SEMI North America
1401 K Street, NW Suite 601
Washington, DC 20005

Tel: 1.202.289.0440
Fax: 1.202.289.0441
semidc@semi.org
www.semi.org

February 7, 2011

Mr. Timothy Mooney
Bureau of Industry and Security
U.S. Department of Commerce
14th St. and Pennsylvania Ave., N.W.
Washington, DC 20230

RE: Advance Notice of Proposed Rulemaking – Commerce Control List: Revising Descriptions of Items and Foreign Availability (Federal Register Notice of December 9, 2010)

Dear Mr. Mooney:

Semiconductor Equipment and Materials International (SEMI) is pleased to submit to the Commerce Department's Bureau of Industry and Security (BIS) the following comments on the BIS advance notice of proposed rulemaking regarding the Commerce Control List (CCL).

SEMI represents over 2,000 global companies that provide equipment, materials and services used to manufacture semiconductors, photovoltaics, displays and related technologies. SEMI's over 400 U.S. member companies are comprised of both large and small companies that make a critical contribution to the advance of microelectronic technologies and that are central to the communities of highly skilled and educated engineers and technologists in many regions of the United States.

SEMI and our member companies support the Administration's initiative to modernize the current export control system and we commend the Commerce Department for this timely review of the Commerce Control List. We recognize the complexities of updating the regulations and appreciate this opportunity to comment on the CCL. We are committed to export control reform and look forward to working with the government on an on-going basis to help achieve these goals.

About the Semiconductor Equipment Industry

The instruments and materials that SEMI member companies produce are used principally to manufacture commercial integrated circuits or semiconductors on a mass volume basis. In turn, these devices are designed and used to manufacture electronic devices. The principal customers of semiconductor equipment and materials companies are large, well-known semiconductor fabrication operators.

The U.S. industry serves a global customer base and companies must export on a commercially reasonable basis to survive. The average U.S. maker of semiconductor production equipment receives over 80 percent of its revenues from overseas sales. These U.S. firms cannot be world leaders or even sustain their existing enterprises or market share unless they are able to compete quickly and effectively in the global marketplace.

A regular stream of revenue from export sales is needed, among other things, to fund U.S. firms' enormous research and development (R&D) investments. Semiconductor equipment companies reinvest, on average, 10 to 15 percent of their revenues in R&D. This level of R&D is necessary for these companies to remain world leaders. The ability to fund these investments has always been dependent on export revenues, so access to overseas markets and the ability to compete in these markets with leading edge technology is vital to the long term health of the U.S. semiconductor equipment infrastructure.

SEMI projects global semiconductor equipment sales to have reached $37.54 billion for 2010. Following a 46 percent market decline in 2009, the equipment market is estimated to have expanded by 136 percent in 2010. SEMI forecasts annual growth of about 4 percent in 2011 and another 4 percent in 2012.

While year-end figures are being finalized, we estimate growth in all regions for 2010. Taiwan was the largest market for equipment, followed by South Korea. China, South Korea, Europe and Taiwan are all estimated to have experienced growth rates over 100 percent. For the first time, the size of the China market ($3.27 billion) exceeded the size of the Europe market ($2.33 billion). Please see Attachment One for additional details.

These forecasts confirm that Asia is where the majority of the advanced semiconductor fabs are being built. United States SEMI members need to have the same access to these Asian customers that their non-U.S. competitors have. They must participate fully in the Chinese and other Asian markets to be world leaders and even to survive.

I. Item Descriptions for Export Control Classification Numbers

SEMI has for many years provided information and analysis to the U.S. government to help inform policy-making regarding Category 3 of the Commerce Control List. While these activities have resulted in what are, in SEMI's view, improvements to Category 3, much more needs to be done. One reason for this is that the last comprehensive review of semiconductor manufacturing equipment ("SME") controls occurred two decades ago while the semiconductor industry creates a new technology generation approximately every 18 months. The incremental changes made during this time have been inadequate and have not kept pace with advances in technology.

Overall, our foremost concerns are not with ambiguity in item descriptions (although there is some unclarity). Rather, our foremost concerns are with the outdated character of the list and challenges with some of the terms and technical parameters. For example, ECCN 3B001's use of possible output results – such as, "feature size of 65 nm or less" – to establish the scope of equipment controls has proven to be particularly problematic. Also, terms that ECCN 3B001 uses to describe output results, like "critical dimension," do not have a fixed meaning.

These and other concerns are more fully outlined in an October 2010 letter from the Information Systems Technical Advisory Committee to BIS Assistant Secretary Kevin Wolf. Rather than reiterate the concerns here, we ask that you refer to Attachment Two. This letter describes aspects of Category 3B001 ECCNs that should be addressed and requests guidance on the policy objectives behind these regulations. Without a deeper understanding of the policy objectives, it is quite difficult to formulate constructive proposals.

SEMI believes that a fundamental review for semiconductor equipment controls is necessary beyond clarification of ECCN descriptions and that it should result not only in changes to ECCN descriptions but also in Wassenaar proposals to update the list. SEMI proposes to coordinate industry participation in the government working group that will review the Category 3 controls as we seek to better understand the policy rationale and tailor recommendations accordingly.

II. Recommendations on Structure of Tiered List

SEMI members have carefully evaluated the criteria that BIS described in the advance notice of proposed rulemaking (the "Notice") with regard to distribution of items among control list tiers. In sum, SEMI strongly recommends that no SME items be placed in a tier higher than Tier 3. There is no reasonable basis, in SEMI's view, for placement of SME in Tier 2 – which is the focus of SEMI's comments – and certainly no basis for placement in Tier 1.[1]

The Notice specifies that:

> Tier 2 items are available almost exclusively from regime partners or adherents and provide a substantial military or intelligence advantage to the United States, or make a substantial contribution to the indigenous development, production, use, or enhancement of a Tier 1 or Tier 2 item.

The following subsections discuss SME under the two categories of criteria described in the Notice: 1) connections to military or intelligence advantage; and 2) foreign availability.

A. Connections to Military or Intelligence Advantage

Semiconductor production equipment comprises the instruments that semiconductor companies use to produce semiconductor devices. These devices are mass produced to serve as components for civil electronic systems. While modern semiconductors are technologically advanced, the technology and most advanced applications are to serve the needs of consumer products. Defense electronic systems, like any other electronic systems, rely on semiconductors. But defense systems account for a tiny fraction of semiconductor volumes, seldom use the most advanced semiconductor technology, and do not drive the advance of semiconductor technology.

Modern semiconductor production equipment comports with these facts about modern semiconductor production. The machines that SEMI members manufacture are designed to produce enormous volumes of commercial semiconductors at the highest possible levels of efficiency. Like the integrated circuits that they produce, these machines unquestionably involve advanced technology. But it is not technology that has a connection to military or intelligence capabilities. Rather, semiconductor production technology is overwhelmingly driven by quintessentially commercial considerations: enabling companies to produce large volumes of commercial products with high yields.

SME's only utility is that, when used by skilled engineers with a variety of other pieces of equipment and technologies, it can be used to produce integrated circuits. In and of itself, a

[1] There would appear to be no Wassenaar Arrangement ("WA") restraint on the U.S. government's flexibility to adjust its export licensing policies relating to semiconductor manufacturing equipment. Only one such item, chemical vapor deposition equipment, is on the WA "Sensitive List." Placement on the Sensitive List only affects reporting and notification obligations regarding an item. There is no WA requirement that WA Participating States condition exports of any item on issuance of a transaction-specific license.

semiconductor production instrument does not provide military or intelligence advantage to the United States.

Presumably, then, the only question regarding military or intelligence advantage is whether any given semiconductor production equipment "makes a substantial contribution to the indigenous development, production, use, or enhancement of a Tier 1 or Tier 2 item." For these purposes, "substantial" means "providing a capability with respect to which the United States must maintain parity and that would pose a serious threat to U.S. national security if not controlled."

There was a time during the Cold War when semiconductors and SME production were largely restricted to the United States. Defense applications tended to drive advances in semiconductor device and equipment technology, and export controls on SME had a clear, understandable point: withholding SME production capabilities from the Soviet Union and its allies. Then, it might have been reasonable to contend that exports of leading edge semiconductor production equipment could provide the Warsaw Pact with a manufacturing capability that could undermine U.S. security. None of these circumstances exists today.

Electronic systems employed by the militaries in the United States and abroad, like all electronic systems, continue to incorporate semiconductors. Today, though, most of these semiconductors are ubiquitous commercial devices that are used by civil systems and are not susceptible to control in any meaningful way. And while some semiconductors are made to "mil-specs," those mil-specs are a function of design and materials and not the equipment used to make them.

As discussed above, today's SME industry is overwhelmingly devoted to making commercial devices -- enabling semiconductor companies to produce vast volumes of commercial semiconductors as efficiently as possible. The advance of SME technology revolves around these goals.

Some military electronic systems do incorporate application-specific semiconductors (ASICs). But industry experts understand that conventional semiconductor production systems are not needed to produce these ASICs. Given the relatively low volume of such chips that is needed, they can be produced in laboratory environments.

Regardless, it is distinctly incongruous to try to affect supply of military ASICs through export controls on conventional SME. Making specialized military-specific semiconductors is not what modern, conventional semiconductor systems are designed to do. To the extent that any equipment were uniquely devoted to production of military ASICs, it might be reasonable to apply export controls to them. But this does not characterize the modern production systems that SEMI members produce and sell as a matter of course.

B. Foreign Availability

Semiconductor manufacturing equipment is broadly available from around the world. American semiconductor equipment companies are competing head-on with Asian and European firms. These regions have highly competitive industries, often backed with government support. As the following chart shows, only five of the top ten global semiconductor equipment companies are from the United States.

Top Ten Equipment Companies

2009 rank	2008 rank	Supplier	HQ Region	2009 sales
1	1	Applied Materials		$3,597 million
2	3	Tokyo Electron		$2,324 million
3	2	ASML		$2,268 million
4	6	Nikon		$1,547 million
5	4	KLA-Tencor		$1,321 million
6	5	Lam Research		$1,198 million
7	9	Dainippon Screen		$805 million
8	11	ASM International NV		$690 million
9	10	Novellus Systems		$582 million
10	12	Teradyne		$552 million

Source: VLSI Research March 2010

All major types of equipment used to produce semiconductors are supplied by companies outside of the United States. In fact, today it is possible to fabricate an advanced semiconductor without any equipment supplied by the United States.

Making the Same Chip

	Option 1	Option 2	Option 3, etc
Etch	Lam	TEL	Hitachi High
CVD	Novellus	Jusung	ASM
PVD	Applied	Ulvac	Unaxis
Implant	Varian	SEN	Nissin
Lithography	ASML	Nikon	Canon
Track	Sokudo	TEL	Suss Micro
Mask Making	Nuflare	Micronic	Hitachi
CMP	Applied	Ebara	Tokyo Seimitsu
Process Control	KLA-Tencor	Vistec	Nova Measuring

Substantial Foreign Availability of Technology

Source: Applied Materials

To provide specific information about foreign availability for Category 3B001 items, the SEMI Industry and Research Statistics Department prepared an extensive spreadsheet outlining overseas suppliers for equipment categories. Please see Attachment Three.

A key point jumps out from this data: there is an emerging semiconductor equipment industry within China. A well-known example is AMEC (Advanced Micro-Fabrication Equipment, Inc.). AMEC is focused on etch equipment and has produced current generation tools for both the local Chinese market and for export. There are also several lesser known Chinese semiconductor equipment companies and organizations involved in this SME area. These include:

- MOCVD: Qingdao Jingcheng-Hauqi Microelectronic Equipment Company (http://www.jcmee.com)
- MOCVD: Qingdao Jason Electric Company (http://www.qdjason.com)
- MOCVD: Institute of Microelectronics at the Chinese Academy of Sciences (http://kw305.51.net)
- Ion implant: Beijing Zhongkexin Electronics Equipment Company (http://www.zhongkexin.com.cn)
- Etch: Beijing NMC Company (North Microelectronics) (http://www.bj-nmc.cn)
- CVD: Piotech (Shenyang) Company (http://en.sypiotech.cn/newEbiz1/EbizPortalFG/portal/html/index.html)
- Lithography: Shanghai Micro Electronics Equipment Company (http://www.smee.com.cn/china/homepage.asp)
- CMP: ACM Research (Shanghai) (http://www.acmrcsh.com)

IV. Additional Comments

Pending completion of the current review, we urge the government to establish license-free paths for SME exports to civil semiconductor fabrication facilities. The priority, in SEMI's view, should be eliminating unnecessary and counterproductive controls on shipments of conventional SME products to civilian fabrication facilities. This could be accomplished through expanded license exception coverage such as CIV and enhancements to the Validated End-User (VEU) program. SEMI has been asked to coordinate industry input to the End-User Review Committee regarding the VEU program and we will explore this topic with government officials separately.

SEMI and our member companies are committed to export control reform and we appreciate the opportunity to provide these comments.

Sincerely,

Karen Savala

Karen Savala
President, SEMI Americas

Attachments

SEMI Attachment One

Comments on the Advance Notice of Proposed Rulemaking regarding the Commerce Control List

February 7, 2011

Semiconductor Equipment Sales to Reach $37.5 Billion in 2010

TOKYO, Japan – November 30, 2010 – SEMI projects 2010 semiconductor equipment sales to reach $37.54 billion according to the year-end edition of the SEMI Capital Equipment Forecast, released here today by SEMI at the annual SEMICON Japan exposition.

The forecast indicates that, following a 46 percent market decline in 2009, the equipment market will expand by 136 percent in 2010 and experience annual growth of about 4 percent in 2011 and another 4 percent in 2012. Revenues of $37.54 billion place equipment spending this year on par with 2004 investment levels.

"In terms of year-over-year growth, 2010 will be a record year for the semiconductor equipment market," said Stanley T. Myers, president and CEO of SEMI. "SEMI remains cautiously optimistic about the industry's growth prospects over the next two years given the pervasiveness of semiconductors in the products we use every day."

Wafer processing equipment, the largest product segment by dollar value, is expected to increase 137 percent in 2010 to $28.11 billion. The forecast predicts that the market for assembly and packaging equipment will grow by 155 percent to $3.59 billion in 2010. The market for semiconductor test equipment is also forecasted to grow by 155 percent to reach $3.96 billion this year.

Growth is forecasted for all regions in 2010, with Taiwan being the largest market for equipment followed by South Korea. North America will be the third largest market for overall spending on semiconductor equipment. China, Korea, Rest of World, Europe, and Taiwan regions will experience growth rates over 100 percent.

The following results are given in terms of market size in billions of U.S. dollars and percentage growth over the prior year:

Forecast by Equipment Segment

Equipment Type	2009	2010 Forecast	% Chg	2011 Forecast	% Chg	2012 Forecast	% Chg
Wafer Processing	$11.84	$28.11	137%	$30.19	7%	$30.83	2%
Test	1.55	3.96	155%	3.76	-5%	4.08	9%
Assembly & Packaging	1.41	3.59	155%	2.97	-17%	3.31	11%
Other*	1.11	1.88	69%	2.03	8%	2.30	13%
Total	**$15.92**	**$37.54**	**136%**	**$38.95**	**4%**	**$40.52**	**4%**

Forecast by Region

Region	2009	2010 Forecast	% Chg	2011 Forecast	% Chg	2012 Forecast	% Chg
Taiwan	$4.35	$9.99	130%	$9.00	-10%	$9.17	2%
South Korea	2.60	8.61	231%	8.28	-4%	8.72	5%
North America	3.39	5.31	57%	6.01	13%	5.81	-3%
Japan	2.23	4.41	98%	4.90	11%	4.94	1%
Rest of World	1.44	3.62	151%	4.08	13%	4.52	11%
China	0.94	3.27	248%	3.77	15%	4.16	10%
Europe	0.97	2.33	141%	2.91	25%	3.20	10%
Total	**$15.92**	**$37.54**	**136%**	**$38.95**	**4%**	**$40.52**	**4%**

*Totals and percentages may differ due to rounding of numbers

Source: SEMI November 2010

The Equipment Market Data Subscription (EMDS) from SEMI provides comprehensive market data for the global semiconductor equipment market. A subscription includes three reports: the monthly SEMI Book-to-Bill Report, which offers an early perspective of the trends in the equipment market; the monthly Worldwide Semiconductor Equipment Market Statistics (SEMS), a detailed report of semiconductor equipment bookings and billings for seven regions and over 22 market segments; and the SEMI Semiconductor Equipment Consensus Forecast, which provides an outlook for the semiconductor equipment market. For more information or to subscribe, please contact SEMI customer service at 1.877.746.7788 (toll free in the U.S.) or 1.408.943.6901 (International Callers).

SEMI is the global industry association serving the manufacturing supply chains for the microelectronic, display and photovoltaic industries. SEMI member companies are the engine of the future, enabling smarter, faster and more economical products that improve our lives. Since 1970, SEMI has been committed to helping members grow more profitably, create new markets and meet common industry challenges. SEMI maintains offices in Austin, Beijing, Bengaluru, Berlin, Brussels, Grenoble, Hsinchu, Moscow, San Jose, Seoul, Shanghai, Singapore, Tokyo, and Washington, D.C. For more information, visit www.semi.org

Association Contacts

Deborah Geiger/SEMI, Phone: 408.943.7988, E-mail: dgeiger@semi.org

Dan Tracy/SEMI, Phone: 408.943.7987, E-mail: dtracy@semi.org

# # #

Information Systems Technical Advisory Committee

October 15, 2010

The Honorable Kevin J. Wolf
Assistant Secretary of Commerce for Export Administration
U.S. Department of Commerce
Bureau of Industry and Security
1401 Constitution Avenue, NW
Washington, DC 20230

Dear Secretary Wolf:

This letter summarizes industry concerns with Category 3B001.a-i (Semiconductor Manufacturing Equipment or SME) and seeks your support in effecting an in-depth examination of this category, something we believe necessary owing to a number of issues with the control language as presently written. Forty years ago, the effectiveness of the CoCom controls, from which 3B001 has evolved, could not be doubted. However, over the intervening years the evolution of the SME tools and suppliers, the semiconductor manufacturing industry and the world situation, has rendered them ill-defined, difficult to interpret, outdated, and possibly even candidates for elimination.

Briefly, the ISTAC 3B Working Group has considered four aspects of the regulations that need to be addressed:

> ***Approach:*** In some cases, the controls are absolute, i.e., a given type of SME is controlled irrespective of any consideration other than its intended function. In other cases, controls use functional characteristics of the tool as the control basis. Finally, in still other cases the controls utilize the evaluated characteristics of the tool's output.
>
> ***Purpose:*** From the perspective of industry, there exists uncertainty about the threats that the regulations are intended to address. The issues are never identified in any specific or detailed fashion, but rather exist as general aspects of "national security". While national security is undoubtedly an imperative, the lack of specificity of intent makes formulating well-crafted and targeted regulations difficult.
>
> ***Definitions:*** The entries which use output characteristics suffer from lack of detail in how said characteristics are to be evaluated. Specifically, detail is lacking about what is to be measured and, in some ECCNs, how it is to be measured. Statistical quantities are used without any information about how these are to be determined and on exactly what data they are to be based. Other uncertainties arise when qualifiers such as "designed or optimized" or "specially designed" are used since their meanings in this context are not defined. For example, "critical dimension" could be interpreted to mean the smallest feature on the device, but common semiconductor

industry usage of the term "critical dimension" is to denote a characteristic dimension of any given feature of interest.

Linkage: The origins of the values of the numbers used in the various regulations are unclear. Some, as in the case of "180 nm", appear to be related to design rules (or "technology nodes") in CMOS technology. The origins of others, such as the film thickness in 3B001.d.1, are less obvious. Also missing is the detailed relationship mapping these values onto the capabilities of the devices and then how these capabilities are then related to the control objectives.

Most of the development efforts in SME over the past decade have focused on improving productivity (e.g., process uniformity, repeatability, reproducibility, yield, cost of ownership, etc.) since capable technology for achieving the requirement somewhere on the substrate has generally not been the limiting issue. Commercial considerations, both for the SME manufacturer and the SME user, have driven this focus. Therefore, it must be noted that SME manufacturers' specifications for their tools' performance are established within the context of this commercial production: the tools can be developed and sold, the end users can produce and sell devices, and both enterprises can operate profitably. Moreover, this "commercial viability" is only one of several subjective aspects of semiconductor and SME production. SME tools in the regulations are largely non-deterministic in their output because the specific aspects of their output depend on the particular process being used, the details of the device integration scheme, the quality of the post-production inspections, the overall business model, and the capabilities of other SME within the manufacturing process flow. For example, shortcomings arising from one type of SME may be ameliorated by a different SME tool with the final output meeting specifications even though a given process step's output did not meet specifications.

This "variable capability" is a specific instance of the more general (and important) concept of SME as an instrument rather than a tool. Yo-Yo Ma can produce beautiful music from a cello: the non-musician can produce only noise. Jeremiah Clarke's "Trumpet Voluntary" is magnificent when played on a trumpet: its output will sound strange played on a sousaphone, yet each is a brass wind instrument, on which an accomplished musician plays the same piece of music. Both SME and musical instruments produce outputs that are strongly dependent on the skill of the operator, on the context of the application and on the evaluation criteria (often subjective) used to judge success. Regulations dealing with either must, therefore, be carefully and thoughtfully crafted with care taken not to treat them in the same fashion as tools whose output is deterministic, for example numerically-controlled machine tools, computers or various electronic devices.

Drafting new regulations for 3B001.a-i will be a large job, and it is for this reason that we ask your help. Specifically, we request your guidance on the policy objectives of the regulations because, for example, controls that are designed to limit production capability for military-only applications will differ greatly from those that target production capabilities from a purely economic standpoint.

In your tenure as Assistant Secretary, we have been gratified to observe your uncommonly high energy level as well as your commitment to addressing issues that have too long been

ignored. We hope that you will aid us in our effort to reexamine the 3B001.a-i controls, and we seek your consideration and guidance as how best to proceed. In the end, the aim of this effort is an outcome that well-serves both the security interests of the U. S. Government and the global business interests and demands of the SME industry and its customers.

Sincerely,

Jonathan Wise
Chair, ISTAC

cc: Aaron Amundson, ISTAC DFO
Brian Baker, BIS
Joel Cook, ISTAC Cat 3B Working Group
Jeff Rogers, ISTAC Cat 3B Working Group

SEMI Attachment Three: Foreign Availability for Category 3B001

Equipment Segment - Epitaxial Growth

Company	Location - Country	Website Address	Boilerplate from Company Website
ASM International	The Netherlands	www.asm.com	ASM offers a complete portifolio of 300mm tools across our product line, with Front-end technologies that provide solutions for device geometries down to 65 nanometers and below, and in both Front-end-of-Line (FEOL) transistor formation , and Back-end-of -Line (BEOL) interconnect technologies.
NuFlare Technology, Inc.	Japan	www.nuflare.co.jp/english	We have developed as a top semiconductor manufacturing equipment maker with and integrated approached extending from electron beam mask writer development, to production, sales, and servicing. We also supply thin film growth equipment that can support the growing sophistication of semiconductor devices and is based on a new concept that is able to achieve a perfect crystal format.
Hitachi Kokusai	Japan	www.h-kokusai.com	The operations of Kokusai Denki Logistics Co., Ltd. were divided into two parts. The transport operations concerning semiconductor manufacturing systems were integrated into Kokusai Electric Semiconductor Service Co., Ltd. Meanwhile, operations concerning communications and information systems and other enterprises were integrated into Kokusai Denki Techno Service Inc.
LPE	Italy	www.lpe-epi.com	LPE's production strategy concentrates on reactors dedicated to severe applications such as Schottky, Power Transistor, PowerMos, Rectifier, very thich epi layers for IGBT devices grown in a single process; NPN, patterned wafers and others on arsenic doped substrates, CMOS, Buried Layers on Sb doped substrates and Mixed Technology. Our reactors are capable of covering the whole range of products mentioned above, including large wafers.

Equipment Segment - Molecular Beam Epitaxy

Riber	Europe	www.riber.com	Founded in 1964, Riber is a French company that has started by supplying the Research Laboratories and Universities with ultrahigh vacuum (UHV) pumps and components. In 1976, Riber became a division of Instruments S.A., a Scientific Instrumentation Company. Its experience with ultrahigh vacuum enabled it to become rapidly the world leader in the industrial development of Molecular Beam Epitaxy (MBE), a crystal growth technique used for processing the base layers of semiconductor devices and brought to light in the seventies by several Physics Nobel prizes and Riber pioneer customers. In 1978, Riber began offering to the semiconductor research institutes the first turnkey MBE systems with guaranteed performance (MBE500 & MBE 1000 Series).
Oxford Instruments	Europe	www.oxford-instruments.com	The company is a world-wide business, supplying commercially successful, high-tech tools and systems into diverse markets which include industry, energy, the environment, health and research. Oxford Instruments has a global reputation for its technical skills and expertise, focusing its science and technology on providing the scientific and commercial communities with the right tools to support their work. This expertise includes the creation of low temperature and high magnetic field environments; X-ray, electron and optical based metrology; nuclear magnetic resonance, and advanced semiconductor processing technologies.
Omicron Nanotechnolgy	Germandy	www.omicron.de	Nanotechnology has been our everyday business since long before the term ever existed. Founded in 1984 by Norbert Nold, Omicron started business by introducing the SPECTALEED and the legendary Ultra High Vacuum STM 1 as their first and highly successful products. The STM 1, which still delivers state-of-the-art performance even by today's standards in nearly 200 laboratories worldwide, firmly established Omicron's present position as the world market leader in UHV scanning probe microscopy. Today, our products like, for example, the new NanoESCA or the UHV Gemini Column are right at the forefront of research. We are used to redefining the limits of the technically feasible again and again. More than 500 articles demonstrate this to the full. Many of them were published in leading journals such as Nature, Science, Physical Review Letters or Chemical Review Letters.

DCA Instruments	Finland	www.dca.fi	DCA Instruments is a company specializing in the design and manufacture of Molecular Beam Epitaxy (MBE) and UHV thin film deposition systems and components. DCA is a Finnish company located in Turku, in the southwest corner of Finland. Since the company was founded in 1989, DCA has installed more than 100 UHV systems around the world.
Eiko	Japan	www.1974eiko.co.jp	Making full use of our cultivated ultra vacuum technologies, EIKO group has satisfied a various of customers' requirements including the development of technologies for eco-friendly product, semi-conductor related These days, we have been delivered experimental equipments which comply with customers' request in the fields of ultra vacuum evaporation and plasma CVD equipments for solar photovoltaic generating panel, sputter and electron beam equipments for nonvolatile memory highlighted as next generation memory, and other equipments for OLED and flat panel
Dr. Eberl MBE-Komponenten	Germany	www.mbe-components.com	Dr. Eberl MBE-Komponenten has been manufacturing thin film deposition equipment for MBE, surface science and other UHV-applications since 1989. The product range comprises, amongst others, effusion cells, electron beam evaporators, sublimation sources, gas sources and various customized equipment. Overall MBE-Komponenten GmbH has delivered MBE systems, components and services to more than 300 customers worldwide. History: Dr. Karl Eberl founded the MBE-Komponenten GmbH in 1989 as a spin-off from the Technische Universität München, Walter-Schottky-Institute, Garching. First products were Silicon Sublimation Sources, Carbon Sublimation Sources and High Temperature Sources for Molecular Beam Epitaxy.

Equipment Segment - MOCVD

Aixtron	Europe	www.aixtron.com	AIXTRON SE is a leading provider of deposition equipment to the semiconductor industry. The Company's technology solutions are used by a diverse range of customers worldwide to build advanced components for electronic and opto-electronic applications based on compound, silicon, or organic semiconductor materials and more recently carbon nanostructures. Such components are used in display technology, signal and lighting technology, fiber communication networks, wireless and cell telephony applications, optical and electronic data storage, computer technology as well as a wide range of other high-tech applications.
Jusung Engineering	Korea	www.jseng.com	As a professional front-end semiconductor equipment manufacturing company, JUSUNG developed EUREKA, a Low Pressure Chemical Vapor Deposition (LP CVD) procedure. JUSUNG has earned high recognition for its technologies and product quality from the world's premier semiconductor makers. Full-scale exports began in 1997 and JUSUNG now supplies products for the mass production lines of domestic and foreign semiconductor makers. JUSUNG has also developed and started marketing ALD, LP CVD, MO CVD, PE CVD, UHV CVD and ETCH system, which are used during the front-end semiconductor manufacturing process. JUSUNG's products are responsible for up to 20% of the semiconductor's front-end manufacturing processes.
Taiyo Nippon Sanso	Japan	http://www.tn-sanso.co.jp/en	One of our main achievements has been in the growth market of electronics (which includes semiconductors, liquid-crystal displays, solar cells, and LEDs): the construction of an integrated gas supply system for new, large-size liquid-crystal display complexes. In addition, in the LED market (which has exhibited remarkable growth) we have worked to expand our business by investing in large-scale production machinery for compound semiconductor manufacturing (MOCVD: Metal Organic Chemical Vapor Deposition) equipment, in tandem with the development of gas supply and the required peripheral devices. Finally, we have rapidly launched upstream manufacturing projects for special gases and monosilane (a phenomenal increase in demand for these is anticipated for use in thin-film solar cells and liquid-crystal displays), and have laid the foundations for business expansion.

Institute of Microelectronics of Chinese Academy of Sciences	China	http://kw305.51.net/	

Qingdao Jingcheng-Huaqi Microelectronic Equipment Co., Ltd.	China	http://www.jcmee.com/#	

Qingdao Jason Electric Co. Ltd.	China	http://www.qdjason.com/	

Equipment Segment - Sputtering/PVD

Company	Location - Country	Website Address	Boilerplate from Company Website
Canon Anelva	Japan	www.canon-anelva.co.jp/en	Canon ANELVA Corporation manufactures major equipment for the fabrication of semiconductors and LCDs using vacuum technology. ANELVA stands for a ANalysis ELectronics VAcuum. The name represents our basic corporate ideal: combining analytical techology and vacuum technology by electronic and developing advanced vacuum and thin-film technologies with an eye toward the future. We provide products achieved by applying vacuum technology, such as manufacturing equipments for storage devices, semiconductors, liquid crystal display (LCD), and plasma display panels (PDP), small-size manufacturing equipmes for laboratory use, and those for medium-scale production.

Ulvac	Japan	www.ulvac.com	Founded in Japan in 1952, ULVAC is an international corporation that designs, manufacturers and markets equipment and materials for industrial applications of vacuum technology. Today, ULVAC is a leading global supplier of production systems, instrumentation, pumps and vacuum components used in the semiconductor, flat panel display, disk/magnetic media, and industrial manufacturing markets. The corporation is comprised of some 36 individual companies engaged in all sectors of the vacuum industry. The ULVAC name is derived from the company's conceptual foundation - "The ULtimate in VACuum Technology".
Oerlikon (Unaxis)	Switzerland	www.oerlikon.com	Oerlikon is a globally leading company in the field of thin film, vacuum and precision technology. Based on these core competencies, Oerlikon develops production systems, components, and services for high-technology products. The company's commercial activities center on protective coatings for precision tools and components, production equipment and coating processes for solar modules, as well as production systems for data storage devices (Oerlikon Balzers Coating), systems for producing vacuums and conveying process gases (Oerlikon Leybold Vacuum), optical components, aerospace technology and outsourcing (Oerlikon Components). Oerlikon also applies its core competencies as a major provider of semiconductor technology (Oerlikon ESEC Semiconductor).
Equipment Segment - Ion Implant			
Company	**Location - Country**	**Website Address**	**Boilerplate from Company Website**
Sumitomo Eaton Nova - changed its name to **SEN Corporation**, an SHI and Axcelis Company effective April 1, 2006.	Japan	www.senova.co.jp/english	As the leading manufacture of ion implantation systems for semiconductor industry in Japan, SEN provides high-current, medium-current, and hi-energy ion implantation systems for the production of the latest semiconductor devices, including those for 300mm wafers. We also provide ion implantation systems most suitable for the production of low-temperature polysilicon TFT-LCDs and organic EL displays, whose high performance is attracting attention for use in the production of high performance flat panel displays.

Nissin Electric	Japan	www.nissin.co.jp	With an original foundation and free use of the state-of-the-art technology, fostered by high voltage technology. Nissin Electric moving forward in expanding these dreams in various directions. Some our most noteworthy products and achievements include Information Telecommunication technology, Photovoltaic System, Electron Beam Processing Equipment and Ion Implanter. Making dreams come true - Nissin Electric continues the challenge and pursuit of progressive ideas and original themes.
Beijing Zhongkexin Electronics Equipment Co., Ltd	China	http://www.zhongkexin.com.cn/	By strong support of Ministry of Science and Technology of the People's Republic of China, the People's Government of Beijing Municipality and China Electronics Technology Group Corporation, Beijing Zhongkexin Electronics Equipment Co. Ltd. is built as a high-tech enterprise and a holding company owned by 48th Research Institute of CETC. It is located in Opto-mechatronics Industrial Base, Tongzhou Park, Zhongguancun Science Park of Beijing. The company covers 117 acres of land and owns more than 200 technical staffs, including 12 research professors, 60 senior engineers. The fields are covered by microelectronics, physics, optical, mechanical, electrical and others. It is mainly specialized in R&D and manufacture of IC key equipment and test products such as ion implanter and rapid thermal process system, R&D and production of photovoltaic products such as silicon solar cells and PV modules. It also provides technical service of various ion implantation equipment such as maintenance, repair, renovation and providing the related spare parts.

Advanced Ion Beam Tech	Taiwan	http://www.aibt-inc.com/	Founded in 1999 and located in Silicon Valley, Advanced Ion Beam Technology, Inc. (AIBT) is a high-tech company engaged in the research, development, and manufacture of ion implant systems for the semiconductor industry. AIBT is dedicated to the research and development of leading edge ion implantation technology. We partner with the world's leading semiconductor manufacturers to develop the most advanced doping processes, and challenge our products to meet the most stringent technical requirements for future CMOS devices. AIBT has a strong intellectual property portfolio that covers innovative ion beam generation, transport, and implant process control in ion implant technology. Hermes-Epitek, leader in sales and services of semiconductor equipment in Taiwan and Singapore, provides strong world-wide sales and services support for our products. Together with Hermes-Epikek and TEL, Hermes-Epitek's long time partner, our sales and service support is committed to total customer satisfaction around the globe.
Ulvac	Japan	www.ulvac.co.jp/eng	Development, manufacture, sales, customer support and machinery importing/exporting activities related to vacuum equipment, peripheral devices and vacuum components for the display, semiconductor, electronics, electrics, metals, machinery, automotive, chemical, food and pharmaceutical industries, and for universities and research centers. Research guidance and technical consulting on all aspects of vacuum technology.

Equipment Segment - Etch

Company	Location - Country	Website Address	Boilerplate from Company Website
TEL	Japan	www.tel.com/eng	TEL's largest product line, semiconductor equipment, includes coater/developers, dry etchers, thermal processing systems, single wafer deposition systems, surface preparation systems, test systems, and metrology software. TEL also offers a leading edge line-up of Flat Panel Display (FPD) production equipment. The company's FPD coater/developers and etcher/ashers realize superior cost performance, thereby meeting the demands for large-scale FPD mass production lines. TEL maintains the leading market share positions for both FPD coater/developers and plasma etcher/ashers.
Charm Engineering	Korea	www.charmnci.com	Founded in 1973
Oerlikon (Unaxis)	Switzerland	www.oerlikon.com	Oerlikon is a globally leading company in the field of thin film, vacuum and precision technology. Based on these core competencies, Oerlikon develops production systems, components, and services for high-technology products. The company's commercial activities center on protective coatings for precision tools and components, production equipment and coating processes for solar modules, as well as production systems for data storage devices (Oerlikon Balzers Coating), systems for producing vacuums and conveying process gases (Oerlikon Leybold Vacuum), optical components, aerospace technology and outsourcing (Oerlikon Components). Oerlikon also applies its core competencies as a major provider of semiconductor technology (Oerlikon ESEC Semiconductor).
PSK Tech	Korea	www.psk-inc.com	PSK Tech Inc. provides a total solution of the advanced automated wafer fabrication systems for photo resist and residue removal. These systems are heavily used currently for Memory / Logic mass production in order to achieve the lowest overall cost.

Beijing NMC Co., Ltd (North Microelectronics)	China	http://www.bj-nmc.cn/	Northern Micro with the hardware environment and world-class management, protection of the advanced nature of its products and services, reliability and security. Company to establish a semiconductor and solar equipment assembly plant and a variety of clean technology R & D laboratories. Under construction in Beijing Economic and Technological Development Zone is located in the new R & D base, the field of semiconductor microelectronics for the North to the field of solar energy and LED to provide strong support for the overall expansion. North microelectronic products include semiconductor manufacturing NMC508B 8 inch plasma etching machine, NMC612A 12-inch plasma etching machine, solar cell manufacturing ESSIND ™ PECVD silicon solar flat plate and the LED manufacturing ELEDE ™ plasma etching equipment.
SEMES	Korea	www.semes.co.kr	SEMES (formerly DNS KOREA CO., LTD) is one of the world's leading manufacturers of process equipment in the field of semiconductor and flat panel display industry. Company's sales volume is top position of the semiconductor equipment market in Korea for recent 2 years. We are the leading company. DNS KOREA has been manufacturing the crucial equipment, such as Spin Coater, Developer, Spin Scrubber, Spin Etcher, Wet station as well as STN Full-Line (Pre-process) Equipment. We assure that our product will also be the best equipment in the next 300mm generation.
AMEC	China	www.amec-inc.com	Designs, manufactures, markets and services semiconductor processing equipment used in the fabrication of ICs. Advanced Micro-Fabrication Equipment Inc. (AMEC) is an emerging Asia-based semiconductor equipment company with a portfolio of wafer fabrication solutions designed to advance technology, increase productivity and reduce manufacturing costs for leading global semiconductor manufacturers. AMEC's solutions combine innovative technology solutions with economic innovations for the 65/45-nm nodes and beyond. AMEC's global infrastructure will include R&D, manufacturing, business and support operations in China, Japan, Korea, Singapore, Taiwan, and the U.S.

Hitachi High Technologies	Japan	www.hitachi-hitec.com	Our specialization, nanotechnology, is slated to be the leading technology of the 21st century, and promises to become the focus of ever increasing interest. In pursuit of our goal of becoming the global leading company in the field of nanotechnology, we are developing our business across a variety of segments, including Electronic Device Systems, Life Science, Information Systems & Electronic Components, and Advanced Industrial Products. We are working to achieve our goal by providing customers with added value based on the most advanced technologies in these fields.
Ulvac	Japan	www.ulvac.co.jp/eng	Development, manufacture, sales, customer support and machinery importing/exporting activities related to vacuum equipment, peripheral devices and vacuum components for the display, semiconductor, electronics, electrics, metals, machinery, automotive, chemical, food and pharmaceutical industries, and for universities and research centers. Research guidance and technical consulting on all aspects of vacuum technology.
FOI Corporation	Japan	www.foi.co.jp/English	FOI Corporation excels in application of oplasma technology. We are aggressive in the development, manufacturing, and sales/servicve of etching equipment for oxide film for 300mm/200mm silicon wafers, and ashing equipment for 200mm/300mm silicon wafers, and other related equipments.
Shibaura Mechatronics	Japan	www.shibaura.co.jp/e	As The Provider of Infrastructure for The Digital Age, Shibaura Mechatronics contributes to society by providing manufacturing equipment for electronic components, such as FPDs, semiconductors and optical discs.
Samco	Japan	www.samcointl.com	SAMCO, Inc. is a process equipment company that develops and manufactures a wide variety of unique deposition, etching, and surface treatment systems for a worldwide network of major industrial customers and academic facilities. We provide process expertise and turnkey systems to major manufacturers in the compound semiconductor, optoelectronics, MEMS and other industries

Panasonic Factory Solutions	Japan	panasonic.co.jp/pfsc	Panasonic Factory Solutions Co., Ltd. is dedicated to innovating the manufacturing process around the core of circuit manufacturing technologies and contributing to the growth and prosperity of our customers' business. We aim to further advance the circuit manufacturing technologies we have built up to date, to come up with groundbreaking processes and to put together production systems that will coexist with the

Equipment Segment - CVD

Company	Location - Country	Website Address	Boilerplate from Company Website
TEL	Japan	www.tel.com/eng	TEL's largest product line, semiconductor equipment, includes coater/developers, dry etchers, thermal processing systems, single wafer deposition systems, surface preparation systems, test systems, and metrology software. TEL also offers a leading edge line-up of Flat Panel Display (FPD) production equipment. The company's FPD coater/developers and etcher/ashers realize superior cost performance, thereby meeting the demands for large-scale FPD mass production lines. TEL maintains the leading market share positions for both FPD coater/developers and plasma etcher/ashers.
Oerlikon (Unaxis)	Switzerland	www.oerlikon.com	Oerlikon is a globally leading company in the field of thin film, vacuum and precision technology. Based on these core competencies, Oerlikon develops production systems, components, and services for high-technology products. The company's commercial activities center on protective coatings for precision tools and components, production equipment and coating processes for solar modules, as well as production systems for data storage devices (Oerlikon Balzers Coating), systems for producing vacuums and conveying process gases (Oerlikon Leybold Vacuum), optical components, aerospace technology and outsourcing (Oerlikon Components). Oerlikon also applies its core competencies as a major provider of semiconductor technology (Oerlikon ESEC Semiconductor).

Piotech (Shenyang) Co., L	China	http://en.sypiotech.cn/newEbiz1	Piotech (Shenyang) Co., Ltd., formerly known as Shenyang Keyi PECVD Business Division of the Chinese Academy of Sciences, was founded to meet the development of key project of the National 11th Five-year Plan. The company, located at Central Bohai Gulf economic circles, based on Shenyang — China's equipment manufacturing centre and relying on the Chinese Academy of Sciences, has advanced technology, international business concept and an elitist team. The company boasts a cutting-edge high-technology team consisted of a dozen of top experts leading the development of the world's most advanced production equipment and technologies for semiconductor film, graduate students in China's prestigious universities and elites of Chinese Academy of Sciences. We are devoted to the development and production of world advanced 12-inch plasma chemical vapor deposition equipment and determined to become the leader of offering technical solutions for the production of 90-22nm plasma chemical vapor deposition in large integrated circuit industry
Atto (IPS and Atto merged in 2009)	Korea	www.atto.co.kr	IPS-Manufacture, retrofit and sales of equipment for manufactuing semiconductors, LCDs or solar cells. Import and sales of parts required to manufacture semiconductors, LCDs or solar cells. Post management and service provision consequent on sales of semiconductors, LCDs or solar cells and research and development services related to the equiment mentioned above.
AMEC	China	www.amec-inc.com	Designs, manufactures, markets and services semiconductor processing equipment used in the fabrication of ICs. Advanced Micro-Fabrication Equipment Inc. (AMEC) is an emerging Asia-based semiconductor equipment company with a portfolio of wafer fabrication solutions designed to advance technology, increase productivity and reduce manufacturing costs for leading global semiconductor manufacturers. AMEC's solutions combine innovative technology solutions with economic innovations for the 65/45-nm nodes and beyond. AMEC's global infrastructure will include R&D, manufacturing, business and support operations in China, Japan, Korea, Singapore, Taiwan, and the U.S.

Hitachi Kokusai	Japan	www.h-kokusai.com	The operations of Kokusai Denki Logistics Co., Ltd. were divided into two parts. The transport operations concerning semiconductor manufacturing systems were integrated into Kokusai Electric Semiconductor Service Co., Ltd. Meanwhile, operations concerning communications and information systems and other enterprises were integrated into Kokusai Denki Techno Service Inc.
Aixtron	Germany	www.aixtron.com	AIXTRON AG is a leading provider of deposition equipment to the semiconductor industry. The Company's technology solutions are used by a diverse range of customers worldwide to build advanced components for electronic and opto-electronic applications based on compound, silicon, or organic semiconductor materials. Such components are used in fiber optic communication systems, wireless and mobile telephony applications, optical and electronic storage devices, computing, signaling and lighting, as well as a range of other leading-edge technologies.
Jusung	Korea	www.jseng.com	As a professional front-end semiconductor equipment manufacturing company, JUSUNG developed EUREKA, a Low Pressure Chemical Vapor Deposition (LP CVD) procedure. JUSUNG has earned high recognition for its technologies and product quality from the world's premier semiconductor makers. Full-scale exports began in 1997 and JUSUNG now supplies products for the mass production lines of domestic and foreign semiconductor makers. JUSUNG has also developed and started marketing ALD, LP CVD, MO CVD, PE CVD, UHV CVD and ETCH system, which are used during the front-end semiconductor manufacturing process. JUSUNG's products are responsible for up to 20% of the semiconductor's front-end manufacturing processes.

SEMES	Korea	www.semes.co.kr	SEMES (formerly DNS KOREA CO., LTD) is one of the world's leading manufacturers of process equipment in the field of semiconductor and flat panel display industry. Company's sales volume is top position of the semiconductor equipment market in Korea for recent 2 years. We are the leading company. DNS KOREA has been manufacturing the crucial equipment, such as Spin Coater, Developer, Spin Scrubber, Spin Etcher, Wet station as well as STN Full-Line (Pre-process) Equipment. We assure that our product will also be the best equipment in the next 300mm generation.
Koyo Thermo Systems	Japan	www.koyo-thermos.com/globa	Koyo Thermo Systems wants to contribute to the development of many fields--steel, machinery, automobiles, aircraft, electronics, new materials, and the telecommunications industry--through the application of highly controlled heat technology. Heat technology, the main field of Koyo Thermo Systems, is essential for the production of the semiconductors and display devices that make our telecommunications-based society possible.
Samco	Japan	www.samcointl.com	SAMCO, Inc. is a process equipment company that develops and manufactures a wide variety of unique deposition, etching, and surface treatment systems for a worldwide network of major industrial customers and academic facilities. We provide process expertise and turnkey systems to major manufacturers in the compound semiconductor, optoelectronics, MEMS and other industries

Equipment Segment - E-beam for mask making

Company	Location - Country	Website Address	Boilerplate from Company Website

Advantest	Japan	www.advantest.co.jp	As the miniaturization of IC devices continues, electron beam exposure technology is gaining prominence as a useful technology for next-generation design rules. Advantest is offering the F3000 EB lithography system that uses E-Beam direct-write technology not only as a design tool for research and development, but also as a tool suitable for system LSIs production lines where mostly small-lot-multiple-type products are produced. To help reduce your development costs and shorten development periods, please give serious consideration to Advantest's E-Beam Solution.
JEOL	Japan	www.joel.com	JEOL is a leading global supplier of scientific instruments used for research and development in the fields of nanotechnology, life sciences, optical communication, forensics, and biotechnology. Utilizing its unique technologies, products, services, and knowledge, JEOL helps its customers make significant breakthroughs in product development and scientific research. JEOL products include scientific instrumentation and industrial equipment, based on five major product groups.
Vistec	Germany	www.vistec-semi.com	The Vistec SB351 system has been developed for the 90nm node and features the 65nm R&D capability node. Thanks to its modular system architecture the SB351 Variable Shaped Beam system is used for both mask making (incl. nanoimprint) and direct write. Fully automatic substrate handling and network-supported operation software allow production, prototyping and R&D work. Further highlights of the Vistec SB351 are the full 300mm wafer exposure capability and the fast data preparation software including Proximity Effect Correction. The high-precision stage features a travel range of 310mm x 310mm, which allows complete exposure of 300mm wafers for direct write applications. The Vistec SB351 is fully compatible with SEMI standard mask sizes up to 9 inches and wafer sizes up to 300mm. The proven combination of the "write-on-the-fly" writing mode and the Flexible Stage Speed (FSS) principle increases throughput - an essential parameter for commercial applications such as mask making and Electron Beam Direct Write.

Hitachi High Technologies	Japan	www.hitachi-hitec.com	Our specialization, nanotechnology, is slated to be the leading technology of the 21st century, and promises to become the focus of ever increasing interest. In pursuit of our goal of becoming the global leading company in the field of nanotechnology, we are developing our business across a variety of segments, including Electronic Device Systems, Life Science, Information Systems & Electronic Components, and Advanced Industrial Products. We are working to achieve our goal by providing customers with added value based on the most advanced technologies in these fields.
Marketech International C	Taiwan	http://www.micb2b.com/E_h	MIC is providing Fab/Plant design; construction management, facility turnkey and supplying advanced high-tech equipment and material business to IC/FPD/Opto-electric/MEMS. We also accept customized too project and OEM for Tool-maker.

Equipment Segment - Surface finishing/wafer thinning (backside)

Company	Location - Country	Website Address	Boilerplate from Company Website
Disco	Japan	www.disco.co.jp	Manufacture and sale of precision cutting, grinding and polishing machines
Logitech Ltd.	UK	www.logitech.uk.com	Logitech Ltd was founded in 1965 as a spin-off from research work being carried out at the University of Glasgow, Scotland, into advanced semiconductor materials processing. Our origins have always influenced the way the company has developed, and growth has been achieved over the years by becoming expert in a number of diverse, but related materials processing areas.
Okamoto	Japan	www.okamoto-sed.com	Okamoto is a leading manufacturer of precision grinding and polishing tools since 1935. Grinding tools used in applications of wafer manufacturing, SOI, TSV, MEMS, thin wafers down to 25 um, bonded wafers, bumped wafers, solar ingot grinding, quartz, sapphire, GaAs, InP and more. Polishing tools used with CMP technology for high throughput and high accuracy. All tools available up to 300mm. For thin wafer applications, grind/polish systems can be integrated with a mounter, DAF, and detaper equipment as a complete in-line system. Okamoto is ISO9002 certified.
Tokyo Ohka Kogyo	Japan	www.tok.co.jp	Our current businesses are comprised of a materials business with electronic industry materials (such as photoresist, chemical products and specialty chemicals, as our core products), as well as printing materials, and an equipment business (with semiconductor manufacturing equipment and LCD-panel manufacturing equipment as our core products). We have placed special emphasis on the cutting-edge electronics field, relative to semiconductor, flat panel display and package mounting materials, as a crucial direction that will see advancements by leaps and bounds in the 21st century. Therefore, we shall be committing our corporate resources to business developments like these in global markets.

Accretech	Japan	www.accretech.jp	ACCRETECH-TOKYO SEIMITSU's next-generation semiconductor manufacturing equipment supports the device production. We go through even the fields of CMP equipment and wafer inspection equipment, as well as the conventional fields of wafer manufacturing, test area and assembly, helping you to build the optimum manufacturing system. Production and measurement: two inextricably linked elements. Accurate measurement is a prerequisite for creation. The field of measuring is expanding rapidly in terms of precision, accuracy, speed and stability. Beginning with industrial, optical parts and production line measuring instruments, ACCRETECH-TOKYO SEIMITSU provides a wide range of equipment to meet the needs of the modern world.
SEMES	Korea	www.semes.co.kr	We are now developing and producing equipment that advances the digitalization of printing processes in the printing field and world-leading high-tech industrial equipment such as manufacturing equipment for semiconductors, FPDs (flat panel displays), and printed circuit boards in the electronics field. It is our desire to contribute to the development of society with a view to the coming era of ubiquitous connectivity.

Equipment Segment - Laser mask repair

Company	Location - Country	Website Address	Boilerplate from Company Website
Carl Zeiss	Germany	www.smt.zeiss.com	Carl Zeiss SMT AG provides a broad range of products and solutions that support the global chip industry. Key products are lithography optics for wafer steppers/scanners from ASML.Our product range additionally comprises optical components and subsystems for lithography lasers from Cymer as well as Synchroton Optics. Furthermore, SMT offers unique mask review and e-beam based mask repair systems.
SII Nano Technology Inc.	Japan	www.sii.co.jp	As a specialist in precision measurement technology that originated in watch making, we have focused on the potential of nanotechnology since its infancy. By refining our unique high-precision technologies that were nurtured through the development of watches, we have created many analysis and measurement instruments that were the world's first when they appeared. Our craftsmanship DNA allows us to keep pace with the flow of the constantly changing times.

Equipment Segment - Mask substrates (not equipment)

Company	Location - Country	Website Address	Boilerplate from Company Website
Toppan	Japan	www.photomask.com	Toppan Photomasks, Inc. is a wholly owned subsidiary of Toppan Printing Co., Ltd., a diversified global company with revenue in excess of $13 billion in fiscal 2007. Together with the photomasks business of Toppan Printing, the company forms the world's premier photomask provider. Utilizing operations within the industry's most advanced and largest network of manufacturing facilities, Toppan Photomasks offers a comprehensive range of photomask technologies and research and development capabilities to meet the increasingly sophisticated and divergent product-and-service requirements of the global semiconductor industry.
Dai Nippon	Korea	www.screen.co.jp	We are now developing and producing equipment that advances the digitalization of printing processes in the printing field and world-leading high-tech industrial equipment such as manufacturing equipment for semiconductors, FPDs (flat panel displays), and printed circuit boards in the electronics field. It is our desire to contribute to the development of society with a view to the coming era of ubiquitous connectivity.
Hoya	Japan	www.hoya.co.jp/english	The information technology field is Hoya's core business. Products in this category include mask blanks and photomasks, which are essential to the fabrication of semiconductor devices; optical glass for use in devices such as liquid crystal displays and digital cameras; and glass disks for hard disk drives.
Taiwan Mask Company	Taiwan	www.corporateinformation.com	Taiwan Mask Corporation. The Company's principal activities are the design, development, manufacture and distribution of mask and optical lens for the semiconductor industry. Other activities are the provision of technical support, consultation, testing and repair services.

TSMC	Taiwan	http://www.tsmc.com/englisl	TSMC created the semiconductor Dedicated IC Foundry business model when it was founded in 1987. Service is what differentiates TSMC from just another fab. Our people, services, and commitment to surpassing our customer's expectations have defined what a foundry company should be. **(NOTE: TSMC's mask shop is primarily used for 'captive' mask making but they are quitely selling into the merchant market)**

Equipment Segment - Lithography

Company	Location - Country	Website Address	Boilerplate from Company Website
ASML	The Netherlands	www.asml.com	ASML researches, develops, designs, manufactures, markets and services lithography systems used by the semiconductor industry to fabricate state-of-the-art chips. Most of the major global semiconductor manufactures are ASML customers. For chipmakers, technological advancement in imaging means increased manufacturing productivity and improved profitability.
Nikon	Japan	www.nikon.com	Nikon is involved in a broad spectrum of businesses centering on the core business segments of precision equipment, imaging products and instruments. We focus our energies on developing proposal-based products that build on Nikon's unique strengths and capitalize on our proprietary technologies. These technologies, maximized through Nikon's singular vision, have already resulted in a long list of innovations, ranging from IC scanners that utilize immersion lithography technology to LCD steppers and scanners which feature our
Shanghai Micro Electronics Equipment CO., LTD.	China	http://www.smee.com.cn/china/	**Shanghai Microelectronics Equipment Co., Ltd.** was established in 2002, the company is committed to large-scale industrial production, projection lithography research and development, production, sales and services,The products can be widely used in IC manufacturing and advanced packaging, MEMS, TSV/3D, TFT-OLED and other manufacturing fields.
Elionix	Japan	www.elionix.co.jp	
Canon	Japan	www.canon.com	Canon is pursuing development near-field mask lithography technology, with the aim of applying it to next-generation exposure equipment for processing to resolutions of several dozen nanometers without the need for large-scale equipment. Canon also foresees that the development of near-field optical technologies will lead to new applications in optical memory and micro-optical devices.

Gigaphoton	Japan	www.gigaphoton.com	Gigaphoton Inc. was founded in 2000 as a joint venture of "Komatsu Ltd.," the world's No. 2 construction machinery manufacturer, and "Ushio Inc.," the world's No.1 lithography lamp manufacturer. Since then, by leveraging the synergy of these two companies, we at Gigaphoton have been developing and marketing user-friendly, highly innovative laser light sources, and delivering them to major lithography tool suppliers in the global semiconductor industry.

Equipment Segment - Resist Track

Company	Location - Country	Website Address	Boilerplate from Company Website
TEL	Japan	www.tel.com/eng	TEL's largest product line, semiconductor equipment, includes coater/developers, dry etchers, thermal processing systems, single wafer deposition systems, surface preparation systems, test systems, and metrology software. TEL also offers a leading edge line-up of Flat Panel Display (FPD) production equipment. The company's FPD coater/developers and etcher/ashers realize superior cost performance, thereby meeting the demands for large-scale FPD mass production lines. TEL maintains the leading market share positions for both FPD coater/developers and plasma etcher/ashers.
PSK Tech	Korea	www.psk-inc.com	PSK Tech Inc. provides a total solution of the advanced automated wafer fabrication systems for photo resist and residue removal. These systems are heavily used currently for Memory / Logic mass production in order to achieve the lowest overall cost.
Suss Micro	Germany	www.suss.com	SUSS MicroTec is a world leading supplier of precision technology providing innovative solutions for markets including Advanced Packaging, MEMS, Nanotechnology, Compound Semiconductor, Silicon-On-Insulator, and 3D Interconnect. SUSS MicroTec manufactures a complete line of photoresist and dielectric coat/bake/develop systems, microlithography exposure systems, wafer and device bonders, probers, photomasks,cleaners and etchers.

SEMES	Korea	www.semes.co.kr	SEMES (formerly DNS KOREA CO., LTD) is one of the world's leading manufacturers of process equipment in the field of semiconductor and flat panel display industry. Company's sales volume is top position of the semiconductor equipment market in Korea for recent 2 years. We are the leading company. DNS KOREA has been manufacturing the crucial equipment, such as Spin Coater, Developer, Spin Scrubber, Spin Etcher, Wet station as well as STN Full-Line (Pre-process) Equipment. We assure that our product will also be the best equipment in the next 300mm generation.

Equipment Segment - Mask Making

Company	Location - Country	Website Address	Boilerplate from Company Website
Micronic	Sweden	www.micronic.se/site_eng	Micronic manufactures systems that are used in the production of advanced photomasks for flat panel displays (the LRS product series), semiconductor applications (the Sigma and Omega product series), and electronic packaging (the MP and FPS product series). The product offering also includes metrology systems for display photomasks (the MMS product series). Micronic has secured its forefront position by offering products that combine high resolution, or the ability to write the smallest photomask features, and high throughput thanks to short write times
NuFlare Technology, Inc.	Japan	www.nuflare.co.jp/english	We have developed as a top semiconductor manufacturing equipment maker with and integrated approached extending from electron beam mask writer development, to production, sales, and servicing. We also supply thin film growth equipment that can support the growing sophistication of semiconductor devices and is based on a new concept that is able to achieve a perfect crystal format.

Hitachi High Technologies	Japan	www.hitachi-hitec.com	Our specialization, nanotechnology, is slated to be the leading technology of the 21st century, and promises to become the focus of ever increasing interest. In pursuit of our goal of becoming the global leading company in the field of nanotechnology, we are developing our business across a variety of segments, including Electronic Device Systems, Life Science, Information Systems & Electronic Components, and Advanced Industrial Products. We are working to achieve our goal by providing customers with added value based on the most advanced technologies in these fields.
JEOL	Japan	www.joel.com	JEOL is a leading global supplier of scientific instruments used for research and development in the fields of nanotechnology, life sciences, optical communication, forensics, and biotechnology. Utilizing its unique technologies, products, services, and knowledge, JEOL helps its customers make significant breakthroughs in product development and scientific research. JEOL products include scientific instrumentation and industrial equipment, based on five major product groups.

Equipment Segment - CMP

Company	Location - Country	Website Address	Boilerplate from Company Website
Ebara	Japan	www.ebara.co.jp	Ebara Corporation is one of the world's principal manufacturers of fluid transfer machinery, with particularly strong positions in pumps, compressors, fans, and chillers. The Company is also a prominent contractor of environmental engineering systems, focusing on the realization of the "sustainable society." Ebara is a leading supplier of precision machinery to the semiconductor device manufacturing industry. Key products in this sector include chemical mechanical polishing systems, dry vacuum pumps, and other equipment, such as wafer plating systems, that assist the industry in meeting the demands of manufacturing the next generation of semiconductor devices. Ebara is actively engaged in developing and commercializing new energy technologies, including wind power generators, fuel cell cogeneration systems, and photovoltaic power generators.

ACM Research (Shanghai), Inc.	China	http://www.acmrcsh.com/	ACM Research, Inc. was founded in 1998 in Silicon Valley, USA focusing on stress-free copper polishing (Ultra SFP™) and copper plating (Ultra ECP™). In September 2006, ACM shifted its focus to Asia,forming the ACM Shanghai subsidiary, a joint venture with Shanghai Venture. The company is located in Shanghai's Zhangjiang High Tech Park, where it conducts research and development, engineering, manufacturing, marketing, sales and service activities. ACM specializes in wet process equipment including copper stress free polishing (SFP), copper plating (ECP), and single-wafer megasonic cleaning tools. ACM has a strong IP portfolio with over 100 patents filed internationally, and over 60 already granted.
G&P Technology	Korea	www.gnptech.com	Founded in 1999, G&P Technology, as the name Grinding & Polishing implies, has dedicated its resources and efforts to providing Universities, R&D Organizations, & MEMS companies with precise and affordable CMP (Chemical Mechanical Polishing) systems and services. The company was established through a university venture under the leadership of Prof. H.D. Jeong of Pusan University of Korea who leads CMP research and development in Korea.
Accretech	Japan	www.accretech.jp	ACCRETECH-TOKYO SEIMITSU's next-generation semiconductor manufacturing equipment supports the device production. We go through even the fields of CMP equipment and wafer inspection equipment, as well as the conventional fields of wafer manufacturing, test area and assembly, helping you to build the optimum manufacturing system.

Equipment Segment - Cluster Tooling/Wafer Handling Systems

Tri-Joint Engineering	Taiwan	http://www.tjel.com/	Note: Website in Japanese only.
RECIF	Europe	www.reciftech.com	Recif Technologies designs, manufactures, distributes and maintains robotic handling equipment for highly sensitive environments dedicated to the semiconductor industry.
JEL	Japan	www.jel-robot.co.jp/	JEL is manufacturer of clean robots for handling wafers or FPD substrates

Rorze	Japan	www.rorze.com/	Rorze is the manufacturer of transferring systems and robots for semiconductor wafers and flat panel glass substrates.

Equipment Segment - Process Control

Company	Location - Country	Website Address	Boilerplate from Company Website
Hitachi Kokusai	Japan	www.h-kokusai.com	The operations of Kokusai Denki Logistics Co., Ltd. were divided into two parts. The transport operations concerning semiconductor manufacturing systems were integrated into Kokusai Electric Semiconductor Service Co., Ltd. Meanwhile, operations concerning communications and information systems and other enterprises were integrated into Kokusai Denki Techno Service Inc.

Equipment Segment - Die Bonders

Company	Location - Country	Website Address	Boilerplate from Company Website
BE Semiconductor/Datacon	The Netherlands	www.besi.nl	BE Semiconductor Industries N.V. is a leading manufacturer of semiconductor die sorting, flip chip and multi-chip die bonding, packaging and plating equipment for both array connect and leadframe assembly applications. Our technologically advanced equipment and integrated systems are used principally to produce semiconductor assemblies or "packages", which provide the electronic interface and physical connection between the chip and other electronic components and protect the chip from the external environment.
ASM Pacific	Hong Kong	www.asmpacific.com	ASM Pacific Technology Ltd. was founded in 1975. We are the world's largest assembly and packaging equipment supplier for the semiconductor industry. We manufacture semiconductor assembly equipment and materials (etched and stamped leadframes) used by multinational chip manufacturers, independent IC assembly houses and consumer electronics manufacturers.
Renesas Eastern Japan Semiconductor	Japan	www.tosemi.renesas.com	Semiconductor development, design, manufacture, and sale, as well as the manufacture and sale of semiconductor manufacturing equipment. Development, manufacture, and sale of applied electronics for purposes such as image recognition, and environment analysis.

Gallant Precision	Taiwan	www.gpmcorp.com.tw/index	Headquartered in Hsinchu, GPM is established in 1978. At the beginning, GPM focused on manufacturing components and parts of semiconductor molds with own brand _GPM¯, and has expended steadily to the precision and processing equipment in 1985. Through merging with KingBond and Kingroup in successively since 2002, we strengthen our manufacturing and production capability, not only expansion into the categories of Semiconductor packaging equipment, FPD processing equipment, Automation, Industry robots, but also the Green industry, including LED processing equipment, PV/Solar production equipment, wind Power system, Power Plant/System and Solar Wind. Nowadays, GPM's customers are located throughout Japan, Korea, Indian, China, Southeast Asia and Taiwan.

Equipment Segment - Die Bonders

Company	Location - Country	Website Address	Boilerplate from Company Website
NEC Machinery name changed to **Canon Machinery**	Japan	www.canon-machinery.co.jp	Since the foundation of our company in 1972, we have been making every possible effort to improve our technologies and thus create sophisticated production systems with the management philosophy, "Originality, Sincerity . Challenge." The philosophy reflects our willingness to create optimum solutions satisfying the customer needs based on the customer's viewpoints as well as our enthusiasm to tackle with any challenging assignments without hesitation.
Shinkawa	Japan	shinkawa.com/english	Shinkawa has specialized in the production of semiconductor manufacturing equipment, specifically bonding equipment commonly called a bonder, as its core product for the semiconductor industry for nearly fifty years.
Shibaura Mechatronics	Japan	www.shibaura.co.jp/e	As The Provider of Infrastructure for The Digital Age, Shibaura Mechatronics contributes to society by providing manufacturing equipment for electronic components, such as FPDs, semiconductors and optical discs.

Towa	Japan	www.towajapan.co.jp	As the industry leader in the field of semiconductor packaging technology, TOWA has developed numerous technology de facto standards. At the same time, we have continued our research and development efforts in order to meet customer requirements for new technologies.

Equipment Segment - Semiconductor Test Equipment

Company	Location - Country	Website Address	Boilerplate from Company Website
Advantest	Japan	www.advantest.com	Advantest has established an impressive track record of helping customers turn technological innovations into practical, market-ready products by providing user-focused test and measurement solutions. Manufacturing and sale of electronic measuring instruments, automatic test equipment, and electron beam lithography systems
Verigy	Germany & Singapore	www.verigy.com	Verigy designs, develops, manufactures and sells advanced test systems and solutions for the semiconductor industry. Building upon 65+ years of testing technology innovation, Verigy's advanced solutions help semiconductor designers and manufacturers lower their costs of test and improve their competitiveness.

Equipment Segment - Board Test Products

Company	Location - Country	Website Address	Boilerplate from Company Website
EADS (Airbus)	France	www.eads.com	In the short time since its formation EADS has established itself as a leading player in the global aerospace and defence market underpinning the capability and expertise of EADS' 17,000 UK employees. The success stories of Airbus, Ariane and Eurocopter show what EADS can achieve. Our products have earned us international acclaim. We are also shaping the future, by researching, developing and implementing projects that push current technological boundaries.

Diagnosys	France	www.diagnosys.com	DiagnoSYS is an established Global Company with the sole aim of providing Electronic Test Solutions and Services Worldwide. We offer Test Solutions to our Customers through offices in the UK, USA, India, France, Germany & Sweden and another 39 countries around the globe through a comprehensive distributor network.
Equipment Segment - Board Test Products			
Company	**Location - Country**	**Website Address**	**Boilerplate from Company Website**
Seica	Italy	www. seicatestsolutions.com	Seica's innovative test solutions are being used across the globe to improve quality, increase productivity and save money in automobile, military and consumer markets.
Marconi	UK	www.marconi.com	Marconi is a multi-regional designer, manufacturer and supplier of telecommunications and information technology equipment and services. Our network technology and services enable our customers to evolve narrowband networks to next-generation broadband networks. Our customer base includes public network operators, Internet service providers, large corporations, government departments and agencies, utilities and educational institutions. Our core activities can be divided into two main business types, Network Equipment and Network Services.