

Recent Trends in MEMS Standardization

MEMS international standardization will be essential to accelerate design and development, ensure compatibility and quality and enable mass production. In Japan, the Micromachine Center is playing a leading role in promoting MEMS standardization. Three international standards proposed by Japan have been published, and one more is currently under consideration. Recently South Korea has also become actively involved in international standardization activities; so far, one standard proposed by South Korea has been published, four are currently under consideration and two have been submitted as proposals.

International standards in the MEMS field have been prepared by Working Group 4 (WG4) of Technical Committee Meeting No. 47 (TC 47) (semiconductor devices) of the International Electrotechnical Commission (IEC). In October 2007, Japan proposed that this working group be upgraded to a subcommittee (SC) and offered to serve as secretariat. The status of activities of WG4 and Japan's achievements and contributions up to now were evaluated by the other countries, and in May 2008 the proposal was approved. Nine nations participated as regular members: China, Germany, France, Italy, Japan, South Korea, the Netherlands, Russia and the United States. The Micromachine Center became the domestic consideration organization for the new subcommittee, SC47F, and assumed the secretary.

The first international conference for SC47F was held October 28 - 30 at the Mita Kaigisho in Tokyo to coincide with the TC47 conference. The following table shows the status of individual documents, focusing on the content of the discussions at this conference.

Document	Proposed	Proposed By	Level	Status
IEC 62047-1; Terms and definitions	July 2002	Japan	IS	Published as an International Standard (IS) in September 2005. Published as a Japanese Industrial Standard (JIS C 5630-1) in March 2008.
IEC 62047-2; Tensile test method of thin film materials	July 2003	Japan	IS	Published as an International Standard (IS) in August 2006. Submitted as a draft Japanese Industrial Standard (JIS) to the Japan Standards Association in July 2008.
IEC 62047-3; Standard test piece for tensile tests	July 2003	Japan	IS	Published as an International Standard (IS) in August 2006. Submitted as a draft Japanese Industrial Standard (JIS) to the Japan Standards Association in July 2008.
IEC 62047-4; Generic specification	July 2004	South Korea	IS	Published as an International Standard (IS) in August 2008.
IEC 62047-5; RF MEMS switches	December 2005	South Korea	CD	Following comment and review of the second Committee Draft (CD) by individual countries, it was decided to prepare a third CD.
IEC 62047-6; Thin film material fatigue test methods	May 2006	Japan	CDV	The Committee Draft for Vote (CDV) was approved, and a Final Draft Industrial Standard (FDIS) reflecting the results of comment and review by individual countries was submitted. Expected to be published as an International Standard in FY 2008.
IEC 62047-7; FBAR filter	March 2007	South Korea	CD	A review of the comments from individual countries regarding the Committee Draft (CD) was conducted, and it was decided to prepare a second CD.
IEC 62047-8; Thin film bending test methods	March 2007	South Korea	CD	A review of the comments from individual countries regarding the Committee Draft (CD) was conducted, and it was decided to prepare a second CD.
IEC 62047-9; Wafer-to-wafer bonding strength measurement	March 2007	South Korea	CD	A proposal from Japan to add a 3-point bending test method and a die shear test method to the test methods in the South Korean proposal was approved, and Japan prepared a draft. At South Korea's request, it was decided that Japan should also prepare the draft for the blister test.
IEC 62047-10; Micropillar compression test	August 2008	South Korea	NP	Currently on the ballot as a "New Work Item Proposal" (NP). Japan voted in favor of the proposal, attaching a comment regarding the purpose, scope and content of the standard based on the results of the domestic committee review.
IEC 62047-11; Test methods for MEMS material coefficient of thermal expansion	August 2008	South Korea	NP	Currently on the ballot as a "New Work Item Proposal" (NP). During the committee meeting, Japan expressed the view that consideration should be given to including other test methods for the coefficient of thermal expansion in the draft, but the South Korean side wanted these to be proposed separately. Accordingly, Japan voted in favor of the proposal on the condition that the document be given a narrowly focused title.

In addition, the draft international standards currently being prepared in Japan are shown in the table below. These will be proposed as "New Work Item Proposals" (NPs) around the end of the development period.

Topic	Development Period	Notes
Thin film material life acceleration test methods	FY 2006 - FY 2008	Establishes methods for life tests using resonant oscillation that are conducted for tiny mechanical structures used for micromachines
Standard materials for calibration	FY 2006 - FY 2008	Establishes the standard materials used for calibrating weight displacement for the material testers used to test microstructure materials
MEMS mechanism material bonding strength test methods	FY 2007 - FY 2008	Establishes methods for testing the strength of bonds between thin films and substrates between the microstructures that will become constituent members
MEMS gyro and electronic compass	FY 2008 - FY 2010	Defines (in matrix form) the passive and active sensitivity of tiny multi-axial gyros, and defines parameters for performance requirements and standardizes the methods to represent and measure these parameters. Also standardizes the properties and user interface (including coordinate system) for hexaxial electronic compasses.