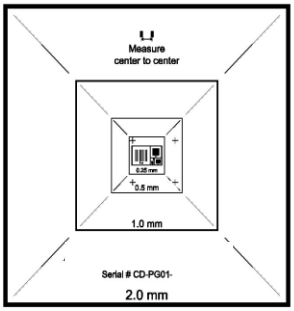
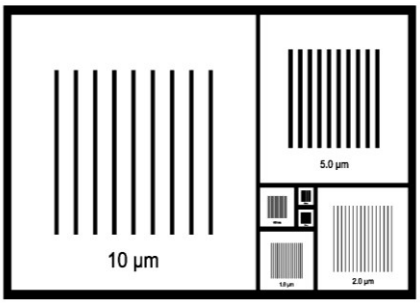
Pelcotec™ CDMS - Critical Dimension Magnification Standards

Pelcotec™ CDMS- 1T, Pelcotec™ CDMS- 1C, Pelcotec™ CDMS- 0.1T, Pelcotec™ CDMS- 0.1C





Product Number: 682-1 and 682-1A through 682-1Z, Pelcotec™ CDMS- 1T, 2mm - 1µm, Traceable

Product Number: 683-01 and 683-01A through 683-01Z, Pelcotec™ CDMS- 0.1T, 2mm - 100nm, Traceable

Product Number: 686-1 and 686-1A through 686-1Z, Pelcotec™ CDMS- 1C, 2mm - 1µm, Certified

Product Number: 687-01 and 687-01A through 687-01Z, Pelcotec™ CDMS- 0.1C, 2mm - 100nm, Certified

The Pelcotec™ Critical Dimensions and Magnification Standards (CDMS) can be used for calibration of many different types of microscopes including scanning electron, scanning ion, atomic force and reflected light microscopes.

To maintain optimum planarity, the patterns are fabricated on ultra flat silicon wafers. Calibration features between 2.0mm and 5µm were patterned using photolithography and are 50nm thick chrome. Using typical imaging conditions in an SEM, the perimeter of each line produces a brightness that allows for easy edge detection and measurement of center-to-center distance.

Calibration features between 2.0 µm and 100nm were patterned using e-beam lithography and consist of a 20nm thick chrome base with 50nm thick gold on top. These features produce a high contrast image against the silicon substrate, again allowing for easy measurement of center-to-center distance.

The zeros in the fiducial identifiers as well as the alignment cross-hairs make excellent features for focus and stigmation. As always, for optimum results ensure that the instrument is aligned with a stable beam current. Use the largest number of pixels for image capture and a slow enough scan rate to achieve a good signal-to-noise ratio. By performing both short- and long-term repeat measurements the user will be able to evaluate instrumental reproducibility and stability.

The design of the standard allows instrument calibration up to four orders of magnitude with the 0.1C or 0.1T product. Starting with the largest dimension that can be imaged (e.g. 2.0mm) and doubling the magnification brings the next calibration marker into view. Continuing this process until the 10 µm features are imaged, the user can now move in a clockwise spiral to the next smallest calibration feature until a complete magnification calibration curve is obtained over the range of interest.

For the certified CDMS (0.1C and 1C), the physical distance between the first and last lines are given for the 10, 5, 2 and 1 micrometer pitch lines (extended to 500, 250 and 100nm for 0.1C). If needed, this data can be

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used to obtain the actual (rather than the stated average) pitch between the first and last lines, thereby extending the magnifications available to the user.

Less or no use of the calibration lines to focus on the CD in a SEM will minimize the build-up of contamination on the surface and increase the periods between cleaning.

When it becomes necessary to clean the CDMS standard, the following procedures are recommended:

- Remove dust and large particles with dry filtered nitrogen gas. A photographic lens quality "dust-off" product may be used as an alternative, as may a rinse in distilled water followed by drying in high-purity methanol. Avoid gases and liquids that leave residues.
- For finger prints and hydrocarbon residues, an oxygen plasma cleaner may be used.
- **Avoid mechanical abrasion of the surface such as touching or wiping with a cloth.**

For die level certification purposes the following measurements are made on each certified standard:

Line	**Segment width per measurement**	**Segment length per measurement**	**Area per measurement**	**Number of measurements**
For 0.1C and 1C:				
2.0mm	0.10mm	2.0mm	$0.2mm^2$	10
1.0mm	0.05mm	1.0mm	$0.05mm^2$	10
0.5mm	0.04mm	0.5mm	$0.01mm^2$	10
0.25mm	0.02mm	0.25mm	$0.005mm^2$	10
10µm	1.5µm	80µm	$120\mu m^2$	10
5µm	2.0µm	45µm	$90\mu m^2$	10
2µm	2.0µm	30µm	$60\mu m^2$	10
1µm	1.0µm	16µm	$16\mu m^2$	10
For 0.1C only:				
500nm	0.75µm	9.5µm	$7.125\mu m^2$	10
250nm	0.50µm	5.0µm	$2.5\mu m^2$	10
100nm	0.50µm	5.1µm	$2.55\mu m^2$	10

We do not place an end date on the certification. The CDMS standards are constructed of Si, Cr, and Au and so are considered chemically stable under normal conditions of use. These standards are not intended to be mechanically touched. The only deterioration is caused by contamination. When used under clean conditions, we expect the validity of the certification to last between 5-10 years. The recertification frequency should be determined by the end-user taking into account the frequency of use, handling, storage and the condition of the standard over time or if a catastrophic event occurs like scratching the standard. Recertification can only be effected by purchasing a new certified standard.

For wafer level traceability of the CDMS-1T and -0.1T, the measurements for 10 certified standards across each wafer are used to obtain the statistics given on the traceability certificate.

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