands for the holder are the same as those for the basic microscope. This means that the X-ray emission is below 1mSv/hour at a distance of 10 cm, implying a level of < 5mSv/hour at a distance of 5 cm.

6. **Vacuum**
   1. The pre-vacuum pumping time is normally 32 seconds. However if the Cryo option is present the pumping time is variable between 8 seconds and 15 minutes.
   2. Starting condition: ultimate vacuum, e.g. 22 scale divs. (log scale). When the holder is retracted to the park position, and immediately reinserted, the vacuum must read 33 scale divs. (log scale) within:
   10 min. with anti-contamination device not cooled down;
   1 min. with anti-contamination device cooled down.

	7. Resolution The High resolution guaranteed depends on the type of microscope and pole pieces present. The double tilt holder may never be the limiting link in the resolution. **8. Drift** The maximum specimen drift is < 1 nm/min. x actual magnification (measured on the screen). This drift must be measured after a small repositioning (within 0.1 of a grid square). **9. Warranty: 90 days**		