

AS FILED WITH THE SECURITIES AND EXCHANGE COMMISSION ON JANUARY 15, 1998

REGISTRATION NO. 333-40269

SECURITIES AND EXCHANGE COMMISSION  
WASHINGTON, D.C. 20549

AMENDMENT NO. 2

TO

FORM S-1  
REGISTRATION STATEMENT UNDER THE SECURITIES ACT OF 1933

MKS INSTRUMENTS, INC.  
(Exact name of registrant as specified in its charter)

MASSACHUSETTS  
(State or other jurisdiction of  
incorporation or organization)

3823  
(Primary Standard Industrial  
Classification Code Number)

04-2277512  
(I.R.S. Employer  
Identification Number)

Six Shattuck Road  
Andover, MA 01810  
(978) 975-2350  
(Address, including zip code, and telephone number,  
including area code, of registrant's principal executive offices)

JOHN R. BERTUCCI  
Chairman, President and Chief Executive Officer  
MKS Instruments, Inc.  
Six Shattuck Road  
Andover, MA 01810  
(978) 975-2350  
(Name, address, including zip code, and telephone  
number, including area code, of agent for service)

COPIES TO:

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APPROXIMATE DATE OF COMMENCEMENT OF PROPOSED SALE TO THE PUBLIC:

As soon as practicable after the effective date hereof.

If any of the securities being registered on this Form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act of 1933, check the following box. [ ]

If this Form is filed to register additional securities for an offering pursuant to Rule 462(b) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. [ ]

If this Form is a post-effective amendment filed pursuant to Rule 462(c) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. [ ]

If this Form is a post-effective amendment filed pursuant to Rule 462(d) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. [ ]

If delivery of the prospectus is expected to be made pursuant to Rule 434, please check the following box: [ ]

THE REGISTRANT HEREBY AMENDS THIS REGISTRATION STATEMENT ON SUCH DATE OR DATES AS MAY BE NECESSARY TO DELAY ITS EFFECTIVE DATE UNTIL THE REGISTRANT SHALL FILE A FURTHER AMENDMENT WHICH SPECIFICALLY STATES THAT THIS REGISTRATION STATEMENT SHALL THEREAFTER BECOME EFFECTIVE IN ACCORDANCE WITH SECTION 8(a) OF THE SECURITIES ACT OF 1933 OR UNTIL THE REGISTRATION STATEMENT SHALL BECOME EFFECTIVE ON SUCH DATE AS THE COMMISSION, ACTING PURSUANT TO SECTION 8(a), MAY DETERMINE.

INFORMATION CONTAINED HEREIN IS SUBJECT TO COMPLETION OR AMENDMENT. A REGISTRATION STATEMENT RELATING TO THESE SECURITIES HAS BEEN FILED WITH THE SECURITIES AND EXCHANGE COMMISSION. THESE SECURITIES MAY NOT BE SOLD NOR MAY OFFERS TO BUY BE ACCEPTED PRIOR TO THE TIME THE REGISTRATION STATEMENT BECOMES EFFECTIVE. THIS PROSPECTUS SHALL NOT CONSTITUTE AN OFFER TO SELL OR THE SOLICITATION OF AN OFFER TO BUY NOR SHALL THERE BE ANY SALE OF THESE SECURITIES IN ANY STATE IN WHICH SUCH OFFER, SOLICITATION OR SALE WOULD BE UNLAWFUL PRIOR TO REGISTRATION OR QUALIFICATION UNDER THE SECURITIES LAWS OF ANY SUCH STATE.

SUBJECT TO COMPLETION, DATED JANUARY 15, 1998

4,000,000 SHARES

[LOGO]  
MKS INSTRUMENTS

COMMON STOCK

All of the 4,000,000 shares of Common Stock offered hereby are being sold by the Company. Prior to this offering, there has been no public market for the Common Stock of the Company. It is currently estimated that the initial public offering price per share will be between \$ and \$ . See "Underwriting" for a discussion of factors to be considered in determining the initial public offering price.

Upon consummation of this Offering, John R. Bertucci, Chairman of the Board of Directors, Chief Executive Officer and President of the Company, and members of his family, will in the aggregate beneficially own approximately 72% of the outstanding Common Stock of the Company. See "Risk Factors -- Concentration of Stock Ownership."

Application has been made for quotation of the Common Stock on the Nasdaq National Market under the symbol "MKSI."

SEE "RISK FACTORS" COMMENCING ON PAGE 5 FOR CERTAIN FACTORS THAT SHOULD BE CONSIDERED BY PROSPECTIVE PURCHASERS OF THE COMMON STOCK OFFERED HEREBY.

THESE SECURITIES HAVE NOT BEEN APPROVED OR DISAPPROVED BY THE SECURITIES AND EXCHANGE COMMISSION OR ANY STATE SECURITIES COMMISSION NOR HAS THE SECURITIES AND EXCHANGE COMMISSION OR ANY STATE SECURITIES COMMISSION PASSED UPON THE ACCURACY OR ADEQUACY OF THIS PROSPECTUS. ANY REPRESENTATION TO THE CONTRARY IS A CRIMINAL OFFENSE.

	Price to Public	Underwriting Discount(1)	Proceeds to Company(2)
Per Share.....	\$	\$	\$
Total(3).....	\$	\$	\$

- (1) See "Underwriting" for information concerning indemnification of the Underwriters and other matters.
- (2) Before deducting estimated expenses payable by the Company, estimated at \$ .
- (3) The Company has granted to the Underwriters a 30-day option to purchase up to 600,000 additional shares of Common Stock solely to cover over-allotments, if any. If the Underwriters exercise this option in full, the Price to Public will total \$ , the Underwriting Discount will total \$ and the Proceeds to the Company will total \$ . See "Underwriting."

The shares of Common Stock are offered by the several Underwriters named herein, subject to receipt and acceptance by them and subject to their right to reject any order in whole or in part. It is expected that certificates representing such shares will be made against payment therefor at the offices of NationsBanc Montgomery Securities, Inc. on or about , 1998.

NATIONSBANC MONTGOMERY SECURITIES, INC.  
  
DONALDSON, LUFKIN & JENRETTE  
  
SECURITIES CORPORATION  
  
PAINWEBBER INCORPORATED  
  
, 1998.

MKS INSTRUMENTS, INC.  
PROSPECTUS COVER  
NOVEMBER 14, 1997

INSIDE FRONT COVER (PG. 2):

This page is produced in four-color process. Amidst a dark background, the MKS logo appears at the top of the page, and underneath is the phrase "A wide range of products made using MKS Process Control Instruments." Two paragraphs describing the role MKS plays in complex advanced materials manufacturing processes, such as semiconductor, also appear on this page, and are as follows:

(first paragraph) "MKS Surrounds the Process. In semiconductor and other industries involving advanced materials processing, products such as semiconductor devices, CD ROMS, flat panel displays, and fiber optic cables are the result of complex manufacturing processes. These processes build up very thin layers of materials, step by step, through the interaction of specific gases and materials inside tightly controlled process chambers. Maintaining control of these complex steps throughout the entire manufacturing process is critical to performance and yield. (second paragraph) MKS Process Control Instruments are integrated into almost every step of gas-related processes--managing the flow rates of gases entering and exiting the process chamber, controlling the gas composition and pressure inside the chamber, analyzing and monitoring the composition of the gases, and isolating the gases from the outside environment."

In the center of the page is a photo montage, displaying images of semiconductor devices, flat panel displays, magnetic and optical storage media, fiberoptic cables, solar panels, and gas lasers. Each of these images has a text label adjacent to it.

INSIDE SPREAD (PGS. 3 AND 4):

These pages are produced in four-color process. The main focus of the spread is the illustration of a typical process chamber, with numerous MKS products surrounding the chamber. At the top of the illustration, centered across the two pages, is the title "MKS Instruments...Surrounding the Process." Each product is described in a brief paragraph, and the paragraphs appear on both sides of the illustration--left and right columns. The paragraphs are as follows:

DIRECT LIQUID INJECTION SUBSYSTEMS

For use in the delivery of a wide variety of new materials to the process chamber that cannot be delivered using conventional thermal-based mass flow controllers.

AUTOMATIC PRESSURE CONTROLLERS WITH INTEGRATED BARATRON(R) PRESSURE TRANSDUCERS

A compact, integrated measurement and control package for use in controlling upstream or downstream process chamber pressure.

ULTRACLEAN MINI-BARATRON(R) PRESSURE TRANSDUCERS

For use in gas cabinets to feed ultra-pure gases to critical process systems.

ULTRACLEAN MASS FLOW CONTROLLERS

For the precise measurement and control of mass flow rates of inert or corrosive gases and vapors into the process chamber.

IN SITU FLOW VERIFIERS

For fast verification of mass flow controller accuracy and repeatability during a process.

PRESSURE CONTROL VALVES

To precisely control the flow of gases to a process chamber in a wide range of flow rates.

**DIGITAL COLD CATHODE IONIZATION AND CONVECTION VACUUM GAUGES**

A variety of indirect pressure gauges for measuring very low chamber pressures and conveying information digitally to host computers.

**HEATED PUMPING LINES**

For the reduction of contaminants in the vacuum pump and pump exhaust stream.

**ORION(R) PROCESS MONITORS AND RESIDUAL GAS ANALYZERS**

For the analysis of the composition of background and process gases inside a process chamber.

**PRESSURE SWITCHES**

Provide protection of vacuum equipment and processes by signaling when atmospheric pressure has been reached.

**IN SITU DIAGNOSTICS ACCESS VALVE**

Allows for accurate calibration and diagnostics of vacuum gauges and pressure transducers while directly mounted on the process chamber.

**BARATRON(R) PRESSURE MEASURING INSTRUMENTS**

For the accurate measurement and control of a wide range of process pressures.

**EXHAUST THROTTLE VALVES AND AUTOMATIC PRESSURE CONTROLLERS**

For isolation and downstream control of process chamber pressures, and pressure control within the exhaust systems.

**HIGH VACUUM VALVES**

To isolate the process chamber from both the pumps and from atmosphere.

**VAPOR SUBLIMATION TRAP**

To collect by-products and particulates that could otherwise contaminate devices in the process chambers and damage vacuum pumps.

Lines are drawn from each paragraph section to its corresponding part on the illustration. The MKS logo appears in color above the left column of text. Underneath the illustration at the bottom of the page spread is a sentence that reads as follows: 'The above graphic depicts a typical process chamber and surrounding equipment used in semiconductor manufacturing.'

At the bottom of the right column (on pg. 4) is a sentence in smaller type that reads: 'Prices of products shown above range from \$400 to \$80,000.'

[PICTURES]

MKS, MKS Instruments, Baratron and Orion are trademarks of the Company. This Prospectus contains trade marks, service marks and trade names of companies and organizations other than MKS.

CERTAIN PERSONS PARTICIPATING IN THIS OFFERING MAY ENGAGE IN TRANSACTIONS THAT STABILIZE, MAINTAIN OR OTHERWISE AFFECT THE PRICE OF THE COMMON STOCK OFFERED HEREBY, INCLUDING THE ENTRY OF STABILIZING BIDS, SYNDICATE COVERING TRANSACTIONS OR THE IMPOSITION OF PENALTY BIDS. FOR A DESCRIPTION OF THESE ACTIVITIES, SEE "UNDERWRITING."

## PROSPECTUS SUMMARY

The following summary is qualified in its entirety by the more detailed information, including "Risk Factors" and the Consolidated Financial Statements and the Notes thereto appearing elsewhere in this Prospectus. Except as otherwise noted herein, all information in this Prospectus (i) gives effect to a 2,110-for-1 stock split, to be effected in the form of a stock dividend prior to the closing of this offering, of each share of Class A Common Stock and Class B Common Stock of the Company and the conversion of such shares upon the closing of this offering into an aggregate of 12,035,440 shares of Common Stock of the Company (the "Recapitalization") and (ii) assumes no exercise of the Underwriters' over-allotment option. See "Description of Capital Stock," "Underwriting" and Note 2 of Notes to Consolidated Financial Statements.

## THE COMPANY

MKS Instruments, Inc. ("MKS" or the "Company") is a leading worldwide supplier of instruments and components used to measure, control, analyze and isolate gases in semiconductor and other manufacturing processes. The Company offers a comprehensive line of products which are used around the process chamber in both semiconductor front-end manufacturing processes and other advanced thin-film and vacuum-based processes used in the manufacture of, among other things, flat panel displays, magnetic and optical storage media, solar cells, fiber optic cables and gas lasers. The Company's products include: (i) pressure and flow measurement and control instruments; (ii) vacuum gauges, valves and components; and (iii) gas analysis instruments.

The trend toward semiconductor devices with smaller geometries and enhanced functionality has resulted in higher value per wafer and more complex manufacturing processes. This has led to the need for increasingly sophisticated semiconductor manufacturing equipment, a heightened emphasis on uptime, yield and throughput, and the need for more precise process controls. As a result, the design and performance of instruments that control pressure or the flow of gases, or analyze the mixture of gases, are becoming even more critical to the semiconductor manufacturing process. In addition, the number and diversity of components and subassemblies used in the manufacturing process has grown as the number and complexity of process steps and sophistication of process equipment has increased. These trends in the semiconductor industry have led semiconductor equipment manufacturers to seek to establish relationships with a smaller group of suppliers that provide broad and integrated product lines, worldwide sales and support and advanced technological capabilities for critical process technology areas.

The Company believes that it offers the widest range of pressure and vacuum measurement and control products serving the semiconductor industry. The Company's objective is to be the leading worldwide supplier of instruments and components used to measure, control, analyze and isolate gases in semiconductor and other advanced thin-film processing applications. The Company's strategies to accomplish this objective include extending its technology leadership, providing a comprehensive product line, building upon its close customer relationships in the semiconductor industry, expanding the application of its existing technologies to related markets and leveraging its global infrastructure.

For over 20 years the Company has been focused on serving the needs of semiconductor device manufacturers and semiconductor equipment OEMs and has established long-term relationships with many of its customers. The Company has over 4,000 customers worldwide including most major semiconductor equipment OEMs, semiconductor device manufacturers, a broad range of industrial companies and university, government and industrial research laboratories. The Company's customers in its principal market, the semiconductor market, include Applied Materials, Eaton, Hitachi, Lam Research, Tokyo Electron, Ltd. ("TEL") and ULVAC. The Company sells its products primarily through its direct sales force in 22 offices in Canada, France, Germany, Japan, Korea, the Netherlands, the United Kingdom and the United States.

MKS Instruments, Inc. is a Massachusetts corporation organized in June 1961. The Company's principal executive offices are located at Six Shattuck Road, Andover, MA 01810, and its telephone number is (978)975-2350.

## THE OFFERING

Common Stock offered by the Company..... 4,000,000 shares  
Common Stock to be outstanding after the  
offering..... 16,035,440 shares(1)  
Use of proceeds..... For distributions to current stockholders  
and general corporate purposes.  
Proposed Nasdaq National Market symbol..... MKSI

- (1) Based on shares of Common Stock outstanding as of September 30, 1997. Excludes (i) 1,042,361 shares of Common Stock issuable upon exercise of stock options outstanding as of such date at an exercise price of \$6.64 per share and (ii) 1,978,139 additional shares reserved for future grants or issuances under the Company's stock option and stock purchase plans.

SUMMARY CONSOLIDATED FINANCIAL DATA  
(IN THOUSANDS, EXCEPT PER SHARE DATA)

	YEAR ENDED DECEMBER 31,					NINE MONTHS ENDED SEPTEMBER 30,	
	1992	1993	1994	1995	1996	1996	1997
STATEMENT OF INCOME DATA:							
Net sales.....	\$73,260	\$80,852	\$106,829	\$157,164	\$170,862	\$136,097	\$134,629
Gross profit.....	30,628	34,068	47,016	69,461	68,854	55,019	56,173
Income from operations.....	4,593	6,365	12,087	24,106	16,068	12,990	15,088
Net income.....	\$ 2,646	\$ 4,351	\$ 10,003	\$ 21,658	\$ 12,503	\$ 10,291	\$ 12,892
PRO FORMA STATEMENT OF INCOME DATA:							
Pro forma net income(1).....					\$ 8,248		\$ 8,731
Pro forma net income per share(2).....					\$ 0.59		\$ 0.62
Pro forma weighted average common shares outstanding(2).....					13,994		14,134

## SEPTEMBER 30, 1997

	SEPTEMBER 30, 1997		
	ACTUAL	PRO FORMA(3)	PRO FORMA AS ADJUSTED(3)(4)
BALANCE SHEET DATA:			
Working capital.....	\$ 29,479	\$ (704)	
Total assets.....	106,685	106,685	
Short-term obligations.....	16,372	16,372	
Long-term obligations, less current portion.....	16,348	16,348	
Stockholders' equity.....	51,756	21,573	

- (1) Effective July 1, 1987, the Company elected to be treated as an S corporation. As an S corporation, the Company has not been subject to federal, and certain state, income taxes. The pro forma net income reflects the provision for income taxes that would have been recorded had the Company been a C corporation, assuming an effective tax rate of 38.0%. As a result of terminating its S corporation status upon the closing of this offering, the Company will record a one-time non-cash credit to historical earnings for additional deferred taxes. If this credit to earnings had occurred at September 30, 1997, the amount would have been approximately \$2.8 million. This amount is expected to change through the closing of this offering and is excluded from pro forma net income. See Notes 2 and 9 of Notes to Consolidated Financial Statements.

- (2) In accordance with a regulation of the Securities and Exchange Commission, the pro forma net income per share and weighted average common shares outstanding reflect the effect of an assumed issuance of sufficient shares to fund the S Corporation Distribution, as of January 1, 1997, to be made out of the proceeds of this offering. See "S Corporation and Termination of S Corporation Status" and Note 2 of Notes to Consolidated Financial Statements.

- (3) Pro forma balance sheet data reflects the distribution of an estimated \$30.2 million, calculated as of September 30, 1997, of cumulative undistributed S corporation taxable income for which stockholders of record prior to the closing of this offering have been or will be taxed. The actual amount to be distributed is expected to increase based upon taxable earnings for the period October 1, 1997 through the closing of the offering, subject to certain limitations. See "S Corporation and Termination of S Corporation Status."

- (4) Adjusted to reflect the sale of 4,000,000 shares of Common Stock at an assumed initial public offering price of \$ per share, after deducting the estimated underwriting discount and offering expenses payable by the Company.



## RISK FACTORS

In addition to the other information in this Prospectus, prospective purchasers of the Common Stock offered hereby should consider carefully the following factors in evaluating the Company and its business.

## CYCLICALITY OF THE SEMICONDUCTOR INDUSTRY

During 1996 and the first nine months of 1997, the Company estimates that approximately two-thirds of the Company's sales were to semiconductor equipment OEMs and semiconductor device manufacturers and the Company expects that sales to such customers will continue to account for a substantial majority of its sales. The Company's business depends substantially upon the capital expenditures of semiconductor device manufacturers, which in turn depend upon the demand for semiconductors and other products utilizing semiconductors. Historically, the semiconductor market has been highly cyclical and has experienced periods of overcapacity, resulting in significantly reduced demand for capital equipment. In 1996, the semiconductor industry experienced a significant decline, which caused a number of the Company's customers to reduce their orders from the Company. Although there have been indications that the semiconductor and semiconductor equipment industries have begun to recover from the 1996 downturn, there can be no assurance that such industries will continue to improve or that there will not be further downturns or slowdowns in any of the markets that the Company serves. More recently, the financial markets in Asia, one of the Company's principal international markets, have experienced significant turmoil, including the decline in value of the Japanese Yen and Korean Won versus the U.S. Dollar. There can be no assurance that such turmoil in the financial markets will not negatively impact the growth of the semiconductor industry in the region. Also, the requirement that the Company continue to invest in research and development, marketing and customer support will constrain the Company's ability to reduce expenses in response to any such downturn or slowdown. In addition, the Company's future sales will depend in part on the sale of products for new large fabrication facilities that are either planned or under construction and there can be no assurance that such fabrication facilities will be completed or, if completed, will operate at full capacity. Any reduction in orders resulting from a downturn or slowdown in the semiconductor industry, together with the Company's inability to quickly adjust expenses, would have a material adverse impact on the Company's revenues, financial condition and results of operations. See "Management's Discussion and Analysis of Financial Condition and Results of Operations -- Selected Quarterly Operating Results."

## FLUCTUATIONS IN OPERATING RESULTS

The Company has experienced and expects to continue to experience significant fluctuations in its quarterly and annual operating results. A substantial proportion of the Company's shipments occur shortly after an order is received. Due to the short time between receipt of orders and shipments, the Company operates with a low level of backlog. Moreover, this backlog at any point in time is not sufficient to meet the Company's revenue expectations for a particular quarter. As a consequence of the just-in-time basis of the Company's shipments and the low level of backlog, a decrease in demand for the Company's products from one or more customers could occur with limited advanced notice and could have an adverse effect on the Company's results of operations in a particular period. The Company's revenues and operating results are also affected by a variety of other factors, including specific economic conditions in the industries in which the Company's customers operate, particularly the semiconductor industry; the timing of the receipt of orders from major customers; customer cancellations or shipment delays; price competition; disruption in sources of supply; seasonal variations of capital spending by customers; production capacity constraints; specific features requested by customers; exchange rate fluctuations; the introduction or announcement of new products by the Company or its competitors; and other factors, many of which are beyond the Company's control.

The Company's results of operations for a particular period would be adversely affected if an anticipated significant order were not received in time to permit shipment during that period, as a significant portion of the Company's operating expenses are fixed in nature and planned expenditures are based in part on anticipated orders. In addition, the need for continued expenditures for research and development would make it difficult to reduce expenses in a particular period if the Company's sales goals for that period were not met. The inability to adjust spending quickly enough to compensate for any revenue shortfall would magnify the adverse impact of such revenue shortfall on the Company's results of operations. For example, the Company was in the process of increasing its production capacity when the semiconductor capital equipment market began to

experience a significant downturn in 1996. This downturn had a material adverse effect on the Company's operating results in the second half of 1996 and the first half of 1997. As a result of the factors discussed above, it is likely that the Company will in the future experience quarterly or annual fluctuations and that, in one or more future quarters, the Company's operating results will fall below the expectations of public market analysts or investors. In any such event, the price of the Company's common stock could decline significantly. See "Management's Discussion and Analysis of Financial Condition and Results of Operations -- Selected Quarterly Operating Results."

#### CUSTOMER CONCENTRATION

While the Company sold products to more than 4,000 customers in 1996, the Company's five largest customers in 1994, 1995 and 1996 accounted for approximately 18%, 24% and 26%, respectively, of the Company's net sales. During the first nine months of 1997, the five largest customers accounted for approximately 31% of the Company's net sales, and one customer, Applied Materials, accounted for approximately 21% of the Company's net sales. While the Company has entered into a purchase contract with Applied Materials that expires in 2002, no significant customer of the Company, including Applied Materials, has entered into an agreement requiring it to purchase any minimum quantity of the Company's products. The demand for the Company's products from its customers depends in part on orders received by such customers from their own semiconductor device manufacturer customers.

The Company sells its products primarily to semiconductor equipment OEMs and, to a lesser extent, semiconductor device manufacturers. The number of the Company's potential customers in its primary market is limited. The loss of a major customer or any reduction in orders by such customers, including reductions due to market or competitive conditions, would likely have a material adverse effect on the Company's business and results of operations. Attempts to mitigate the adverse impact of any such loss or reduction through the rapid addition of new customers could be difficult because prospective customers typically require lengthy qualification periods prior to placing volume orders with a new supplier. The Company's future success will continue to depend upon its ability to maintain its relationships with its existing key customers and to attract new customers, as well as the success of the Company's OEM customers in creating demand for their capital equipment products incorporating the Company's products. See "Business -- Customers."

#### COMPETITION

The market for the Company's products is highly competitive. The Company encounters substantial competition in each of its product lines from a number of competitors, although no one competitor competes with the Company across all product lines. Certain of the Company's competitors have greater financial and other resources than the Company. Other competitors are smaller than the Company but well established in specific product niches. In some cases, particularly with respect to mass flow controllers, end-user semiconductor device manufacturers may direct semiconductor equipment OEMs to use a specified supplier's product in their equipment. Accordingly, for such products, the Company's success will depend in part on its ability to have semiconductor device manufacturers specify that its products be used at their fabrication facilities and the Company may encounter difficulties in changing established relationships of competitors with a large installed base of products at such customers' fabrication facilities. There can be no assurance that competitors will not develop products that offer price or performance features superior to those of the Company's products. To the extent that the Company's products do not achieve performance or other advantages over products offered by competitors, the Company is likely to experience greater price competition or loss of market share with respect to such products. Also, certain of the Company's customers may develop in-house products that serve the functions of and replace the Company's products. The Company believes that the worldwide competitive pressures in the Company's markets could result in a decline in the prices of its products in the future. Declines in the selling prices of the Company's products, if not offset by reductions in the cost of producing such products and increased unit volume sales or by sales of products with higher gross margins, could have a material adverse effect on the Company's business and results of operations. See "Business -- Competition."

#### TECHNOLOGICAL CHANGES

The semiconductor equipment industry is subject to rapid technological change and new product introductions and enhancements. The Company's success depends in part upon its ability to develop enhanced and new

products that keep pace with technological developments, achieve market acceptance and respond to evolving customer requirements. New product introductions may contribute to fluctuations in quarterly operating results, as customers may defer ordering products from the Company's existing product lines or may purchase products from competitors. Any new product reliability or quality problems could result in reduced orders, higher manufacturing costs and additional service and warranty expense. Responding to rapid technological change and the need to develop and introduce new products to meet customers' needs and evolving industry standards will require the Company to make substantial investments in research and product development. Any failure by the Company to anticipate or respond adequately to technological developments and customer requirements or any significant delays in product development or introduction could result in a loss of competitiveness and could materially adversely affect the Company's operating results. There can be no assurance that the Company will successfully develop and manufacture new products or that any product enhancements or new products developed by the Company will gain market acceptance.

The semiconductor device manufacturing industry is currently undergoing an evolution from 200mm to 300mm wafers and from .35 micron to .25 and .18 micron line-widths. Device manufacturers are beginning to establish pilot production lines and specifications for the use of 300mm wafers and the production of .25 and .18 micron devices. The Company has developed, and is developing, new products and product enhancements to address the expected increasing demand for equipment capable of handling these new wafer sizes and line-widths. The Company has supplied pre-production equipment to be incorporated into semiconductor equipment OEM 300mm pre-production wafer process equipment which is expected to be included in pilot product lines of device manufacturers. The Company has also developed equipment that is being used by research laboratories for devices using .18 micron line-widths. However, there can be no assurance that the Company's new products and enhancements will be designed into production lines by the Company's customers. Failure by the Company to develop products and enhancements for general acceptance by its customers in a timely manner would have a material adverse effect on the Company's business, financial condition and results of operations. See "Business -- Trends in Manufacturing."

#### EXPANSION INTO NEW MARKETS

The Company plans to build upon its experience in manufacturing and selling gas management products used by the semiconductor industry by designing and selling gas management products for applications in other industries which use production processes similar to those used in the semiconductor industry. The Company's future success will depend in part on its ability to identify new applications for its products, adapt its products for such applications and then market and sell such products to customers. The Company has limited experience selling its products in certain markets outside the semiconductor industry. There can be no assurance that the Company will be successful in further expanding its business outside the semiconductor industry. Any failure to penetrate additional markets would limit the Company's ability to reduce its vulnerability to downturns in the semiconductor industry and could have a material adverse effect upon its business and results of operations. See "Business -- MKS Strategy" and "Use of Proceeds."

#### EXPANSION OF MANUFACTURING CAPACITY

The Company plans in the year ending December 31, 1998 to add manufacturing facilities to its Austin, Texas and United Kingdom operations and further equip its cleanroom facilities in Andover and Methuen, Massachusetts. The Company expects to complete such plans before the completion of its year ending December 31, 1998. The Company's ability to continue to increase sales of certain of its products depends in part upon its ability to expand its manufacturing capacity for such products in a timely manner. If the Company is unable to expand its manufacturing capacity on a timely basis or to manage such expansion effectively, the Company's rate of growth and market share could be reduced and its business and results of operations could be adversely affected. Because the semiconductor industry is subject to rapid demand shifts which are difficult to foresee, the Company may not be able to increase capacity quickly enough to respond to a rapid increase in demand in the semiconductor industry. The Company's market share and results of operations could also be adversely affected if it is unable to adjust to a rapid demand increase in the highly cyclical semiconductor industry. Additionally, any capacity expansion by the Company will increase its fixed operating expenses and if sales levels do not increase to offset the additional expense levels associated with any such expansion, the Company's operating results would likely be adversely affected. See "Business -- Manufacturing" and "Use of Proceeds."

## INTERNATIONAL OPERATIONS AND SALES

The Company has production, sales and service facilities in Germany, Japan, Korea and the United States and sales and service facilities in Canada, France, the Netherlands and the United Kingdom. In addition, the Company has established, through agents and representatives, sales and service facilities in China, India, Israel, Italy, Singapore and Taiwan. International sales (which include sales by the Company's foreign subsidiaries, but exclude export sales made directly by the Company, which were less than 10% of the Company's total net sales) accounted for approximately 32%, 30% and 28% of net sales in 1995, 1996, and the first nine months of 1997, respectively. The Company anticipates that international sales will continue to account for a significant portion of its net sales. As a result, the Company's operations are subject to risks inherent in international business activities, including, in particular, general economic conditions in each country, the overlap of different tax structures, management of a large organization spread over various countries, unexpected changes in regulatory requirements, compliance with a variety of foreign laws and regulations and longer accounts receivables payment cycles in certain countries. The Company's international sales are also subject to certain governmental restrictions including the Export Administration Act and the regulations promulgated thereunder. Other risks associated with international operations include import and export licensing requirements, trade restrictions and changes in tariff and freight rates. A number of these risks also apply to sales to U.S. based semiconductor equipment OEMs that incorporate the Company's products into systems delivered outside the United States. Additionally, the Company denominates in local currencies the prices for products sold to and by its foreign subsidiaries, and, therefore, the Company's operating results attributable to these sales are exposed to fluctuations in the value of the U.S. dollar versus other currencies. While the Company seeks to mitigate its exposure to currency fluctuations by entering into forward exchange contracts and local currency purchased options to reduce currency exposure arising from foreign denominated sales associated with intercompany purchases of inventory, there can be no assurance that exchange rate fluctuations will not have an adverse effect on the Company's results of operations and financial condition or that the Company will not realize losses with respect to its hedging activities. See "Management's Discussion and Analysis of Financial Condition and Results of Operations" and "Business -- Sales, Marketing and Support."

## NEED TO RETAIN AND ATTRACT KEY PERSONNEL

The Company's success depends to a large extent upon the efforts and abilities of a number of key employees and officers. The loss of key employees or officers could materially and adversely affect the Company. The Company believes that its future success will depend in part on its ability to attract and retain highly skilled technical, financial, managerial and marketing personnel. Competition for such personnel is intense and there can be no assurance that the Company will be successful in attracting and retaining such personnel. The Company is the beneficiary of a \$5,000,000 key-man life insurance policy on its Chairman of the Board of Directors, Chief Executive Officer and President, John R. Bertucci. See "Business -- Employees" and "Management -- Executive Officers and Directors."

## CONCENTRATION OF STOCK OWNERSHIP

Upon consummation of this offering, John R. Bertucci, Chairman of the Board of Directors, Chief Executive Officer and President of the Company, and members of his family will, in the aggregate, beneficially own approximately 72% of the Company's outstanding Common Stock. As a result, these stockholders, acting together, would be able to control all matters requiring stockholder approval, including the election of directors and approval of significant corporate transactions such as mergers and consolidations and the sale of all or substantially all of the assets of the Company as well as action to liquidate or dissolve the Company. See "Principal Stockholders."

## INTELLECTUAL PROPERTY MATTERS

Although the Company seeks to protect its intellectual property rights through patents, copyrights, trade secrets and other measures, there can be no assurance that the Company will be able to protect its technology adequately, that competitors will not be able to develop similar technology independently, that any of the Company's pending patent applications will be issued or that intellectual property laws will protect the Company's intellectual property rights. In addition, litigation may be necessary in order to enforce the Company's patents, copyrights or other intellectual property rights, to protect the Company's trade secrets, to determine the validity and scope of the proprietary rights of others or to defend against claims of infringement. Such litigation could result in substantial costs and diversion of resources and could have a material adverse

effect on the Company's business and results of operations. There can be no assurance that any patent issued to the Company will not be challenged, invalidated or circumvented, that the rights granted thereunder will provide competitive advantages to the Company or that third parties may not assert that the Company's products infringe patent, copyright or trade secrets of such parties. Furthermore, there can be no assurance that others will not independently develop similar products or duplicate the Company's products. See "Business -- Patents and Other Intellectual Property Rights."

#### ENVIRONMENTAL REGULATIONS

The Company's operations are subject to a variety of extensive and changing federal, state and local environmental and safety laws, regulations and ordinances. Such laws, regulations or ordinances may impose liability for the cost of remediating, and for certain damages resulting from, releases, including past releases, of hazardous materials. The Company believes that it currently conducts and in the past has conducted its activities and operations in substantial compliance with applicable environmental laws and believes that costs of complying with existing environmental laws will not have a material adverse effect on the Company's financial condition or results of operations. There can be no assurance, however, that environmental laws will not become more stringent in the future or that the Company will not incur significant costs in the future in order to comply with such laws.

#### NO PRIOR PUBLIC MARKET; POSSIBLE VOLATILITY OF STOCK PRICE

Prior to this offering there has been no public market for the Company's Common Stock and there can be no assurance that an active public market for the Common Stock will develop or continue after the offering. The initial public offering price will be determined by negotiation between the Company and the representatives of the Underwriters. See "Underwriting." The trading price of the Company's Common Stock could be subject to wide fluctuations in response to quarterly variations in operating results, announcements of technological innovations or new products by the Company or its competitors or other events or factors. In addition, the stock market has experienced extreme price and volume fluctuations which have particularly affected the market prices for many high technology companies. These broad market fluctuations may materially and adversely affect the market price of the Company's Common Stock.

#### DILUTION

Purchasers of Common Stock offered hereby will incur immediate and substantial dilution in the net tangible book value per share of Common Stock from the assumed initial public offering price. See "Dilution."

#### ANTITAKEOVER PROVISIONS

Certain provisions of the Company's Articles of Organization, By-Laws and Massachusetts law could discourage potential acquisition proposals and could delay or prevent a change in control of the Company. Such provisions could diminish the opportunities for stockholders to participate in tender offers including tender offers at a price above the then current market value of the Common Stock. Such provisions may also inhibit increases in the market price of the Common Stock that could result from takeover attempts. In addition, the Board of Directors, without further stockholder approval, may issue preferred stock that could have the effect of delaying, deterring or preventing a change in control of the Company. The issuance of preferred stock could adversely affect the voting power of the holders of Common Stock including the loss of voting control to others. The Company has no present plans to issue any preferred stock. See "Description of Capital Stock."

#### SHARES ELIGIBLE FOR FUTURE SALE

Sales of substantial amounts of Common Stock in the public market following this offering could adversely effect the market price of the Common Stock. All of the outstanding shares of Common Stock are subject to lock-up agreements with the representatives of the Underwriters ("Lock-up Agreements") for a period of 180 days after the date of this Prospectus. Upon expiration of the Lock-up Agreements 180 days after the date of this Prospectus, 12,035,440 shares of Common Stock will be eligible for sale in the public market, subject to the provisions of Rule 144 under the Securities Act of 1933, as amended (the "Securities Act"). In addition, the Company intends to register approximately 3,020,500 shares of Common Stock issuable under its stock option and purchase plans upon the closing of this offering. See "Shares Eligible for Future Sale," "Description of Capital Stock" and "Underwriting."

## USE OF PROCEEDS

The net proceeds to the Company from the sale of the 4,000,000 shares of Common Stock offered hereby are estimated to be \$ \_\_\_\_\_ (\$ \_\_\_\_\_ if the Underwriters' over-allotment option is exercised in full), assuming an initial public offering price of \$ \_\_\_\_\_ per share, after deducting the estimated underwriting discount and offering expenses. The principal purposes of this offering are to increase the Company's working capital and equity base, to provide a public market for the Company's Common Stock and to facilitate future access by the Company to public equity markets.

The Company expects to use a portion of the net proceeds to pay to current stockholders the undistributed S corporation earnings of the Company through the closing of this offering. Such undistributed S corporation earnings were approximately \$30.2 million (including approximately \$28.9 million representing the share of Mr. Bertucci and members of his family. See "Principal Stockholders.") at September 30, 1997 and are expected to increase from October 1, 1997 to the closing of this offering. See "S Corporation and Termination of S Corporation Status." The Company expects to use the remainder of the net proceeds for general corporate purposes, including working capital, product development and capital expenditures. The Company plans in the year ending December 31, 1998 to make capital expenditures totaling approximately \$10 million, primarily for additions of capital equipment and for expansion of its manufacturing facilities and the Company expects to use a portion of the net proceeds for such purposes.

A portion of the net proceeds may also be used for the acquisition of businesses, products and technologies that are complementary to those of the Company. The Company has no commitments or understandings for any acquisitions and no portion of the net proceeds has been allocated for any specific acquisition. Pending such uses, the Company intends to invest the net proceeds from this offering in short-term, investment-grade, interest-bearing securities.

## S CORPORATION AND TERMINATION OF S CORPORATION STATUS

Effective July 1, 1987, the Company elected to be treated as an S corporation for federal income tax purposes. As a result, the Company currently pays no federal, and certain state, income tax and all of the earnings of the Company are subject to federal, and certain state, income taxation directly at the stockholder level. The Company's S corporation status will terminate upon the closing of this offering, at which time the Company will become subject to corporate income taxation under Subchapter C of the Internal Revenue Code of 1986, as amended (the "Code").

In 1996 and in the first nine months of 1997, the Company distributed \$14.5 million and \$6.4 million, respectively, of undistributed S corporation earnings to its stockholders. The Company expects to make additional distributions of approximately \$5.5 million prior to the closing of this offering.

As soon as practicable following the closing of the offering, the Company intends to make a distribution (the "S Corporation Distribution") to the holders of record on the day prior to the closing of this offering (the "Existing Stockholders") in an amount equivalent to the "accumulated adjustments account," as defined in Section 1368(a)(1) of the Code (the "AA Account"). As of September 30, 1997, the outstanding balance of the AA Account was approximately \$30.2 million, and such balance is expected to increase in the period from October 1, 1997 through the closing of the offering. The AA Account is cumulatively equal to financial reporting income, adjusted for differences between the methods of accounting used for financial accounting and for federal income tax purposes from the effective date of the Company's election to be treated as an S corporation through the date of termination of the Company's S corporation status, that has not been previously distributed. Investors purchasing shares in this offering will not receive any portion of the S Corporation Distribution.

The Company expects to enter into a Tax Indemnification and S Corporation Distribution Agreement (the "Existing Stockholders Agreement") with the Existing Stockholders providing for, among other things, the indemnification of the Company by such stockholders for any federal and state income taxes (including interest) incurred by the Company if for any reason the Company is deemed to be treated as a C corporation during any period which it reported its taxable income as an S corporation. The tax indemnification obligation of the Existing Stockholders is limited to the amount of any reduction in their tax liability as a result of any such determination. The Existing Stockholders Agreement also provides for the cross-indemnification by the Company of each Existing Stockholder for any losses or liabilities with respect to certain additional taxes (including interest and penalties) resulting from the Company's operations during the period in which it was an S corporation. The Existing Stockholders Agreement further provides for the payment, with interest, by the Existing Stockholders or the Company, as the case may be, for the difference between the S Corporation Distribution amount and the actual amount of the AA Account on the day immediately preceding the closing of the offering. The actual amount of the AA Account on the day prior to the closing of the offering cannot be determined until the Company calculates the amount of its taxable income for the year ending December 31, 1998. Purchasers of Common Stock in this offering will not be parties to the Existing Stockholders Agreement.

The termination date of the Company's S corporation status will occur on the closing date of this offering. Subsequent to the termination date, the Company will no longer be an S corporation and, accordingly, will be subject to federal and state income taxes. The pro forma Statement of Income set forth in this Prospectus has been adjusted to include pro forma federal income tax provisions as if the Company had been a C corporation under Subchapter C of the Code during the relevant periods.

## DIVIDEND POLICY

The Company anticipates that following the completion of this offering and the S Corporation Distribution, subject to the Company's contractual obligations under the Existing Stockholders Agreement, all earnings will be retained for development of its business and will not be distributed to stockholders as dividends. Restrictions or limitations on the payment of dividends may be imposed in the future under the terms of credit agreements or under other contractual provisions. In the absence of such restrictions or limitations, the payment of any dividends will be at the discretion of the Company's Board of Directors.

## CAPITALIZATION

The following table sets forth the capitalization of the Company (i) as of September 30, 1997, (ii) on a pro forma basis to reflect distributions and adjustments in connection with the Company's S corporation status and (iii) as adjusted to reflect the sale of 4,000,000 shares of Common Stock by the Company at an assumed initial public offering price of \$ per share and the application of the net proceeds therefrom. See "Use of Proceeds."

	SEPTEMBER 30, 1997		
	ACTUAL	PRO FORMA(1)	PRO FORMA
			AS ADJUSTED(1)(2)(4)
	(IN THOUSANDS, EXCEPT SHARE AND PER SHARE DATA)		
Long-term obligations, less current portion.....	\$16,348	\$ 16,348	\$
Stockholders' equity:			
Preferred stock, \$.01 par value; 2,000,000 shares authorized; no shares issued or outstanding....	--	--	--
Common Stock, no par value; 50,000,000 shares authorized, 12,035,440 shares issued and outstanding (actual and pro forma); 16,035,440 shares issued and outstanding (pro forma as adjusted)(3).....	113	113	
Additional paid-in capital.....	48	48	
Unrealized gain on investments.....	562	562	
Retained earnings.....	50,045	19,862	
Cumulative translation adjustment.....	988	988	
Total stockholders' equity.....	51,756	21,573	
Total capitalization.....	\$68,104	\$ 37,921	\$

- (1) Pro forma data reflects the distribution of an estimated \$30.2 million, calculated as of September 30, 1997, of cumulative undistributed S corporation taxable income for which stockholders of record prior to the closing of the offering have been or will be taxed. The actual amount to be distributed is expected to increase based upon taxable earnings for the period from October 1, 1997 through the closing of the offering, subject to certain limitations. See "S Corporation and Termination of S Corporation Status" and Notes 2 and 9 of Notes to Consolidated Financial Statements.
- (2) As adjusted to reflect the issuance of 4,000,000 shares of Common Stock at an assumed initial public offering price of \$ per share, after deducting the estimated underwriting discount and offering expenses payable by the Company.
- (3) Gives effect to (i) a 2,110-for-1 stock split to be effected in the form of a stock dividend prior to the closing of this offering and the conversion upon the closing of this offering, of the 2,454 shares of Class A Common Stock and 3,250 shares of Class B Common Stock outstanding at September 30, 1997 into an aggregate of 12,035,440 shares of Common Stock and (ii) the filing of an amendment to the Company's Restated Articles of Organization to increase the number of authorized shares of Common Stock to 50,000,000 and to authorize 2,000,000 shares of Preferred Stock prior to the closing of this offering.
- (4) The remaining balance in retained earnings represents accumulated earnings prior to the Company converting from a C corporation to an S corporation in 1987.

DILUTION

As of September 30, 1997, the Company had a net tangible book value of \$51,756,000, or \$4.30 per share of Common Stock. Without taking into account any changes in such net tangible book value subsequent to September 30, 1997, other than to give effect to the sale by the Company of 4,000,000 shares of Common Stock offered hereby at an assumed initial public offering price of \$ per share (after deducting the estimated underwriting discount and offering expenses) and the application of the estimated proceeds therefrom, including the distribution of an estimated \$30.2 million of cumulative undistributed S corporation taxable income for which stockholders have been or will be taxed, as of September 30, 1997, the pro forma net tangible book value of the Company as of September 30, 1997 would have been \$ , or \$ per share. This represents an immediate increase in net tangible book value of \$ per share to current shareholders and the immediate dilution of \$ per share to new investors. The following table illustrates this per share dilution:

Assumed initial public offering price per share.....		\$
Net tangible book value per share at September 30, 1997.....	\$4.30	
Decrease per share attributable to the S Corporation Distribution...		
Increase per share attributable to new investors.....		
	-----	
Pro forma net tangible book value per share after the offering.....		-----
Dilution per share to new investors.....		\$
		=====

The following table summarizes, on a pro forma basis as of September 30, 1997, the number of shares of Common Stock purchased from the Company, the total consideration paid to the Company, and the average price per share paid by the existing stockholders and by the investors purchasing shares of Common Stock in this offering at an assumed initial offering price of \$ per share:

	SHARES PURCHASED		TOTAL CONSIDERATION		AVERAGE PRICE PER SHARE
	NUMBER	PERCENT	AMOUNT	PERCENT	
Existing stockholders.....	12,035,440	75.1%	\$ 161,000	%	\$ 0.013
New investors.....	4,000,000	24.9			
Total.....	16,035,440	100.0%	\$	100.00%	
	=====	=====	=====	=====	

As of September 30, 1997, there were options outstanding to purchase a total of 1,042,361 shares of Common Stock, at an exercise price of \$6.64 per share. To the extent that any of these options are exercised, there will be further dilution to new investors.

## SELECTED CONSOLIDATED FINANCIAL DATA

The following selected financial data as of December 31, 1995 and 1996 and September 30, 1997 and for the years ended December 31, 1994, 1995 and 1996, and the nine month period ending September 30, 1997, have been derived from the Company's financial statements, included elsewhere in this Prospectus, which have been audited by Coopers & Lybrand L.L.P., independent accountants, as indicated in their report. The selected financial data as of and for the nine month period ended September 30, 1996 have been derived from unaudited financial statements that have been prepared on the same basis as the Company's audited financial statements and which, in the opinion of management, included all adjustments, consisting only of normal recurring adjustments, necessary for a fair presentation of the Company's financial position and results of operations. The selected financial data as of December 31, 1992, 1993 and 1994 and for the years ended December 31, 1992 and 1993 are derived from financial statements, which were also audited by Coopers & Lybrand L.L.P., not included herein. Operating results for the nine months ended September 30, 1997 are not necessarily indicative of the results that may be expected for the year ending December 31, 1997. The data should be read in conjunction with the Consolidated Financial Statements, including the Notes thereto, and with "Management's Discussion and Analysis of Financial Condition and Results of Operations" included elsewhere herein.

	YEAR ENDED DECEMBER 31,					NINE MONTHS ENDED SEPTEMBER 30,	
	1992	1993	1994	1995	1996	1996	1997
	(IN THOUSANDS, EXCEPT PER SHARE DATA)						
STATEMENT OF INCOME DATA:							
Net sales.....	\$73,260	\$80,852	\$106,829	\$157,164	\$170,862	\$136,097	\$134,629
Cost of sales.....	42,632	46,784	59,813	87,703	102,008	81,078	78,456
Gross profit.....	30,628	34,068	47,016	69,461	68,854	55,019	56,173
Research and development.....	5,836	6,244	8,036	10,935	14,195	11,220	10,336
Selling, general and administrative.....	20,199	21,459	26,893	34,420	37,191	29,409	30,749
Restructuring.....	0	0	0	0	1,400	1,400	0
Income from operations.....	4,593	6,365	12,087	24,106	16,068	12,990	15,088
Interest expense, net.....	1,784	1,421	1,284	1,448	2,286	1,811	1,466
Other income (expense), net.....	--	--	--	--	(479)	(230)	460
Income before income taxes.....	2,809	4,944	10,803	22,658	13,303	10,949	14,082
Provision for income taxes(1).....	163	593	800	1,000	800	658	1,190
Net income.....	\$ 2,646	\$ 4,351	\$ 10,003	\$ 21,658	\$ 12,503	\$ 10,291	\$ 12,892
PRO FORMA STATEMENT OF INCOME DATA (UNAUDITED)(2):							
Income before income taxes, as reported.....					\$ 13,303		\$ 14,082
Pro forma provision for income taxes.....					5,055		5,351
Pro forma net income.....					\$ 8,248		\$ 8,731
Pro forma net income per common share.....					\$ 0.59		\$ 0.62

	DECEMBER 31,					SEPTEMBER 30, 1997	
	1992	1993	1994	1995	1996	ACTUAL	PRO FORMA(3)
	(IN THOUSANDS)						
BALANCE SHEET DATA:							
Working capital.....	\$19,293	\$18,420	\$25,078	\$ 32,202	\$22,404	\$ 29,479	\$ (704)
Total assets.....	60,697	59,261	72,320	104,511	95,000	106,685	106,685
Short-term obligations.....	9,141	6,749	9,246	15,192	16,124	16,372	16,372
Long-term obligations, less current portion.....	15,761	15,326	14,948	20,462	18,899	16,348	16,348
Stockholders' equity.....	29,593	28,965	37,272	48,392	45,498	51,756	21,573

(1) Effective July 1, 1987, the Company elected to be treated as an S corporation under the applicable provisions of the Internal Revenue Code of 1986. As an S corporation, the Company has not been subject to federal, and certain state, income taxes. The pro forma net income reflects the provision for income taxes that would have been recorded had the Company been a C corporation, assuming an effective tax rate of 38.0%. As a result of terminating its S corporation status upon the closing of this offering, the Company will record a one-time non-cash credit to historical earnings for additional deferred taxes. If this credit to earnings had occurred at September 30, 1997, the amount would have been approximately

\$2.8 million. This amount is expected to change through the closing of the offering and is excluded from pro forma net income. See Notes 2 and 9 of Notes to Consolidated Financial Statements.

- (2) In accordance with a regulation of the Securities and Exchange Commission, the pro forma net income per share and weighted average common shares outstanding reflect the effect of an assumed issuance of sufficient shares to fund the S Corporation Distribution, as of January 1, 1997, to be made out of the proceeds of this offering. See "S Corporation and Termination of S Corporation Status" and Note 2 of Notes to Consolidated Financial Statements.
- (3) Pro forma balance sheet data reflects the distribution of an estimated \$30.2 million, calculated as of September 30, 1997, of cumulative undistributed S corporation taxable income for which stockholders of record prior to the closing of this offering have been or will be taxed. The actual amount to be distributed is expected to increase based upon taxable earnings for the period October 1, 1997 through the closing of the offering, subject to certain limitations. See "Use of Proceeds," "S Corporation and Termination of S Corporation Status" and Notes 2 and 9 of Notes to Consolidated Financial Statements.

MANAGEMENT'S DISCUSSION AND ANALYSIS OF  
FINANCIAL CONDITION AND RESULTS OF OPERATIONS

The following discussion of the results of operations and financial condition should be read in conjunction with the Company's Consolidated Financial Statements and Notes thereto included elsewhere in this Prospectus. With the exception of historical matters and statements of current status, certain matters discussed below are forward-looking statements that involve substantial risks and uncertainties that could cause actual results to differ materially from targets or projected results. Factors that could cause actual results to differ materially include, among others, those factors described in "Risk Factors." Many of these factors are beyond the Company's ability to predict or control. Prospective investors are cautioned not to put undue reliance on forward-looking statements, which statements have been made as of the date of this Prospectus, and prospective investors should not infer that there has been no change in the affairs of the Company since the date hereof that would warrant any modification of any forward-looking statement made herein. The Company disclaims any intent or obligation to update publicly these forward-looking statements, whether as a result of new information, future events or otherwise.

## OVERVIEW

MKS was founded in 1961. The Company sells instruments and components to OEMs and end-users in the semiconductor and other advanced thin-film processing industries. During 1996 and the first nine months of 1997, the Company estimates that approximately two-thirds of its net sales were to semiconductor equipment OEMs and semiconductor device manufacturers. The Company expects that sales to such customers will continue to account for a substantial majority of its sales. The Company typically enters into contracts with its semiconductor equipment OEM customers that provide for quantity discounts. The Company recognizes revenues, and accrues for anticipated returns and warranty costs, upon shipment.

In the third quarter of 1996, as a result of the downturn in the semiconductor industry, the Company recorded a restructuring charge of \$1.4 million. The charge was primarily related to a reduction of personnel and the closure of certain facilities and included the cost of severance, lease commitments and the write-off of leasehold improvements.

A significant portion of the Company's sales are to operations in international markets. International sales by the Company's foreign subsidiaries were 30.1% and 27.9% of net sales for 1996 and for the nine months ended September 30, 1997, respectively. The Company does not classify export sales made directly by the Company as international sales. Such sales were less than 10% of net sales. The Company currently uses, and plans to continue to use, forward exchange contracts and local currency purchased options to reduce currency exposure arising from foreign denominated sales associated with the intercompany purchases of inventory. Gains and losses on derivative financial instruments that qualify for hedge accounting are classified in cost of sales. Gains and losses on derivative financial instruments that do not qualify for hedge accounting are marked-to-market and recognized immediately in other income. See Note 2 to Notes to Consolidated Financial Statements.

Effective July 1, 1987, the Company elected to be treated as an S corporation for federal income tax purposes. The Company's S corporation status will terminate upon the closing of this offering, at which time the Company will become subject to federal, and certain state, income taxation as a C corporation. The pro forma net income reflects a pro forma effective tax rate of 38.0% to reflect federal and state income taxes which would have been payable for 1996 and the first nine months of 1997 had the Company been taxed as a C corporation.

## RESULTS OF OPERATIONS

The following table sets forth for the periods indicated the percentage of total sales of certain line items included in the Company's consolidated statement of income data:

	YEAR ENDED DECEMBER 31,			NINE MONTHS ENDED SEPTEMBER 30,	
	1994	1995	1996	1996	1997
Net sales.....	100.0%	100.0%	100.0%	100.0%	100.0%
Cost of sales.....	56.0	55.8	59.7	59.6	58.3
Gross profit.....	44.0	44.2	40.3	40.4	41.7
Research and development.....	7.5	7.0	8.3	8.3	7.7
Selling, general and administrative.....	25.2	21.9	21.8	21.6	22.8
Restructuring.....	0.0	0.0	0.8	1.0	0.0
Income from operations.....	11.3	15.3	9.4	9.5	11.2
Interest expense, net.....	1.2	0.9	1.3	1.3	1.1
Other income (expense), net.....	0.0	0.0	(0.3)	(0.2)	0.4
Income before income taxes.....	10.1	14.4	7.8	8.0	10.5
Provision for income taxes.....	0.7	0.6	0.5	0.4	0.9
Net income.....	9.4%	13.8%	7.3%	7.6%	9.6%
Pro forma data:					
Historical income before income taxes.....			7.8%		10.5%
Pro forma provision for income taxes.....			3.0		4.0
Pro forma net income.....			4.8%		6.5%

NINE MONTHS ENDED SEPTEMBER 30, 1997 COMPARED TO NINE MONTHS ENDED SEPTEMBER 30, 1996

**Net Sales.** Net sales decreased 1.1% to \$134.6 million for the nine months ended September 30, 1997 from \$136.1 million for the same period of 1996. International net sales decreased 5.9% to \$37.5 million (27.9% of net sales) for the first nine months of 1997 from \$39.9 million (29.3% of net sales) for the first nine months of 1996. The decrease in net sales and international net sales was primarily due to decreased worldwide sales volume resulting from the downturn in the semiconductor industry that began in 1996 and adversely affected the third quarter of 1996, as well as the first and second quarters of 1997.

**Gross Profit.** Gross profit as a percentage of sales increased to 41.7% for the nine months ended September 30, 1997 from 40.4% for the same period of 1996. The change was due primarily to the reduction in fixed costs resulting from the restructuring effected in the third quarter of 1996.

**Research and Development.** Research and development expenses decreased 7.9% to \$10.3 million (7.7% of net sales) for the nine months ended September 30, 1997 from \$11.2 million (8.2% of net sales) for the same period of 1996. The decrease was primarily due to lower staffing levels and project cost reductions during the first nine months of 1997 as a result of the restructuring effected in the third quarter of 1996. The Company expects research and development expenses to continue to increase as the Company continues to work to develop products to address advances in the semiconductor industry, such as the trend toward smaller device geometries and larger wafer sizes.

**Selling, General and Administrative.** Selling, general and administrative expense increased 4.6% to \$30.7 million (22.8% of net sales) for the nine months ended September 30, 1997 from \$29.4 million (21.6% of net sales) for the same period of 1996. The increase was due primarily to increased compensation expense of approximately \$0.9 million, and the write-off of certain assets of approximately \$0.4 million.

**Restructuring.** In the third quarter of 1996, as a result of the downturn in the semiconductor industry, the Company recorded a restructuring charge of \$1.4 million. The charge included \$0.4 million of severance pay, \$0.7 million of lease commitments, and \$0.3 million for the write-off of leasehold improvements.

Interest Expense, Net. Net interest expense decreased 19.1% to \$1.5 million for the nine months ended September 30, 1997 from \$1.8 million for the same period of 1996 primarily due to lower debt outstanding during 1997.

Other Income (Expense), Net. Other expense of \$0.2 million for the nine months ended September 30, 1996 and other income of \$0.5 million for the nine months ended September 30, 1997 reflect losses and gains, respectively, from foreign exchange contracts that did not qualify for hedge accounting.

Provision for Income Taxes. Effective July 1, 1987, the Company elected to be treated as an S corporation under the applicable provisions of the Code, and as a result has not been subject to federal income taxes, but it has been subject to certain state income taxes. The provision for income taxes is comprised of foreign income taxes and certain state income taxes. The provision increased to \$1.2 million for the nine months ended September 30, 1997 from \$0.7 million for the same period of 1996 primarily due to increased income.

Pro Forma Provision for Income Taxes. The pro forma provision for income taxes for the nine months ended September 30, 1997 reflects the estimated tax expense the Company would have incurred had it been subject to federal and state income taxes as a C corporation under the Code. The pro forma provision reflects a pro forma effective tax rate of 38.0%, which differs from the federal statutory rate due primarily to the effects of state and foreign taxes and certain tax credits.

#### YEAR ENDED DECEMBER 31, 1996 COMPARED TO YEAR ENDED DECEMBER 31, 1995

Net Sales. Net sales increased 8.7% to \$170.9 million for 1996 from \$157.2 million for 1995. International net sales were \$51.4 million for 1996 (30.1% of net sales) and \$50.2 million for 1995 (31.9% of net sales). In the fourth quarter of 1995 the Company purchased UTI Instruments Company ("UTI"), a designer and manufacturer of gas monitoring instrumentation, for \$4.4 million in cash. The increase in net sales was due primarily to the inclusion of sales by UTI as well as increased worldwide sales volume of the Company's existing products.

Gross Profit. Gross profit as a percentage of net sales decreased to 40.3% for 1996 from 44.2% for 1995. The decrease was primarily due to higher fixed costs resulting from manufacturing capacity expansion and lower margins initially earned on certain new products.

Research and Development. Research and development expenses increased 29.8% to \$14.2 million (8.3% of net sales) for 1996 from \$10.9 million (7.0% of net sales) for 1995. The increase was primarily due to increased costs associated with the development of new products, including approximately \$0.8 million resulting from the inclusion of a full year of costs associated with UTI.

Selling, General and Administrative. Selling, general and administrative expenses increased 8.1% to \$37.2 million (21.8% of net sales) for 1996 from \$34.4 million (21.9% of net sales) for 1995. The increase was primarily due to the inclusion of a full year of costs associated with UTI.

Restructuring. In the third quarter of 1996 the Company recorded a restructuring charge of \$1.4 million. The charge included \$0.4 million of severance pay, \$0.7 million of lease commitments, and \$0.3 million for the write-off of leasehold improvements.

Interest Expense, Net. Net interest expense increased to \$2.3 million in 1996 from \$1.4 million in 1995 primarily due to increased debt outstanding during 1996.

Other Income (Expense), Net. Other expense of \$0.5 million in 1996 represents losses from foreign exchange contracts that did not qualify for hedge accounting.

Provision for Income Taxes. The provision for income taxes is comprised of foreign income taxes and certain state income taxes. The provision decreased to \$0.8 million in 1996 from \$1.0 million in 1995 primarily due to lower income.

Pro Forma Provision for Income Taxes. The pro forma provision for income taxes in 1996 reflects the estimated tax expense the Company would have incurred had it been subject to federal and state income taxes

as a C corporation under the Code. The pro forma provision reflects a pro forma effective tax rate of 38.0%, which differs from the federal statutory rate due primarily to the effects of state and foreign taxes and certain tax credits.

YEAR ENDED DECEMBER 31, 1995 COMPARED TO YEAR ENDED DECEMBER 31, 1994

**Net Sales.** Net sales increased 47.1% to \$157.2 million for 1995 from \$106.8 million in 1994. International net sales increased 44.0% to \$50.2 million (31.9% of net sales) for 1995 from \$34.8 million (32.6% of net sales) in 1994. These increases were due primarily to increased worldwide sales volume to customers in the semiconductor industry.

**Gross Profit.** Gross profit as a percentage of net sales was substantially the same for 1995 (44.2%) and 1994 (44.0%).

**Research and Development.** Research and development expenses increased 36.1% to \$10.9 million (7.0% of net sales) for 1995 from \$8.0 million (7.5% of net sales) in 1994. The increase in the dollar amount of the expenses was primarily due to increased staffing levels and other costs associated with continued development of new products.

**Selling, General and Administrative.** Selling, general and administrative expenses increased 28.0% to \$34.4 million (21.9% of net sales) for 1995 from \$26.9 million (25.2% of net sales) for 1994. The change was due primarily to increased salaries and wages of approximately \$3.0 million resulting from higher staffing levels, approximately \$1.9 million of increased costs resulting from the establishment of sales and service subsidiaries in Europe, Korea, and the United States, and other increased selling and general and administrative costs incurred to support the Company's increased sales volume.

**Interest Expense, Net.** Net interest expense increased to \$1.4 million for 1995 from \$1.3 million for 1994, primarily due to increased debt outstanding during 1995.

**Provision for Income Taxes.** The provision for income taxes is comprised of foreign income taxes and certain state income taxes. The provision increased to \$1.0 million for 1995 from \$0.8 million for 1994 primarily due to increased income.

SELECTED QUARTERLY OPERATING RESULTS

The following tables present unaudited consolidated financial information for the seven quarters ended September 30, 1997. In the opinion of management this information has been presented on the same basis as the audited Consolidated Financial Statements appearing elsewhere in this Prospectus and all adjustments (consisting only of normal recurring adjustments) which management considers necessary for a fair presentation of the results of such periods have been included in the amounts stated below to present fairly the unaudited quarterly results when read in conjunction with the Company's Consolidated Financial Statements and Notes thereto. The results for any quarter are not necessarily indicative of future quarterly results of operations.

	QUARTER ENDED						
	MARCH 31, 1996	JUNE 30, 1996	SEPT. 30, 1996	DEC. 31, 1996	MARCH 31, 1997	JUNE 30, 1997	SEPT. 30, 1997
	(IN THOUSANDS)						
STATEMENT OF INCOME DATA:							
Net sales.....	\$49,811	\$ 48,278	\$38,008	\$ 34,765	\$40,520	\$ 45,749	\$48,360
Cost of sales.....	29,610	29,235	22,233	20,930	24,277	26,413	27,766
Gross profit.....	20,201	19,043	15,775	13,835	16,243	19,336	20,594
Research and development.....	3,560	4,031	3,629	2,975	2,994	3,563	3,779
Selling, general and administrative.....	10,113	10,595	8,701	7,782	9,612	10,321	10,816
Restructuring.....	0	0	1,400	0	0	0	0
Income from operations.....	6,528	4,417	2,045	3,078	3,637	5,452	5,999
Interest expense, net.....	475	675	661	475	494	527	445
Other income (expense), net.....	(12)	(9)	(209)	(249)	275	(447)	632
Income before income taxes.....	6,041	3,733	1,175	2,354	3,418	4,478	6,186
Provision for income taxes.....	363	224	71	142	289	378	523
Net income.....	\$ 5,678	\$ 3,509	\$ 1,104	\$ 2,212	\$ 3,129	\$ 4,100	\$ 5,663

	QUARTER ENDED						
	MARCH 31, 1996	JUNE 30, 1996	SEPT. 30, 1996	DEC. 31, 1996	MARCH 31, 1997	JUNE 30, 1997	SEPT. 30, 1997
PERCENTAGE OF NET SALES:							
Net sales.....	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Cost of sales.....	59.4	60.6	58.5	60.2	59.9	57.7	57.4
Gross profit.....	40.6	39.4	41.5	39.8	40.1	42.3	42.6
Research and development.....	7.2	8.4	9.5	8.5	7.4	7.8	7.8
Selling, general and administrative.....	20.3	21.9	22.9	22.4	23.7	22.6	22.4
Restructuring.....	0.0	0.0	3.7	0.0	0.0	0.0	0.0
Income from operations.....	13.1	9.1	5.4	8.9	9.0	11.9	12.4
Interest expense, net.....	1.0	1.4	1.7	1.4	1.2	1.1	0.9
Other income (expense), net.....	0.0	0.0	(0.6)	(0.7)	0.6	(1.0)	1.3
Income before income taxes.....	12.1	7.7	3.1	6.8	8.4	9.8	12.8
Provision for income taxes.....	0.7	0.4	0.2	0.4	0.7	0.8	1.1
Net income.....	11.4%	7.3%	2.9%	6.4%	7.7%	9.0%	11.7%

The Company's quarterly operating results have varied significantly and are likely to continue to vary significantly due to a number of factors including specific economic conditions in the industries in which the Company's customers operate, particularly the semiconductor industry; the timing of the receipt of orders from major customers; customer cancellations or shipment delays; price competition; disruption in sources of supply; seasonal variations of capital spending by customers; production capacity constraints; specific features requested by customers; exchange rate fluctuations; the introduction or announcement of new products by the Company or its competitors; and other factors, many of which are beyond the Company's control. See "Risk Factors -- Fluctuations in Operating Results."

The Company's net sales have fluctuated over the past seven quarters primarily due to the decline in the semiconductor industry in 1996 that adversely affected sales of the Company's products in the third and fourth quarters of 1996 and the first and second quarters of 1997.

Gross profit as a percentage of net sales decreased for the second quarter of 1996 primarily due to higher fixed costs resulting from manufacturing capacity expansion. Gross profit as a percentage of net sales improved in the third quarter of 1996 primarily due to reduced overhead costs as a result of the Company's restructuring. Gross profit as a percentage of net sales decreased in the fourth quarter of 1996 primarily as a result of lower net sales relative to fixed costs. Gross profit as a percentage of net sales increased in the first, second and third quarters of 1997 primarily as a result of fuller utilization of existing manufacturing capacity as a result of increased net sales.

Research and development expenses increased in the second quarter of 1996 primarily as a result of increased staffing levels and costs related to product development support. The reduction in research and development expenses in the third and fourth quarters of 1996 was primarily due to lower staffing levels and project cost reductions. The increase in research and development expenses for the second and third quarters of 1997 was primarily due to increased staffing levels.

Selling, general and administrative expenses decreased in the third and fourth quarters of 1996 primarily due to a reduction of general and administrative staffing levels as a result of the restructuring effected in the third quarter of 1996 and other cost reductions, and increased in the first quarter of 1997 primarily due to increased staffing levels and increased compensation expense. The increase in selling, general and administrative expenses in the second and third quarter of 1997 was primarily due to increased compensation expense and the write-off of certain assets with no remaining value.

Other income primarily represents gains and losses on foreign exchange contracts.

#### LIQUIDITY AND CAPITAL RESOURCES

The Company has financed its operations and capital requirements through a combination of cash provided by operations, long-term real estate financing, capital lease financing and short-term lines of credit.

Operations provided cash of \$7.7 million, \$13.2 million, \$26.3 million and \$11.7 million for 1994, 1995, 1996 and the first nine months of 1997, respectively, primarily impacted in each period by net income, depreciation and changes in the levels of inventory and accounts receivable. Investing activities utilized cash of \$4.0 million, \$13.2 million, \$10.2 million, and \$2.6 million in 1994, 1995, 1996 and the first nine months of 1997, respectively, primarily for the purchase of property and equipment in each period and, in 1994, for the purchase of investments and, in 1995, the acquisition of UTI. Financing activities utilized cash of \$2.3 million, \$0.4 million, \$15.6 million and \$7.9 million in 1994, 1995, 1996 and the first nine months of 1997, respectively, primarily for stockholder distributions in each period. Cash flows from financing activities for each period were primarily from short-term and long-term borrowings.

Working capital was \$29.5 million as of September 30, 1997. The Company has a combined \$20.0 million unsecured revolving line of credit with two domestic financial institutions, expiring June 30, 1999. The unused balance under this revolving line of credit was \$17.5 million at September 30, 1997. The Company also has lines of credit through its foreign subsidiaries with several financial institutions, totaling \$13.3 million at September 30, 1997. The total unused balance under these lines of credit was \$2.6 million at September 30, 1997. These lines generally expire and are renewed at six month intervals. In addition, the Company has outstanding term loans and mortgage loans from banks totaling \$14.4 million (net of the current portion) at September 30, 1997. See Note 6 of Notes to Consolidated Financial Statements.

The Company believes that the net proceeds from this offering, together with the cash anticipated to be generated from operations and funds available from existing credit facilities, will be sufficient to satisfy its estimated working capital and planned capital expenditure requirements through at least the next 12 months.

#### EFFECT OF CURRENCY EXCHANGE RATES AND EXCHANGE RATE RISK MANAGEMENT.

A significant portion of the Company's business is conducted outside of the United States through its foreign subsidiaries. The foreign subsidiaries maintain their accounting records in their local currencies. Consequently, period to period comparability of results of operations is affected by fluctuations in exchange rates. The Company derives a significant portion of its cash flows from foreign denominated revenue. To the extent the dollar value of foreign denominated revenue is diminished as a result of a strengthening dollar, the Company's results of operations and cash flows could be adversely affected. To mitigate the risks associated with foreign currency rate fluctuations, the Company has entered into forward exchange contracts and local currency purchased options on a continuing basis in amounts and timing consistent with the underlying currency exposures. Gains on forward exchange contracts and local currency purchased options, qualifying for hedge accounting, amounted to \$0.9 million, \$1.9 million and \$2.5 million for the years ended December 31, 1994, 1995 and 1996, respectively, and \$1.6 million and \$1.0 million for the nine months ended September 30, 1996 and 1997, respectively, and are classified in cost of sales. Losses of \$0.5 million, \$0.2 million and gains of

\$0.5 million on forward exchange contracts that did not qualify for hedge accounting were recognized in earnings for 1996 and the nine months ended September 30, 1996 and 1997, respectively, and are classified in other income (expense), net. While the Company does not issue or hold derivative financial instruments for trading purposes, there can be no assurance that any losses realized on such instruments will be fully offset by gains on the underlying exposure. Prospectively, the Company plans to use local currency purchased options, and to a lesser extent forward exchange contracts, to seek to mitigate the impact of exchange rate fluctuations. See Notes 2 and 3 of Notes to Consolidated Financial Statements.

#### RECENTLY ISSUED ACCOUNTING PRONOUNCEMENTS

See Note 2 of Notes to Consolidated Financial Statements for a discussion of the impact of recently issued accounting pronouncements.

#### YEAR 2000

The Company has commenced a study of its computer systems in order to assess its exposure to year 2000 issues. The Company expects to make necessary modifications or changes to its computer information systems to enable proper processing of transactions relating to the year 2000 and beyond. The Company will evaluate appropriate courses of action, including modification or replacement of certain software systems. However, there can be no assurance that year 2000 costs and expenses will not have a material effect on the Company.

## BUSINESS

The Company is a leading worldwide supplier of instruments and components used to measure, control, analyze and isolate gases in semiconductor and other manufacturing processes. The Company offers a comprehensive line of products which are used around the process chamber in both semiconductor front-end manufacturing processes and other advanced thin-film and vacuum-based processes used in the manufacture of, among other things, flat panel displays, magnetic and optical storage media, solar cells, fiber optic cables and gas lasers. The Company's products include: (i) pressure and flow measurement and control instruments; (ii) vacuum gauges, valves and components; and (iii) gas analysis instruments.

For over 20 years the Company has been focused on serving the needs of semiconductor device manufacturers and semiconductor equipment OEMs and has established long-term relationships with many of its customers. The Company has over 4,000 customers worldwide including most major semiconductor equipment OEMs, semiconductor device manufacturers, a broad range of industrial companies and university, government and industrial research laboratories. The Company's customers in its principal market, the semiconductor market, include Applied Materials, Eaton, Hitachi, Lam Research, TEL and ULVAC. The Company sells its products primarily through its direct sales force in 22 offices in Canada, France, Germany, Japan, Korea, the Netherlands, the United Kingdom and the United States.

## INDUSTRY BACKGROUND

In the past 35 years, significant advances in materials science and processing technologies have enabled the manufacture of products ranging from highly complex microprocessor chips to simple but effective impervious coatings for food packaging. In many materials processing applications, specific gas mixtures at precisely controlled pressures are used to create and maintain the required process atmosphere, serve as a medium to deposit source material on a substrate and provide the etchant media for removing materials from a substrate. The largest commercial application of materials science technology processes is in the manufacture of semiconductor devices.

Worldwide semiconductor sales have increased as the use of semiconductors has expanded beyond personal computer and computer systems to a wide array of additional applications such as telecommunications and data communications systems, automotive products, consumer goods, medical products and household appliances. In large part, this growth has been facilitated by the ability of semiconductor manufacturers to produce increasingly fast, more complex, higher performance semiconductors while steadily reducing cost per function, power consumption requirements and size of these products to meet end-user and system designer requirements. These improvements in the ratio of price to performance have been enabled by advancements in semiconductor process technology, which have facilitated the ability to reduce circuit geometries and subsequently increase transistor densities, or the number of transistors on a silicon wafer. These trends have driven the need for increasingly complex and sophisticated semiconductor device manufacturing processes, process equipment and process controls.

## SEMICONDUCTOR MANUFACTURING PROCESS

The front-end of the semiconductor manufacturing process, or wafer processing, requires hundreds of process steps involving the controlled application of materials on silicon wafers. These process steps take place within a process chamber, which provides a controlled environment for the fabrication of semiconductor devices. Most of the key front-end processes used in the production of semiconductors require precise control of gas pressure, flow and composition in the process chamber.

To ensure the integrity and performance of the manufacturing process, semiconductor device manufacturers require sophisticated instruments that can provide precise automated control of all major process variables within the process chamber. The process steps required to produce device features involve the control of multiple gases flowing into the process chamber at specified intervals, and at controlled pressure and vacuum levels. In a typical process step, the process chamber is evacuated to a base pressure established by a vacuum pumping system and measured with vacuum gauges. Automatic shut-off valves are sequenced to protect pumps and process instruments from exposure to atmospheric pressure. Chamber leak integrity may

be checked by gas analyzers scanning for the presence of undesirable atmospheric gases or water vapor. Mass flow controllers automatically control the flow rates of multiple gases into the process chamber. Simultaneously, the automatic pressure control system for the process chamber measures the pressure in the chamber and controls it at the desired level by electronically adjusting the position of a control valve located between the process chamber and the vacuum pump. Downstream of the process chamber, heated lines and vacuum valves and switches are used to prevent contamination of the devices as a result of backstreaming of particles and exhaust gases into the process chamber.

The front-end process steps involving gaseous media include deposition, etch, ion implantation, plasma stripping and cleaning, rapid thermal processing, diffusion and epitaxy. The most frequently employed front-end process steps requiring gaseous media are deposition, etch and ion implantation.

Deposition involves the formation of several layers of conducting, semiconducting and insulating thin films on the surface of a wafer. The two principal methods of film deposition are physical vapor deposition ("PVD"), which is used primarily to deposit conductive metal layers, and chemical vapor deposition ("CVD"), which is used primarily to deposit semiconducting and insulating thin films. In the PVD process, wafers are typically placed in a process chamber where solid sources of film materials mounted in the chamber are sputtered onto the wafer surface at precisely controlled pressures and temperatures. In the CVD process, a specially designed gas or vaporized liquid material is introduced into a pressure and temperature controlled process chamber containing the wafers. The gases interact with the wafer surface to form a semiconducting or insulating layer. The pressure in the process chamber during the deposition process and the mixture of deposition gases must be tightly controlled to achieve uniform film thickness and composition.

The etching process creates the line-widths and other feature sizes on integrated circuits. To produce specified line-widths manufacturers typically employ plasma etching techniques, which use ionized gases that chemically react with unprotected portions of the wafer to create the thinly etched features that form the patterns of the device. The pressure in the etch chamber and the mixture of etchant gases must be precisely controlled to achieve the specified side wall angle and ratio of line-widths to depths. Plasma stripping and cleaning are etching processes used to prepare the wafer surface for further processing steps.

In the ion implantation process, ions of certain materials are formed in minuscule quantities from gases introduced into a chamber on the implantation tool. The ions are generated in the chamber and are accelerated into the silicon wafer. The ions are implanted beneath the surface of the silicon, altering its electrical characteristics. The flow rates of the gases into the ion chamber and the pressure in the ion chamber must be precisely controlled to create and maintain the ion density required to achieve desired electrical characteristics.

The pressures used in semiconductor manufacturing processes range from as low as one trillionth of atmospheric pressure ( $10^{-9}$  Torr) to as high as 200 times atmospheric pressure. The following table shows the wide range of pressures required for typical semiconductor manufacturing processes:

[This table graphically depicts, using graybars, the gas pressure ranges ( $10^{-9}$  Torr to 152,000 Torr) used in various typical semiconductor process steps (Gas distribution, Atmospheric CVD, Sub-atmospheric CVD, Low Pressure CVD, Plasma Etching & Cleaning, PVD and Implant).]

[CHART]

Etching and deposition steps are repeated many times in the fabrication of a semiconductor device and require varying flow rates, pressures and gases. A typical process step uses from three to five different gases. The uptime, yield and throughput of the process depends on precise repeatable measurement and control of the specific gas pressure and flow rates, as well as the maintenance of the vacuum integrity of the process chamber and the prevention of wafer contamination from particles entering the chamber. Pressure variations of as little as one-hundred-thousandth of atmospheric pressure can change process yields significantly and errors in gas composition may impair device performance. Particle contamination can produce defects that significantly reduce device yields.

#### TRENDS IN SEMICONDUCTOR MANUFACTURING

The ability of semiconductor manufacturers to offer integrated circuits with greater functionality at higher speeds requires continuous improvements in semiconductor process equipment and process controls. The transition to smaller device geometries, such as .25 micron and smaller line-widths, may require shorter process steps and is also leading to the introduction of new materials such as copper and parylene for conductors and insulators which in turn require new technologies for delivery of gases and vapors to the process chamber. In addition, the introduction of advanced processes such as high density plasma is leading to a need for lower pressures, which are more difficult to measure and control than higher pressures. These trends, along with increased wafer sizes, which result in higher device value per wafer, are leading to the need for increased sophistication of semiconductor processing equipment, a heightened emphasis on uptime, yield and throughput and the need for more precise process controls. As a result, the design and performance of instruments that control pressure or the flow of gases, or analyze the mixture of gases, are becoming even more critical to the semiconductor manufacturing process.

At the same time, the accelerating pace of technological change and the increasing sophistication of semiconductor manufacturing equipment have led to an increase in the number of components and subsystems used in the semiconductor manufacturing process. To help address this increased complexity, semiconductor equipment manufacturers are increasingly seeking to establish relationships with a smaller group of broad-based suppliers that provide (i) value-added, integrated component solutions that address multiple steps in the semiconductor manufacturing process, (ii) a worldwide sales and support infrastructure and (iii) advanced technological capabilities to meet their needs on a worldwide basis.

## MKS STRATEGY

The Company's objective is to be the leading worldwide supplier of instruments and components used to measure, control, analyze and isolate gases in semiconductor and other advanced thin-film materials processing applications. The principal elements of the Company's strategy to achieve this objective are set forth below:

**Extend Technology Leadership.** The Company seeks to apply its expertise in vacuum, pressure and flow measurement and control technologies to develop advanced products that meet the critical gas-related process requirements of semiconductor and advanced thin-film materials manufacturers. The Company has introduced technological innovations including corrosion-resistant pressure and vacuum sensors, closed-loop low pressure and vacuum control systems, and transducer-configured residual gas analyzers. The Company has developed, and continues to develop, new products to address emerging industry trends such as the transition from the use of 200mm wafers to 300mm wafers and the shrinking of integrated circuit line-widths from .35 micron to .25 and .18 micron and smaller. The Company has supplied pre-production equipment to be incorporated into semiconductor equipment OEM 300mm pre-production wafer process equipment which is expected to be included in pilot product lines of device manufacturers. The Company has also developed equipment that is being used by research laboratories for devices using .18 micron line-widths. In addition, the Company has developed and, continues to develop materials delivery systems for new classes of materials, such as copper and parylene, that are beginning to be used in small geometry manufacturing technologies. In addition, the Company has been a leader in making its products compatible with emerging digital network standards, such as DeviceNet, for enabling components used in semiconductor manufacturing processes to transmit self-diagnostic and other information on a digital host network while reducing system complexity and space requirements.

**Offer Comprehensive Product Lines.** The Company believes that it offers the widest range of pressure and vacuum measurement and control products serving the semiconductor industry. The Company offers a full line of products including pressure and flow measurement and control instrumentation products; vacuum gauges, valves and components; and gas analysis instruments. Since the development of its original Baratron laboratory-based instrument in 1961, the Company has continuously enhanced and expanded its product offerings in response to the evolving needs of its customers. In 1997, for example, the Company introduced various new products and enhancements to existing products, including the Micro Baratron instrument, a significantly smaller version of its pressure measurement product, and a new low vapor pressure material delivery system. The Company plans to introduce new products in 1998, including a line of mass flow calibrators and process monitoring hardware and software for residual gas analysis. The Company plans to continue to expand its product lines through both internal development and acquisitions of complementary businesses, products and technologies.

**Build Upon Close Working Relationships with Customers.** The Company has been focused on serving the needs of semiconductor device manufacturers and semiconductor equipment OEMs for over 20 years and has established long-term relationships with many of its customers. The Company works closely with its OEM customers on future generation designs to provide products that are tailored for their specific needs. The Company works with its customers at the pre-design and design stage to identify and respond to their requests for current and future generations of products. These close working relationships also allow the Company to understand and address the cost and performance expectations of its customers. The Company plans to enhance its relationships with its major customers and identify opportunities to develop similar relationships with additional semiconductor equipment OEMs and device manufacturers.

**Pursue Applications in Related Markets.** The Company is leveraging its accumulated expertise in the semiconductor industry by developing products for applications that employ production processes similar to semiconductor fabrication processes in their reliance upon gases and vacuum-based production technologies. Applications served by the Company outside the semiconductor industry include vacuum freeze-drying of pharmaceuticals and foods, sterilization of medical appliances, and applications that involve advanced thin-film manufacturing such as flat panel displays, magnetic and optical storage media, solar cells, fiber optic

cables and optical coatings. The Company plans to continue to identify and develop products that address advanced materials processing applications where gas management plays a critical role.

Leverage Global Infrastructure. As semiconductor device manufacturers have become increasingly sensitive to the significant costs of system downtime, they have required that suppliers offer comprehensive local repair service and close customer support. Manufacturers require close support to enable them to repair, modify, upgrade and retrofit their equipment to improve yields and adapt to new materials or processes. To meet these market requirements, MKS maintains a worldwide sales and support organization with offices in 22 locations. The Company currently manufactures its products at nine facilities in the United States and abroad. The Company continues to devote significant resources to expand and maintain its worldwide production and service capabilities to meet the global demand for gas management instruments and components. The Company believes that the ability to manufacture reliable instruments and components in a cost-effective manner is critical to meet the demanding "just-in-time" delivery requirements of its OEM and end-user customers. During the year ending December 31, 1998, the Company plans to add manufacturing capabilities to its Austin, Texas and United Kingdom facilities and further equip its cleanroom facilities in Andover and Methuen, Massachusetts. The Company intends to open a sales and support facility in Singapore also in 1998.

## PRODUCTS

MKS offers a full line of instruments and components that are used to measure, control, analyze and isolate gases in semiconductor and other advanced thin-film manufacturing processes. The Company supplies products in three principal areas: (i) pressure and flow measurement and control instrumentation products; (ii) vacuum gauges, valves and components; and (iii) gas analysis instruments.

The following schematic shows where MKS products are used in a typical semiconductor manufacturing process.

[MANUFACTURING SCHEMATIC]

1. Ultraclean  
Mini-Baratron  
Pressure Transducer  
and Local Display  
Module
2. Automatic Pressure  
Controller/  
Regulator
3. Thermal Mass Flow  
Controller or  
Pressure-based Mass  
Flow Controller
4. Gas Box Rate-of-Rise  
In-situ Calibrator
5. Control and Shut-off  
Valves
6. Direct Liquid  
Injection --  
Controller
7. Direct Liquid  
Injection --  
Micropump
8. Direct Liquid  
Injection --  
Vaporizer
9. RGA Mass  
Spectrometer with  
Software
10. Baratron Pressure  
Switch
11. In Situ Diagnostics  
Access Valve
12. Baratron Pressure  
Transducer
13. Automatic  
Downstream valve  
Controller
14. Vacuum Foreline
15. In-line Valve
16. Convection Pirani  
Gauge
17. Throttle Valve
18. Cold Cathode High  
Vacuum Gauge or Hot  
Cathode High Vacuum  
Gauge
19. In-line Trap
20. Foreline/Exhaust  
Line Heaters

[The schematic is the illustration of a typical process chamber, with numerous MKS products surrounding the chamber. The products are as those listed to the right of the schematic.]

#### PRESSURE AND FLOW MEASUREMENT AND CONTROL INSTRUMENTATION PRODUCTS

The Company designs and manufactures a wide range of pressure and flow measurement and control instrumentation. Each product line consists of products which are designed for a variety of pressure and flow ranges and accuracies.

**Baratron Pressure Measurement Products.** The Company's Baratron pressure measurement products are high-resolution, variable capacitance pressure measurement instruments and consist of five product lines that range from high accuracy digital output instruments to simple electronic switches. These products are typically used to measure the pressure of the gases being distributed upstream of the process chamber, to measure process chamber pressure and to measure pressures between the process chamber and the pump. Baratron instruments measure pressures at ranges from two hundred times atmospheric pressure to  $10(-6)$  Torr. The Company believes it offers the widest range of variable capacitance gas pressure measurement instruments in the semiconductor and advanced thin-film materials processing industries.

A key feature of Baratron instruments is that they measure pressure independent of gas composition, which is critical for precise pressure control of semiconductor processes that involve gas mixtures. In these processes, there is a need to control both pressure and gas mixture, but the pressure measurement instrument must measure only the pressure of the sum of the gases in the chamber, independent of gas composition. The Baratron line of instruments enables users to achieve a highly accurate and repeatable measurement of gas pressure. Pressure measurement, independent of gas composition, is also useful in evacuation (removal of atmospheric gases) and backfilling (introduction of specific amounts of several gases) applications, such as fluorescent bulb manufacturing and gas laser fabrication.

The following table shows the Company's principal Baratron pressure measurement product lines:

BARATRON PRESSURE MEASUREMENT PRODUCTS

PRODUCT LINES	TYPICAL APPLICATIONS	DESCRIPTION	RANGES OF LIST PRICES
High accuracy pressure and vacuum measurement instruments	CVD PVD Etch Pressure calibration	Instruments with built-in temperature stabilization features, for high accuracy and high temperature operation	\$ 2,125 - \$6,125
General purpose pressure and vacuum measurement instruments	CVD PVD Etch	Rugged instruments with and without built-in temperature stabilization features, for reliable, accurate, process measurement	\$450 - \$3,600
Ultra-clean high pressure and vacuum measurement instruments	Gas Distribution CVD Etch	Instruments with ultra- clean surfaces exposed to gas, for high purity applications	\$650 - \$950
General purpose "MINI" pressure and vacuum measurement instruments	CVD Etch	Small footprint instruments for accurate, general purpose process measurement	\$625 - \$1,700
Electronic switches ranging from atmosphere to vacuum	PVD CVD Etch	Economical, stable instrument providing "go/no-go" output for pressure trip-points and alarms	\$375 - \$650

The Company's list prices for its Baratron measurement products vary depending upon accuracy, pressure range, operating temperature range, stability, resolution and gas purity specifications.

Pressure Control Products. The Company's pressure control products consist of analog and digital automatic pressure and vacuum control electronic instruments and valves. These products enable precise control of process pressure by electronically actuating valves which control the flow of gases in and out of the process chamber to minimize the difference between desired and actual pressure in the chamber. The electronic controllers vary from simple analog units with precise manual tuning capability to state-of-the-art self-tuning, digital signal processing controllers. The valve products vary from small gas inlet valves to large exhaust valves.

In most cases, the Company's Baratron pressure measurement instruments provide the pressure input to the pressure control device, providing the user with an integrated closed-loop pressure control system. The Company's pressure control products can also accept inputs from other measurement instruments, enabling the control of gas input or exhaust based on parameters other than pressure.

## PRESSURE AND VACUUM CONTROL PRODUCTS

PRODUCT LINES	TYPICAL APPLICATIONS	DESCRIPTION	RANGES OF LIST PRICES
Downstream automatic valve controllers	CVD Etch	Analog controllers, self-tuning digital controllers and displayless self-tuning controllers	\$850 - \$2,000
Downstream exhaust control throttle valves	CVD Etch	Non-sealing valves, sealing valves, high speed sealing valves, microprocessor-based smart throttle valves and vane-type valves	\$ 1,250 - \$8,200
Upstream or downstream automatic controllers	CVD Etch Implant Backside wafer cooling	Integrated sensor, valve and control electronics package	\$ 1,400 - \$3,000
Upstream control valves	Etch Implant Backside wafer cooling	Elastomer and all-metal-sealed valves	\$450 - \$1,500

The Company has recently introduced a line of integrated pressure controllers that combine the functions of its Baratron pressure measurement instrument, control electronics and valve into a three-inch footprint instrument which can be placed directly on a gas line to control pressure either upstream or downstream of the instrument. This addresses the need for smaller components, saving valuable clean room space.

Flow Measurement and Control Products. The Company's flow measurement products include gas, vapor and liquid flow measurement products based upon thermal conductivity, pressure and direct liquid injection technologies. The flow control products combine the flow measuring device with valve control elements based upon solenoid, piezo-electric and piston pump technologies. The products measure and control the mass flow rate of gases and vapors into the process chamber. The Company's broad product lines include products that allow the precise flow control of inert or corrosive gases, the control of low vapor pressure gases, and heated liquid source materials, and the control of delicate, advanced technology liquid sources and dissolved solid sources for next generation devices.

The Company's line of thermal-based mass flow controllers includes all-metal-sealed designs and ultra-clean designs for semiconductor applications and general purpose controllers for applications where all-metal-sealed construction is not required. The Company has also developed pressure-based mass flow controllers, based on Baratron pressure instrument measurement and control technology, which use flow restrictors in the gas line to transform pressure control into mass flow control.

## FLOW MEASUREMENT AND CONTROL PRODUCTS

PRODUCT LINES	TYPICAL APPLICATIONS	DESCRIPTION	RANGES OF LIST PRICES
Direct liquid injection system	CVD	Pumps and vaporizes liquid metal and dielectric precursors into process chamber	\$8,500 - \$24,900
Gas box rate of rise calibrator	In situ calibration of mass flow controllers	Measures pressure increase with time in a known volume	\$7,500
Pressure-based vapor delivery systems	CVD	Measures and controls flow of low pressure vapors into chamber	\$4,600 - \$12,400
Pressure-based mass flow controllers	CVD Implant	Gas flow controller consisting of Baratron sensor, control valve, orifice, and electronics	\$2,700
Ultra-clean all-metal-sealed thermal mass flow controllers	CVD PVD Etch	Gas flow controller consisting of sensor, control valve and electronics	\$1,400 - \$13,850
General purpose elastomer-sealed mass flow controllers	CVD Etch	Gas flow controller consisting of sensor, control valve and electronics	\$875 - \$2,000

Certain new materials required for the next generation of semiconductor devices are difficult to control using traditional thermal mass flow technology. To control these new materials, the Company has designed a direct liquid injection subsystem ("DLI") which pumps a precise volume of liquid into a vaporizer, which in turn supplies a controlled flow of vapor into the process chamber. The DLI pump and vaporizer are presently used principally for research and development applications for next generation semiconductor device conductors and insulators, such as copper and parylene.

The Company's flow measurement products also include an in situ calibration system which independently measures mass flow and compares this measurement to that of the process chamber mass flow controller. The demand for the Company's calibration system is driven by the increasingly stringent process control needs of the semiconductor industry and the need to reduce costly downtime resulting from stopping operations to address mass flow controller problems.

## VACUUM GAUGES, VALVES AND COMPONENTS

The Company is a leading supplier of vacuum gauges, valves and components. The Company offers a wide range of vacuum instruments consisting of vacuum measurement sensors and associated power supply and readout units. These vacuum gauges measure phenomena that are related to the level of pressure in the process chamber and downstream of the process chamber between the chamber and the pump, but, unlike Baratron pressure measurement instruments, do not measure pressure directly. These gauges are used to measure vacuum at pressures lower than those measurable with a Baratron pressure measurement instrument or to measure vacuum in the Baratron pressure measurement instrument range where less accuracy is required. The Company's indirect pressure gauges use thermal conductivity and ionization gauge technologies to measure pressure from atmospheric pressure to 10(-9)Torr. The Company's Baratron pressure measurement instruments, together with its vacuum gauges are capable of measuring the full range of pressures used in semiconductor and other thin-film manufacturing processes from 200 times atmospheric pressure to 10(-9)Torr.

The Company also manufactures a wide range of vacuum gauge instruments in which the associated electronics are packaged with the vacuum sensor, reducing panel space and installation cost. The Company offers both analog and digital versions of these vacuum gauge transducers.

VACUUM GAUGES, VALVES AND COMPONENT PRODUCTS

PRODUCT LINES	TYPICAL APPLICATIONS	DESCRIPTION	RANGES OF LIST PRICES
Cold cathode and hot filament vacuum gauges	PVD Etch	Electronic gauges to measure pressure down to 10(-9) Torr	\$600 - \$6,200
Convection gauges	PVD CVD Etch	Electronic gauges to measure from atmosphere down to 10(-3) Torr	\$200 - \$725
Right-angle and in-line shut-off valves	PVD CVD Etch Implant	High vacuum rapid action poppet valves	\$275 - \$4,500
Vacuum traps	CVD Etch	Contaminant particle trap	\$1,800 - \$2,500
Other vacuum components	PVD CVD Etch Implant	Flanges, fittings and heated lines	\$325 - \$1,650

The Company's vacuum valves are used on the gas lines between the process chamber and the pump downstream of the process chamber for CVD, PVD, implant and etch processes. The Company's vacuum components consist of fittings, flanges, traps and heated lines that are used downstream from the process chamber to provide leak free connections and to prevent condensable materials from depositing particles near or back into the chamber. The manufacture of small geometry devices cannot tolerate contamination from atmospheric pressure or particles. The Company's vacuum components are designed to minimize such contamination and thus increase yields and uptimes.

GAS ANALYSIS INSTRUMENTS

The Company's gas analysis instruments are sold primarily to the semiconductor industry. The residual gas analysis product lines include a quadrupole mass spectrometer sensor with built-in electronics to analyze the composition of background and process gases in the process chamber. The Company's ORION process monitoring system is a sophisticated quadrupole mass spectrometer process analyzer for statistical process monitoring of manufacturing processes operating from very low pressures to atmospheric pressure. These instruments are provided both as portable laboratory systems and as process gas monitoring systems used in the diagnosis of semiconductor manufacturing process systems. The gas monitoring systems can indicate out-of-bounds conditions, such as the presence of undesirable atmospheric gases, water vapor or out-of-tolerance amounts of specific gases in the process chamber, enabling operators to diagnose and repair faulty equipment. The Company's gas sampling systems provide a turn-key solution for withdrawing gases from chambers at relatively high pressures for introduction into the low pressure gas analyzers. Next generation, smaller geometry and larger wafer size device manufacturing processes are expected to require sophisticated gas analysis instruments and or monitoring equipment to ensure tighter process control and earlier diagnosis of equipment failures.

MARKETS AND APPLICATIONS

The Company estimates that approximately two-thirds of its sales in the first nine months of 1997 were made to the semiconductor industry. The Company's products are also used in other markets and applications

including the manufacture of flat panel displays, magnetic and optical storage media, solar cells, fiber optic cables and optical coatings. The Company sells its products primarily through its direct sales force which consists of 134 employees in 22 offices in Canada, France, Germany, Japan, Korea, the Netherlands, the United Kingdom and the United States. This direct sales force is supplemented by sales representatives and agents in China, India, Israel, Italy, Singapore and Taiwan and in selected domestic cities. The major markets for the Company's products include:

#### Semiconductor Manufacturing

The Company's products are sold to semiconductor device manufacturers and semiconductor equipment OEMs. The Company's products are used in the major front-end process technologies such as PVD, CVD, etch and ion implantation and for process facility applications such as gas distribution, clean room pressure control and vacuum distribution. The Company anticipates that the semiconductor manufacturing market will continue to account for a substantial portion of its sales. While the semiconductor device manufacturing market is global, the major semiconductor equipment OEMs are concentrated in the U.S., Japan and Europe.

#### Flat Panel Display Manufacturing

The Company's products are used in the manufacture of flat panel displays, which require the same or similar fabrication processes as semiconductor manufacturing. The dominant fabrication process is CVD, which uses the same or similar Company products as CVD for semiconductor manufacturing. The Company sells its products both to OEMs and to end-users in the flat panel display market. The transition to larger panel size and higher definition is driving the need for defect reduction which requires tighter process controls.

#### Magnetic and Optical Storage Media

The Company's products are used in the manufacture of CD-ROMs, CDs, hard disks, and DVDs (digital video disks), typically in PVD applications. The Company's products are also used in the production of thin-film heads where ion beam technology is typically used. The transition to higher density storage capacity requires manufacturing processes incorporating tighter process controls. While storage media manufacturing is global, the major manufacturers are concentrated in Japan and the Asia-Pacific region and equipment OEMs are concentrated in the U.S., Japan and Europe.

#### Optical Fiber and Optical Coating

The Company's products are used in optical fiber and optical coating film processes. The Company's products are sold both to coating equipment OEMs and to manufacturers of products made using optical thin-films processes. Optical fibers used for data transmission are manufactured using CVD processes similar to those used in semiconductor manufacturing. The requirement for greater data transmission is driving the need for tighter control of optical fiber coating processes. Optical thin films for eyeglasses, solar panels and architectural glass are deposited using evaporation, CVD or PVD in processes similar to those used in semiconductor manufacturing. Optical fiber manufacturing and optical thin-film processing are concentrated in the U.S., Japan and Europe.

The Company estimates that the flat panel display, magnetic and optical storage media, optical fiber and optical coating markets, combined, accounted for approximately 13% of net sales for 1996 and the first nine months of 1997.

#### Other Markets

The Company's pressure and flow measurement and control instruments are also used in CVD and PVD processes for the application of thin films to harden tool bit surfaces, in the production of diamond thin films, in plasma processes used to sterilize medical instruments, in vacuum freeze drying of pharmaceuticals, foods and beverages and in vacuum processes involved in light bulb and gas laser manufacturing. The major OEMs and manufacturers are concentrated in the U.S., Japan and Europe.

#### CUSTOMERS

The Company has more than 4,000 active customers worldwide (having purchased products during the past year), including most major semiconductor device manufacturers, semiconductor equipment OEMs and

industrial and research laboratories. The Company's largest customers consist primarily of leading semiconductor equipment OEMs and semiconductor device manufacturers, including Applied Materials, Eaton, Hitachi, Lam Research, TEL and ULVAC. In 1995 and 1996 and the first nine months of 1997, sales to the Company's top five customers accounted for approximately 24%, 26% and 31%, respectively, of the Company's net sales. During the same periods, international sales represented approximately 32%, 30% and 28% of total net sales, respectively. During the first nine months of 1997, Applied Materials accounted for approximately 21% of the Company's net sales. Applied Materials purchases products from the Company under the terms of an agreement, with no minimum purchase requirements, that expires in 2002.

#### SALES, MARKETING AND SUPPORT

The Company's worldwide sales, marketing and support organization is critical to its strategy of maintaining close relationships with semiconductor equipment OEMs and device manufacturers. The Company sells its products primarily through its direct sales force which consists of 134 employees in 22 offices in Canada, France, Germany, Japan, Korea, the Netherlands, the United Kingdom and the United States. This direct sales force is supplemented by sales representatives and agents in China, India, Israel, Italy, Singapore and Taiwan and in selected domestic cities. The Company maintains a marketing staff of 24 employees to identify customer requirements, assist in product planning and specifications and to focus on future trends in the semiconductor and other markets.

As semiconductor device manufacturers have become increasingly sensitive to the significant costs of system downtime they have required that suppliers offer comprehensive local repair service and close customer support. Manufacturers require close support to enable them to repair, modify, upgrade and retrofit their equipment to improve yields and adapt new materials or processes. To meet these market requirements, the Company maintains a worldwide sales and support organization with offices in 22 locations. Technical support is provided by applications engineers located at offices in Arizona, California, Colorado, Massachusetts, Oregon and Texas, as well as Canada, France, Germany, India, Israel, Italy, Japan, Korea, the Netherlands, Singapore, Taiwan and the United Kingdom. Repair and calibration services are provided at 14 service depots located both in the United States and abroad. The Company provides warranties from one to three years, depending upon the type of product. In addition, the Company offers training programs for its customers in a wide range of vacuum and gas handling technologies.

#### MANUFACTURING

The Company believes that the ability to manufacture reliable gas management instruments and components in a cost-effective manner is critical to meeting the demanding requirements of its OEM and end-user customers. The Company monitors and analyzes product lead times, warranty data, process yields, supplier performance, field data on mean time between failures, inventory turns, repair response time and other indicators so that it may continuously improve its manufacturing processes. The Company has adopted a total quality management process. Certain of the Company's major manufacturing and service operations are ISO 9001 certified and the Company is planning to implement ISO 9000 for the remainder of its U.S. and European operations by the end of 1998.

The Company is devoting significant financial and management resources to maintain and expand its worldwide production and service capabilities to meet the global demand for gas management instruments and components. The Company believes that the ability to manufacture reliable instruments and components in a cost-effective manner is critical to meet the demanding "just-in-time" delivery requirements of its OEM and end-user customers. Due to the short time between the receipt of orders and shipments, the Company normally operates with a level of backlog that is not significant. The Company currently manufactures its products at nine facilities in the United States and abroad. The Company plans in the year ending December 31, 1998 to add manufacturing capabilities to its Austin, Texas and United Kingdom facilities and further equip its cleanroom facilities in Andover and Methuen, Massachusetts. See "Use of Proceeds."

The Company's principal manufacturing activities consist of precision assembly, test, calibration, welding and machining activities. The Company subcontracts a portion of its assembly, machining and printed circuit board assembly and testing. All other assembly, test and calibration functions are performed by the Company. Critical assembly activities are performed in cleanroom environments at the Company's facilities.

## RESEARCH AND DEVELOPMENT

The Company's research and development efforts are directed toward developing and improving the Company's gas management instruments and components for semiconductor and advanced thin-film processing applications and identifying and developing products for new applications for which gas management plays a critical role. The Company has undertaken an initiative to involve its marketing, engineering, manufacturing and sales personnel in the concurrent development of new products in order to reduce the time to market for new products. The Company's employees also work closely with its customers' development personnel. These relationships help the Company identify and define future technical needs on which to focus its research and development efforts. In addition, the Company participates in SEMI/SEMATECH, a consortium of semiconductor equipment suppliers, to assist in product development and standardization of product technology, and it supports research at academic institutions targeted at advances in materials science and semiconductor process development.

As of September 30, 1997, the Company employed a research and development staff of 131 employees. In 1995, 1996 and the first nine months of 1997, the Company's research and development expenditures were approximately \$10.9 million, \$14.2 million and \$10.3 million, respectively, representing approximately 7.0%, 8.3% and 7.7% of net sales.

## COMPETITION

The market for the Company's products is highly competitive. Principal competitive factors include historical customer relationships; product quality, performance and price; breadth of product line; manufacturing capabilities; and customer service and support. While the Company believes that it competes favorably with respect to these factors, there can be no assurance that it will continue to do so.

The Company encounters substantial competition in each of its product lines from a number of competitors, although no one competitor competes with the Company across all product lines. Certain of the Company's competitors have greater financial and other resources than the Company. In some cases, the competitors are smaller than the Company, but well established in specific product niches. Millipore offers products that compete with the Company's pressure and flow products. AERA, STEC and Unit Instruments each offer products that compete with the Company's mass flow control products. NOR-CAL and MDC each offer products that compete with the Company's vacuum components. Leybold-Inficon offers products that compete with the Company's vacuum measuring and gas analysis products. Spectra Instruments offers products that compete with the Company's gas analysis products. In some cases, particularly with respect to mass flow controllers, end-user semiconductor device manufacturers may direct semiconductor equipment OEMs to use a specified supplier's product in their equipment. Accordingly, the Company's success depends in part on its ability to have semiconductor device manufacturers specify that its products be used at their fabrication facilities and the Company may encounter difficulties in changing established relationships of competitors with a large installed base of products at such customers' fabrication facilities. In addition, the Company's competitors can be expected to continue to improve the design and performance of their products. There can be no assurance that competitors will not develop products that offer price or performance features superior to those of the Company's products.

## PATENTS AND OTHER INTELLECTUAL PROPERTY RIGHTS

The Company relies on a combination of patent, copyright, trademark and trade secret laws and license agreements to establish and protect its proprietary rights. The Company has 38 U.S. patents and 21 U.S. patent applications pending. Foreign counterparts of certain of these applications have been filed or may be filed at the appropriate time. While the Company believes that certain patents may be important for certain aspects of its business, the Company believes that its success depends more upon close customer contact, innovation, technological expertise, responsiveness and worldwide distribution.

The Company requires each of its employees, including its executive officers, to enter into standard agreements pursuant to which the employee agrees to keep confidential all proprietary information of the Company and to assign to the Company all inventions made while in the employ of the Company.

## EMPLOYEES

As of September 30, 1997, the Company employed 1,126 persons, including 711 in manufacturing, 131 in research and development, 284 in marketing, sales, support and general and administrative activities. Management believes that the Company's ongoing success depends upon its continued ability to attract and retain highly skilled employees. None of the Company's employees is represented by a labor union or party to a collective bargaining agreement. The Company believes that its employee relations are good.

## FACILITIES

The Company sells its products primarily through its direct sales force in 22 offices in Canada, France, Germany, Japan, Korea, the Netherlands, the United Kingdom and the United States. The direct sales force is supplemented by sales representatives and agents in China, India, Israel, Italy, Singapore and Taiwan and in selected domestic cities. The Company's corporate headquarters are located in Andover, Massachusetts. Manufacturing and other operations are conducted in a number of locations worldwide. The Company's minimum payments for leased real estate for year ending December 31, 1998 are expected to be \$1,073,000. The Company believes that the current facilities along with the planned addition for 1998 will be adequate and suitable to meet its needs for the foreseeable future. The following table provides information concerning the Company's principal and certain other owned and leased facilities:

LOCATION	SQ. FT.	ACTIVITY	PRODUCTS MANUFACTURED	LEASE EXPIRES
Andover, Massachusetts	82,000	Headquarters, Manufacturing, Customer Support and Research & Development	Baratron pressure measurement products	(1)
Boulder, Colorado	86,000	Manufacturing, Customer Support, Service and Research & Development	Vacuum gauges, valves and components	(2)
Methuen, Massachusetts	85,000	Manufacturing, Customer Support, Service and Research & Development	Pressure control and flow measurement and control products	(1)
Lawrence, Massachusetts	40,000	Manufacturing	Baratron pressure measurement products	(1)
San Jose, California	35,900	Sales and Service		2/14/98
Tokyo, Japan	20,700	Manufacturing, Sales, Customer Support, Service and Research & Development	Mass flow measurement and control products	(3)
Walpole, Massachusetts	20,000	Manufacturing, Customer Support, Service and Research & Development	Gas analysis instruments	3/31/00*
Munich, Germany	14,100	Manufacturing, Sales, Customer Support, Service and Research & Development	Mass flow measurement and control products	(1)
Le Bourget, France	13,700	Sales, Customer Support and Service		(1)
Santa Clara, California	15,600	Sales, Customer Support and Service		(4)**
Richardson, Texas	14,600	Manufacturing, Sales, Customer Support and Service	Subassemblies	8/31/98
Austin, Texas	8,200	Sales, Customer Support and Service		1/30/03

LOCATION	SQ. FT.	ACTIVITY	PRODUCTS MANUFACTURED	LEASE EXPIRES
Seoul, Korea	4,760	Manufacturing, Sales, Customer Support and Service	Mass flow measurement and control products	5/98*
Manchester, U.K.	2,200	Sales, Customer Support and Service		10/5/09
Ottawa, Canada	2,095	Sales, Customer Support and Service		(1)

(1) This facility is owned by the Company.

(2) The Company leases one facility which has 39,000 square feet of space and a lease term which expires 10/31/98 and owns a second and third facility with 28,000 and 19,000 square feet of space, respectively.

(3) The Company leases a facility which has 14,000 square feet of space and a lease term which expires 4/30/99 and owns another facility with 6,700 square feet of space.

(4) The Company leases one facility with 4,000 square feet of space on a month-to-month basis, a second facility of 4,000 square feet with a lease term which expires on 1/30/00 and a third facility of 2,600 square feet with a lease term which expires 6/30/99. The Company owns a fourth facility of 5,000 square feet.

\* The Company has an option to extend these leases for a period of 2 years.

\*\* The Company has an option to extend these leases for a period of 18 months.

In addition to manufacturing and other operations conducted at the foregoing leased or owned facilities, the Company provides worldwide sales, customer support and services from various other leased facilities throughout the world. See "Business -- Sales, Marketing and Support."

#### LEGAL PROCEEDINGS

The Company is not a party to any material legal proceedings.

## MANAGEMENT

## EXECUTIVE OFFICERS AND DIRECTORS

The executive officers and directors of the Company as of October 31, 1997 are as follows:

NAME	AGE	POSITION
John R. Bertucci.....	56	Chairman of the Board of Directors, President and Chief Executive Officer
Ronald C. Weigner.....	52	Vice President and Chief Financial Officer
John J. Sullivan.....	62	Executive Vice President of Technology
William D. Stewart.....	53	Corporate Vice President and General Manager, Vacuum Products
Leo Berlinghieri.....	44	Corporate Vice President, Customer Support Operations
Richard S. Chute(1).....	59	Director
Owen W. Robbins(2).....	68	Director
Robert J. Therrien(1).....	63	Director
Louis P. Valente(1)(2).....	67	Director

(1) Member of Compensation Committee.

(2) Member of Audit Committee.

Mr. Bertucci has served as President of the Company since 1974 and has been Chief Executive Officer and Chairman of the Board of Directors since November 1995. From 1970 to 1974, he was Vice President and General Manager of the Company. Mr. Bertucci has an M.S. in Industrial Administration and a B.S. in Metallurgical Engineering from Carnegie-Mellon University. Mr. Bertucci is also a director of Applied Science and Technology Corporation.

Mr. Weigner has served as Vice President and Chief Financial Officer of the Company since November 1995. From September 1991 until November 1995, he was Vice President and Corporate Controller of the Company and from 1980 to 1993 he was Corporate Controller. Mr. Weigner is a certified public accountant and has a B.S. in Business Administration from Boston University.

Mr. Sullivan has served as Executive Vice President of Technology of the Company since March 1995. From 1982 to March 1995, Mr. Sullivan was Vice President of Marketing of the Company and from 1975 to 1982 he was Vice President of Sales and Marketing of the Company. Mr. Sullivan has an M.S. and a B.S. in physics from Northeastern University.

Mr. Stewart has served as Corporate Vice President and General Manager, Vacuum Products since November 1997. From October 1986 to November 1997 he was President of the Company's HPS Vacuum Products group, which the Company acquired in October 1986. Mr. Stewart co-founded HPS in 1976. Mr. Stewart has an M.B.A. from Northwestern University and a B.S. in Business Administration from the University of Colorado. Mr. Stewart also serves on the Board of Directors of the Janus Fund.

Mr. Berlinghieri has served as Corporate Vice President, Customer Support Operations for the Company since November 1995. From 1980 to November 1995, Mr. Berlinghieri served in various management positions for the Company, including Manufacturing Manager, Production & Inventory Control Manager, and Director of Customer Support Operations. Mr. Berlinghieri is also Treasurer of the TQM-Base Council, Inc., (a non-profit quality management consortium comprised of Boston-area semiconductor and capital equipment manufacturers).

Mr. Chute has served as a director of the Company since 1974. Mr. Chute has been a member of the law firm of Hill & Barlow, a professional corporation, since November 1971.

Mr. Robbins has served as a director of the Company since February 1996. Mr. Robbins was Executive Vice President of Teradyne, Inc., a manufacturer of electronic test systems and backplane connection systems used in the electronics and telecommunications industries from March 1992 to May 1997, and its Chief

Financial Officer from February 1980 to May 1997. Mr. Robbins has served on the Board of Directors of Teradyne since March 1992 and was Vice Chairman from January 1996 to May 1997.

Mr. Therrien has served as a director of the Company since February 1996. Mr. Therrien has been President and Chief Executive Officer of Brooks Automation, Inc., a manufacturer of semiconductor processing equipment, since 1989.

Mr. Valente has served as a director of the Company since February 1996. Mr. Valente was a Senior Vice President of Acquisitions, Mergers and Investments of EG&G, Inc. from 1991 until July 1995. Mr. Valente has been President and Chief Executive Officer of Palomar Medical Technologies, Inc. ("PMT"), a company which designs, manufactures and markets cosmetic lasers, from May 1997 to September 1997, its Chairman of the Board of Directors and Chief Executive Officer from September 1997 to present and a director of PMT since February 1997. Mr. Valente is also a director of Micrion Corporation.

Executive officers of the Company are elected by the Board of Directors on an annual basis and serve until their successors are duly elected and qualified. There are no family relationships among any of the executive officers of the Company.

#### COMMITTEES OF THE BOARD OF DIRECTORS

The Compensation Committee consists of Messrs. Chute, Therrien and Valente. The Compensation Committee reviews and evaluates the salaries, supplemental compensation and benefits of all officers of the Company, reviews general policy matters relating to compensation and benefits of employees of the Company and makes recommendations concerning these matters to the Board of Directors. The Compensation Committee also administers the Company's stock option and stock purchase plans. See "-- Stock Plans."

The Audit Committee consists of Messrs. Robbins and Valente. The Audit Committee reviews with the Company's independent auditors the scope and timing of their audit services, the auditor's report on the Company's financial statements following completion of their audit and the Company's policies and procedures with respect to internal accounting and financial controls. In addition, the Audit Committee will make annual recommendations to the Board of Directors for the appointment of independent auditors for the ensuing year.

#### DIRECTOR COMPENSATION

Directors of the Company are reimbursed for expenses incurred in connection with their attendance at Board and committee meetings. Directors who are not employees of the Company are paid an annual fee of \$10,000 and \$1,000 for each Board meeting they attend and \$500 for each committee meeting they attend which is not held on the same day as a Board meeting. Messrs. Chute, Robbins, Therrien and Valente, the Company's four non-employee directors, have each been granted options, under the Company's 1996 Director Stock Option Plan, to purchase 5,125 shares of Common Stock at an exercise price of \$6.64 per share and will be eligible for future grants under the Company's 1997 Director Stock Option Plan.

#### COMPENSATION COMMITTEE INTERLOCKS AND INSIDER PARTICIPATION

The Compensation Committee is currently comprised of Messrs. Chute, Therrien and Valente. No member of the Compensation Committee was at any time during the fiscal year ended December 31, 1996 or at any other time an employee of the Company. No executive officer of the Company serves as a member of the board of directors or compensation committee of any other entity which has one or more executive officers serving as a member of the Company's Board of Directors or Compensation Committee.

#### EXECUTIVE COMPENSATION

The following table sets forth information with respect to the compensation of the Company's Chief Executive Officer and each of the four other most highly compensated executive officers for the year ended December 31, 1996 (the "Named Executive Officers").

## SUMMARY COMPENSATION TABLE

NAME AND PRINCIPAL POSITION	ANNUAL COMPENSATION			LONG-TERM COMPENSATION	
	SALARY	BONUS	OTHER ANNUAL COMPENSATION	AWARDS	
				SECURITIES UNDERLYING OPTIONS	ALL OTHER COMPENSATION (2)
John R. Bertucci..... President and Chief Executive Officer	\$319,712		--	--	\$15,942
Ronald C. Weigner..... Vice President and Chief Financial Officer	153,555		--	53,031	12,000
John J. Sullivan..... Executive Vice President of Technology	135,962		\$ 30,959(1)	--	11,957
William D. Stewart..... Corporate Vice President and General Manager, Vacuum Products	166,250		--	32,098	12,000
Leo Berlinghieri..... Corporate Vice President, Customer Support Operations	121,755		--	30,338	7,500

(1) Includes a transportation allowance of \$21,127.

(2) Includes a premium of \$3,942 paid on a life insurance policy, and payments of \$12,000 paid into a 401(k) plan for Mr. Bertucci and payments paid into a 401(k) plan for Messrs. Weigner, Sullivan, Stewart and Berlinghieri.

## OPTION GRANTS

The following table contains information concerning the stock option grants made to each of the Named Executive Officers for the year ended December 31, 1996.

## OPTION GRANTS IN LAST FISCAL YEAR

NAME	INDIVIDUAL GRANTS				POTENTIAL REALIZABLE VALUE AT ASSUMED ANNUAL RATES OF STOCK PRICE APPRECIATION FOR OPTION TERM (2)	
	NUMBER OF SECURITIES UNDERLYING OPTIONS GRANTED(1)	PERCENT OF TOTAL OPTIONS GRANTED TO EMPLOYEES IN FISCAL YEAR	EXERCISE OR BASE PRICE PER SHARE	EXPIRATION DATE	5%	10%
John R. Bertucci.....	--	--	--	--	--	--
Ronald C. Weigner.....	53,031	9.82%	\$6.64	11/30/05	\$200,965	\$498,926
John J. Sullivan.....	--	--	--	--	--	--
William D. Stewart.....	32,098	5.94	6.64	11/30/05	121,642	301,994
Leo Berlinghieri.....	30,338	5.62	6.64	11/30/05	114,972	285,435

(1) These options become exercisable on a quarterly basis over a four year period.

(2) Amounts represent hypothetical gains that could be achieved for the respective options if exercised at the end of the option term. These gains are based on assumed rates of stock price appreciation of 5% and 10% compounded annually from the date the respective options were granted to their expiration date. These numbers are calculated based on rules promulgated by the Securities and Exchange Commission and do not reflect the Company's estimate of future stock price growth. Actual gains, if any, on stock option exercises and Common Stock are dependent on the timing of such exercise and the future performance of the Common Stock.

## OPTION EXERCISES AND HOLDINGS

The following table sets forth information concerning option exercises and option holdings for the fiscal year ended December 31, 1996 with respect to each of the Named Executive Officers.

AGGREGATED OPTION EXERCISES IN LAST FISCAL YEAR  
AND YEAR-END OPTION VALUES

NAME	NUMBER OF SHARES UNDERLYING UNEXERCISED OPTIONS AT YEAR-END		VALUE OF UNEXERCISED IN-THE-MONEY OPTIONS AT YEAR-END(1)	
	EXERCISABLE	UNEXERCISABLE	EXERCISABLE	UNEXERCISABLE
John R. Bertucci.....	--	--	--	--
Ronald C. Weigner.....	10,607	42,424	--	--
John J. Sullivan.....	--	--	--	--
William D. Stewart.....	6,420	25,678	--	--
Leo Berlinghieri.....	6,068	24,270	--	--

(1) Values are based on the difference between the fair market value of the underlying securities at December 31, 1996 (\$6.64 per share) and the exercise price of each option listed (in each case, \$6.64 per share).

In January 1997, the Company granted options to purchase 31,369, 52,302 and 54,062 shares of Common Stock to Messrs. Weigner, Stewart and Berlinghieri, respectively, at an exercise price of \$6.64 per share.

## STOCK PLANS

## 1995 Stock Incentive Plan

The Company's Amended and Restated 1995 Stock Incentive Plan (the "1995 Stock Plan") provides for the grant of incentive stock options, nonstatutory stock options, stock appreciation rights, performance shares and awards of restricted stock and unrestricted stock ("Awards"). An aggregate of 2,500,000 shares of Common Stock may be issued pursuant to the 1995 Stock Plan (subject to adjustment for certain changes in the Company's capitalization). No Award may be made under the 1995 Stock Plan after November 30, 2005.

The 1995 Stock Plan is administered by the Board of Directors and the Compensation Committee. The Board has the authority to grant Awards under the 1995 Stock Plan and to accelerate, waive or amend certain provisions of outstanding Awards. The Board has authorized the Compensation Committee to administer certain aspects of the 1995 Stock Plan and has authorized the Chief Executive Officer of the Company to grant Awards to non-executive officer employees. The maximum number of shares represented by such Awards may not exceed 300,000 shares in the aggregate or 20,000 shares to any one employee.

**Incentive Stock Options and Nonstatutory Options.** Optionees receive the right to purchase a specified number of shares of Common Stock at some time in the future at an option price and subject to such terms and conditions as are specified at the time of the grant. Incentive Stock Options and options that the Board of Directors or Compensation Committee intends to qualify as performance-based compensation under Section 162(m) of the Code may not be granted at an exercise price less than the fair market value of the Common Stock on the date of grant (or less than 110% of the fair market value in the case of incentive stock options granted to optionees holding 10% or more of the voting stock of the Company). All other options may be granted at an exercise price that may be less than, equal to or greater than the fair market value of the Common Stock on the date of grant.

**Stock Appreciation Rights and Performance Shares.** A stock appreciation right ("SAR") is based on the value of Common Stock and entitles the SAR holder to receive consideration to the extent that the fair market value on the date of exercise of the shares of Common Stock underlying the SAR exceeds the fair

market value of the underlying shares on the date the SAR was granted. A performance share award entitles the recipient to acquire shares of Common Stock upon the attainment of specified performance goals.

**Restricted and Unrestricted Stock.** Restricted stock awards entitle recipients to acquire shares of Common Stock, subject to the right of the Company to repurchase all or part of such shares at their purchase price from the recipient in the event that the conditions specified in the applicable stock award are not satisfied prior to the end of the applicable restriction period established for such award. The Company may also grant (or sell at a purchase price not less than 85% of the fair market value on the date of such sale) to participants shares of Common Stock free of any restrictions under the 1995 Stock Plan.

All of the employees, officers, directors, consultants and advisors of the Company and its subsidiaries who are expected to contribute to the Company's future growth and success are eligible to participate in the 1995 Stock Plan.

Section 162(m) of the Code disallows a tax deduction to public companies for certain compensation in excess of \$1 million paid to a company's chief executive officer or to any of the four other most highly compensated executive officers. Certain compensation, including "performance-based compensation," is not included in compensation subject to the \$1 million limitation. The 1995 Stock Plan limits to 900,000 the maximum number of shares of Common Stock with respect to which Awards may be granted to any employee in any calendar year. This limitation is intended to preserve the tax deductions to the Company that might otherwise be unavailable under Section 162(m) with respect to certain Awards.

Prior to the date of this Prospectus, the Company plans to grant options (to vest 20% after one year and 5% per quarter thereafter) to purchase approximately 350,000 shares of Common Stock to employees of the Company, at an exercise price equal to the initial public offering price.

#### 1997 Employee Stock Purchase Plan

The Company's 1997 Employee Stock Purchase Plan (the "Purchase Plan") authorizes the issuance of up to an aggregate of 300,000 shares of Common Stock to participating employees. The Company will make one or more offerings ("Offerings") to employees to purchase Common Stock under the Purchase Plan. Offerings under the Purchase Plan commence on June 1 and December 1 and terminate, respectively on November 30 and May 31. During each Offering, the maximum number of shares which may be purchased by a participating employee is determined on the first day of the Offering period under a formula whereby 85% of the market value of a share of Common Stock on the first day of the Offering period is divided into an amount equal to 10% of the employee's annualized compensation (or such lower percentage as may be established by the Compensation Committee) for the immediately preceding six-month period. An employee may elect to have up to 10% deducted from his or her regular salary (or such lower percentage as may be established by the Compensation Committee) for this purpose. The price at which an employee's option is exercised is the lower of (i) 85% of the closing price of the Common Stock on the Nasdaq National Market on the day that the Offering commences or (ii) 85% of the closing price on the day that the Offering terminates.

The Purchase Plan is administered by the Board of Directors and the Compensation Committee. With certain exceptions, all eligible employees, including directors and officers, regularly employed by the Company for at least six months on the applicable Offering commencement date are eligible to participate in the Purchase Plan. The Purchase Plan is intended to qualify as an "employee stock purchase plan" as defined in Section 423 of the Code.

#### 1997 Director Stock Option Plan

The Company's 1997 Director Stock Option Plan (the "1997 Director Plan") authorizes the issuance of up to an aggregate of 200,000 shares of Common Stock. The 1997 Director Plan is administered by the Company's Board of Directors. Options are granted under the 1997 Director Plan only to directors of the Company who are not employees of the Company ("eligible directors"). Under the 1997 Director Plan, prior to the date of this Prospectus each existing eligible director will receive an option to purchase 7,000 shares of Common Stock at an exercise price equal to the initial public offering price and future non-employee directors will receive an option to purchase 7,500 shares of Common Stock upon their initial election to the Board of

Directors ("Initial Options"). Each Initial Option shall vest in twelve equal quarterly installments following the date of grant. On the date of each annual meeting of the stockholders, options will be automatically granted to each eligible director who has been in office for at least six months prior to the date of the annual meeting of the stockholders ("Annual Options"). Each Annual Option will entitle the holder to purchase 4,000 shares of Common Stock. Each Annual Option will become exercisable on the day prior to the first annual meeting of stockholders following the date of grant (or if no such meeting is held within 13 months after the date of grant, on the 13-month anniversary of the date of grant). The exercise price of all options granted under the 1997 Director Plan is equal to the fair market value of the Common Stock on the date of grant. Options granted under the 1997 Director Plan terminate upon the earlier of three months after the optionee ceases to be a director of the Company or ten years after the grant date. In the event of a Change in Control (as defined in the 1997 Director Plan), the vesting of all options then outstanding would be accelerated in full and any restrictions on exercising outstanding options would terminate.

The Company's 1996 Director Stock Option Plan, under which options have been granted to four non-employee directors of the Company, has been terminated. See "-- Director Compensation."

## CERTAIN TRANSACTIONS

Mr. Chute a director of the Company, the Company's Clerk, and a co-trustee of certain of the Bertucci Family Trusts (See "Principal Stockholders") and Mr. Thomas H. Belknap, a co-trustee of certain of the Bertucci Family Trusts, are attorneys at the law firm of Hill & Barlow, a professional corporation. Hill & Barlow has provided legal services to the Company during the calendar year ended December 31, 1996 for which it was compensated by the Company in the aggregate amount of \$189,000.

Mr. Stewart, Vice President and General Manager, Vacuum Products group, is the general partner of Aspen Industrial Park Partnership ("Aspen"). On October 12, 1989 the Company entered into a lease with Aspen for certain facilities occupied by the Company's Vacuum Products group in Boulder, Colorado. The Company pays Aspen approximately \$342,000 annually to lease such facilities.

Effective July 1, 1987, the Company elected to be treated as an S corporation for federal income tax purposes. As a result, the Company currently pays no federal, and certain state, income tax and all of the earnings of the Company are subject to federal, and certain state, income taxation directly at the stockholder level. The Company's S corporation status will terminate upon the closing of this offering, at which time the Company will become subject to corporate income taxation under Subchapter C of the Code. In 1996 and in the first nine months of 1997, the Company distributed \$14.5 million and \$6.4 million, respectively, of undistributed S corporation earnings to its stockholders. The Company expects to make additional distributions of approximately \$5.5 million prior to the closing of this offering. As soon as practicable following the closing of the offering, the Company intends to make a distribution to the holders of record on the day prior to the closing of this offering in an amount equivalent to the AA Account. As of September 30, 1997, the outstanding balance of the AA Account was approximately \$30.2 million and such balance is expected to increase in the period from October 1, 1997 through the closing of the offering. See "S Corporation And Termination of S Corporation Status."

## PRINCIPAL STOCKHOLDERS

The following table sets forth certain information regarding beneficial ownership of the Company's Common Stock as of November 30, 1997, and as adjusted to reflect the sale of shares offered hereby, by (i) each of the directors of the Company, (ii) each of the Named Executive Officers, (iii) each person or entity known to the Company to own beneficially more than 5% of the Company's Common Stock and (iv) all directors and executive officers as a group. Except as indicated below, none of these entities has a relationship with the Company or, to the knowledge of the Company, any Underwriters of this offering or their respective affiliates. Unless otherwise indicated, each person or entity named in the table has sole voting power and investment power (or shares such power with his or her spouse) with respect to all shares of capital stock listed as owned by such person or entity.

NAME OF BENEFICIAL OWNER	NUMBER SHARES BENEFICIALLY OWNED(1)	PERCENTAGE OF COMMON STOCK OUTSTANDING(1)(2)	
		BEFORE OFFERING	AFTER OFFERING
John R. Bertucci(3)	11,507,940	95.62%	71.77%
Ronald C. Weigner(4)	33,760	*	*
John J. Sullivan(5)	409,340	3.40	2.55
William D. Stewart(4)	33,760	*	*
Leo Berlinghieri(4)	33,760	*	*
Richard S. Chute(6)	1,430,731	11.89	8.92
Owen W. Robbins(4)	2,261	*	*
Robert J. Therrien(4)	2,261	*	*
Louis P. Valente(4)	2,261	*	*
Thomas H. Belknap(7)	1,280,770	10.64	7.99
All executive officers and directors as a group	12,027,604	99.03%	74.49%

\* Less than 1% of outstanding Common Stock.

(1) The number of shares beneficially owned by each stockholder is determined under rules promulgated by the Securities and Exchange Commission and the information is not necessarily indicative of beneficial ownership for any other purpose. Under such rules, beneficial ownership includes any shares as to which the individual has sole or shared voting power or investment power and also any shares which the individual has the right to acquire within 60 days of November 30, 1997 through the exercise of any stock option or other right. The inclusion herein of such shares, however, does not constitute an admission that the named stockholder is a direct or indirect beneficial owner of such shares.

(2) Assumes no exercise of the Underwriters' over-allotment option.

(3) Includes 4,441,550 shares held directly by Mr. Bertucci, 4,357,150 shares held directly by Mrs. Bertucci, wife of Mr. Bertucci, and 2,709,240 shares held by trusts (collectively, the "Bertucci Family Trusts") for which either Mr. or Mrs. Bertucci serves as a co-trustee.

(4) Comprised solely of options exercisable within 60 days of November 30, 1997.

(5) Includes 211,000 shares held in a grantor retained annuity trust.

(6) Includes 1,428,470 shares held by certain of the Bertucci Family Trusts for which Mr. Chute serves as a co-trustee and 2,261 shares subject to options held by Mr. Chute exercisable within 60 days of November 30, 1997.

(7) Represents shares held by certain of the Bertucci Family Trusts for which Mr. Belknap serves as a co-trustee.

## DESCRIPTION OF CAPITAL STOCK

The authorized capital stock of the Company consists of 50,000,000 shares of Common Stock, no par value per share, and 2,000,000 shares of Preferred Stock, \$.01 par value per share, after giving effect to the amendment and restatement of the Company's Restated Articles of Organization (the "Articles of Organization") which will be filed with the Secretary of State of The Commonwealth of Massachusetts prior to the closing of this offering.

## COMMON STOCK

As of September 30, 1997, there were 12,035,440 shares of Common Stock outstanding and held of record by seventeen stockholders, after giving effect to a 2,110-for-1 stock split, to be effected prior to the closing of this offering, of shares of Class A Common Stock and Class B Common Stock and the conversion of such shares into shares of Common Stock upon the closing of this offering.

Upon the closing of this offering, all holders of Common Stock shall be entitled to one vote for each share held on all matters submitted to a vote of stockholders and will not have cumulative voting rights. Accordingly, holders of a majority of the shares of Common Stock entitled to vote in any election of directors may elect all of the directors standing for election. Holders of Common Stock are entitled to receive ratably such dividends, if any, as may be declared by the Board of Directors out of funds legally available therefor, subject to any preferential dividend rights of outstanding Preferred Stock. Upon the liquidation, dissolution or winding up of the Company, the holders of Common Stock are entitled to receive ratably the net assets of the Company available after the payment of all debts and other liabilities, subject to the prior rights of any outstanding Preferred Stock. Holders of the Common Stock have no preemptive, subscription, redemption or conversion rights. The outstanding shares of Common Stock are, and the shares offered by the Company in the offering made by this Prospectus will be, when issued and paid for, fully paid and nonassessable. The rights, preferences and privileges of holders of Common Stock are subject to, and may be adversely affected by, the rights of the holders of shares of any series of Preferred Stock that the Company may designate and issue in the future. There are no shares of Preferred Stock outstanding.

## PREFERRED STOCK

The Articles of Organization authorize the Board of Directors, subject to certain limitations prescribed by law, without further stockholder approval, from time to time to issue up to an aggregate of 2,000,000 shares of Preferred Stock in one or more series and to fix or alter the designations, preferences and rights, and any qualifications, limitations or restrictions thereof, of the shares of each such series, including the number of shares constituting any such series and the dividend rights, dividend rates, conversion rights, voting rights, terms of redemption (including sinking fund provisions), redemption price or prices and liquidation preferences thereof. The issuance of Preferred Stock may have the effect of delaying, deferring or preventing a change in control of the Company. The Company has no present plans to issue any shares of Preferred Stock.

## MASSACHUSETTS LAW AND CERTAIN PROVISIONS OF THE COMPANY'S RESTATED ARTICLES OF ORGANIZATION AND BY-LAWS

The Company intends to amend and restate its bylaws (the "By-Laws") prior to the closing of the offering. The By-Laws will include a provision excluding the Company from the applicability of Massachusetts General Laws Chapter 110D, entitled "Regulation of Control Share Acquisitions." In general, this statute provides that any stockholder of a corporation subject to this statute who acquires 20% or more of the outstanding voting stock of a corporation may not vote such stock unless the stockholders of the corporation so authorize. The Board of Directors will be able to amend the By-Laws at any time to subject the Company to this statute prospectively.

Massachusetts General Laws Chapter 156B, Section 50A generally requires that publicly-held Massachusetts corporations have a classified board of directors consisting of three classes as nearly equal in size as possible, unless the corporation elects to opt out of the statute's coverage. The By-Laws, will contain provisions which give effect to Section 50A.

The By-Laws will require that nominations for the Board of Directors made by a stockholder of a planned nomination must be given not less than 30 and not more than 90 days prior to a scheduled meeting, provided that if less than 40 days' notice is given of the date of the meeting, a stockholder will have ten days within which to give such notice. The stockholder's notice of nomination must include particular information about the stockholder, the nominee and any beneficial owner on whose behalf the nomination is made. The Company may require any proposed nominee to provide such additional information as is reasonably required to determine the eligibility of the proposed nominee.

The By-Laws will also require that a stockholder seeking to have any business conducted at a meeting of stockholders give notice to the Company not less than 60 and not more than 90 days prior to the scheduled meeting, provided in certain circumstances that a ten-day notice rule applies. The notice from the stockholder will be required to describe the proposed business to be brought before the meeting and include information about the stockholder making the proposal, any beneficial owner on whose behalf the proposal is made, and any other stockholder known to be supporting the proposal. The By-Laws will require the Company to call a special stockholders meeting at the request of stockholders holding at least 40% of the voting power of the Company.

The Articles of Organization will provide that the directors and officers of the Company shall be indemnified by the Company to the fullest extent authorized by Massachusetts law, as it now exists or may in the future be amended, against all expenses and liabilities reasonably incurred in connection with service for or on behalf of the Company. In addition, the Articles of Organization will provide that the directors of the Company will not be personally liable for monetary damages to the Company for breaches of their fiduciary duty as directors, unless they violated their duty of loyalty to the Company or its stockholders, acted in bad faith, knowingly or intentionally violated the law (which could include securities laws), authorized illegal dividends or redemptions or derived an improper personal benefit from their action as directors.

The Articles of Organization will provide that any amendment to the Articles of Organization, the sale, lease or exchange of all or substantially all of the Company's property and assets, or the merger or consolidation of the Company into or with any corporation may be authorized by the approval of the holders of a majority of the shares of each class of stock entitled to vote thereon, rather than by two-thirds as otherwise provided by statute, provided that the transactions have been authorized by a majority of the members of the Board of Directors and the requirements of any other applicable provisions of the Articles of Organization have been met.

The Articles of Organization will provide a provision excluding the Company from the applicability of Massachusetts General Laws Chapter 110F, entitled "Business Combinations with Interested Shareholders." In general, Chapter 110F places limitations on a Massachusetts corporation's ability to engage in business combinations (as defined in the statute) with certain Company stockholders for a period of three years, unless the corporation elects to opt out of the statute's coverage by including such a provision in its Articles of Organization.

#### TRANSFER AGENT AND REGISTRAR

The Transfer Agent and Registrar for the Common Stock is Boston EquiServe LP.

## SHARES ELIGIBLE FOR FUTURE SALE

Prior to this offering, there has been no public market for the securities of the Company. Upon completion of this offering, based upon the number of shares outstanding at September 30, 1997, there will be 16,035,440 shares of Common Stock of the Company outstanding (assuming no exercise of the Underwriters' over-allotment option or options outstanding under the Company's stock option plans). Of these shares, the 4,000,000 shares sold in this offering will be freely tradeable without restriction or further registration under the Securities Act of 1933, as amended (the "Securities Act"), except that any shares purchased by "affiliates" of the Company, as that term is defined in Rule 144 ("Rule 144") under the Securities Act ("Affiliates"), may generally only be sold in compliance with the limitations of Rule 144 described below.

## SALES OF RESTRICTED SHARES

The remaining 12,035,440 shares of Common Stock are deemed "restricted securities" under Rule 144. All of these shares are subject to 180-day lock-up agreements (the "Lock-Up Agreements") with the Representatives of the Underwriters. Upon expiration of the Lock-Up Agreements 180 days after the date of this Prospectus (and assuming no exercise of any outstanding options), all such shares will be available for sale in the public market, subject to the provisions of Rule 144 under the Securities Act.

Stockholders who are parties to the Lock-Up Agreement have agreed that for a period of 180 days after the date of this Prospectus, they will not sell, offer, contract or grant any option to sell, pledge, transfer, establish an open put equivalent position or otherwise dispose of any shares of Common Stock, any options to purchase shares of Common Stock or any shares convertible into or exchangeable for shares of Common Stock, owned directly by such persons or with respect to which they have the power of disposition, without the prior written consent of NationsBanc Montgomery Securities, Inc.

In general, Rule 144 as currently in effect, beginning 90 days after the effective date of the Registration Statement of which this Prospectus is a part, a stockholder, including an Affiliate, who has beneficially owned his or her restricted securities (as that term is defined in Rule 144) for at least one year from the later of the date such securities were acquired from the Company or (if applicable) the date they were acquired from an Affiliate is entitled to sell, within any three-month period, a number of such shares that does not exceed the greater of 1% of the then outstanding shares of Common Stock (160,354 shares immediately after this offering) or the average weekly trading volume in the Common Stock during the four calendar weeks preceding the date on which notice of such sale was filed under Rule 144, provided certain requirements concerning availability of public information, manner of sale and notice of sale are satisfied. In addition, under Rule 144(k), if a period of at least two years has elapsed between the later of the date restricted securities were acquired from the Company or (if applicable) the date they were acquired from an Affiliate of the Company, a stockholder who is not an Affiliate of the Company at the time of sale and has not been an Affiliate of the Company for at least three months prior to the sale is entitled to sell the shares immediately without compliance with the foregoing requirements under Rule 144.

Securities issued in reliance on Rule 701 (such as shares of Common Stock acquired pursuant to the exercise of certain options granted under the Company's stock plans) are also restricted and, beginning 90 days after the effective date of the Registration Statement of which this Prospectus is a part, may be sold by stockholders other than Affiliates of the Company subject only to the manner of sale provisions of Rule 144 and by Affiliates under Rule 144 without compliance with its one-year holding period requirement.

## OPTIONS

The Company has granted options to purchase an aggregate of 1,042,361 shares of which options to purchase an aggregate of 282,516 were exercisable as of September 30, 1997. Of these, 880,116 shares were subject to the Lock-Up Agreements. The Company intends to file registration statements on Form S-8 under the Securities Act to register all shares of Common Stock issuable under each of the 1995 Stock Plan, Purchase Plan and the 1997 Director Plan promptly following the consummation of this offering. Shares issued pursuant to such plans shall be, after the effective date of the Form S-8 registration statements, eligible for resale in the public market without restriction, subject to Rule 144 limitations applicable to Affiliates and the Lock-up Agreements noted above, if applicable.

UNDERWRITING

The underwriters named below (the "Underwriters"), represented by NationsBanc Montgomery Securities, Inc., Donaldson, Lufkin & Jenrette Securities Corporation and PaineWebber Incorporated (the "Representatives"), have severally agreed, subject to the terms and conditions set forth in the Underwriting Agreement, to purchase from the Company the number of shares of Common Stock indicated below opposite their respective names at the initial public offering price less the underwriting discount set forth on the cover page of this Prospectus. The Underwriting Agreement provides that the obligations of the Underwriters are subject to certain terms and conditions precedent and that the Underwriters are committed to purchase all of such shares, if any are purchased.

UNDERWRITER	NUMBER OF SHARES
NationsBanc Montgomery Securities, Inc. ....	
Donaldson, Lufkin & Jenrette Securities Corporation.....	
PaineWebber Incorporated.....	
 Total.....	 <u>4,000,000</u> =====

The Representatives have advised the Company that the Underwriters initially propose to offer the Common Stock to the public on the terms set forth on the cover page of this Prospectus. The Underwriters may allow to selected dealers a concession of not more than \$ per share, and the Underwriters may allow, and any other dealers may reallow, a concession of not more than \$ per share to certain other dealers. After the initial public offering, the offering price and other selling terms may be changed by the Representatives. The Common Stock is offered subject to receipt and acceptance by the Underwriters and to certain other conditions, including the right to reject orders in whole or in part.

The Company has granted an option to the Underwriters, exercisable during the 30-day period after the date of this Prospectus, to purchase up to a maximum of 600,000 additional shares of Common Stock to cover over-allotments, if any, at the same price per share as the initial shares to be purchased by the Underwriters. To the extent the Underwriters exercise this option, each of the Underwriters will be committed, subject to certain conditions, to purchase such additional shares in approximately the same proportion as set forth in the above table. The Underwriters may purchase such shares only to cover overallotments made in connection with this offering.

All stockholders prior to this offering, as well as certain holders of options to purchase Common Stock, have agreed not to directly or indirectly sell, offer, contract or grant any option to sell, pledge, transfer, establish an open put equivalent position or otherwise dispose of any rights with respect to any shares of Common Stock, any options or warrants to purchase Common Stock, or any securities convertible or exchangeable for Common Stock, owned directly by such holders or with respect to which they have the power of disposition for a period of 180 days after the period of this Prospectus without the prior written consent of NationsBanc Montgomery Securities, Inc. NationsBanc Montgomery Securities, Inc. may, in its sole discretion and at any time without notice, release all or any portion of the securities subject to these lock-up agreements. In addition, the Company has agreed not to sell, offer to sell, contract to sell or otherwise sell or dispose of any shares of Common Stock or any rights to acquire Common Stock, other than pursuant to its stock plans or upon the exercise of outstanding options, for a period of 180 days after the date of this Prospectus without the prior consent of NationsBanc Montgomery Securities, Inc. See "Shares Eligible for Future Sale."

The Underwriting Agreement provides that the Company will indemnify the Underwriters against certain liabilities, including civil liabilities, under the Securities Act, or will contribute to payments the Underwriters may be required to make in respect thereof.

In connection with this offering, the Underwriters may engage in transactions that stabilize, maintain or otherwise affect the price of the Common Stock, including over-allotment, stabilization, syndicate covering transactions and imposition of penalty bids. In an over-allotment, the Underwriters would allot more shares of

Common Stock to their customers in the aggregate than are available for purchase by the Underwriters under the Underwriting Agreement. Stabilizing means the placing of any bid, or the effecting of any purchase, for the purpose of pegging, fixing or maintaining the price of a security. In a syndicate covering transaction, the Underwriters would place a bid or effect a purchase to reduce a short position created in connection with this offering. Pursuant to a penalty bid, NationsBanc Montgomery Securities, Inc. on behalf of the Underwriters, would be able to reclaim a selling concession from an Underwriter if shares of Common Stock originally sold by such Underwriter are purchased in syndicate covering transactions. These transactions may result in the price of the Common Stock being higher than the price that might otherwise prevail in the open market. These transactions may be effected on the Nasdaq National Market, in the over-the-counter market or otherwise, and, if commenced, may be discontinued at any time.

The Representatives have informed the Company that they do not expect to make sales to accounts over which they exercise discretionary authority in excess of 5% of the number of shares of Common Stock offered hereby.

Prior to this offering, there has been no public market for the Common Stock of the Company. Consequently, the initial public offering price has been determined through negotiations among the Company and the Representatives. Among the factors considered in such negotiations were the history of, and prospects for, the Company and the industry in which it competes, an assessment of the Company's management, the present state of the Company's development, the prospects for future earnings of the Company, the prevailing market conditions at the time of this offering, market valuations of publicly traded companies that the Company and the Representatives believe to be comparable to the Company, and other factors deemed relevant.

#### LEGAL MATTERS

The validity of the Common Stock offered hereby will be passed upon for the Company by Hale and Dorr LLP, Boston, Massachusetts. Certain legal matters in connection with this offering will be passed upon for the Underwriters by Ropes & Gray, Boston, Massachusetts.

#### EXPERTS

The consolidated balance sheets of MKS Instruments, Inc. as of December 31, 1995, 1996 and September 30, 1997 and the consolidated statements of income, stockholders' equity and cash flows for each of the three years in the period ended December 31, 1996 and for the nine month period ended September 30, 1997 included in this Prospectus have been included herein in reliance on the report of Coopers & Lybrand L.L.P., independent accountants, given upon the authority of that firm as experts in accounting and auditing.

#### ADDITIONAL INFORMATION

The Company has filed with the Commission a Registration Statement (which term shall include all amendments, exhibits, schedules and supplements thereto) on Form S-1 under the Securities Act with respect to the shares of Common Stock offered hereby. This Prospectus, which constitutes a part of the Registration Statement, does not contain all of the information set forth in the Registration Statement, certain parts of which are omitted in accordance with the rules and regulations of the Commission, to which Registration Statement reference is hereby made. Statements made in this Prospectus as to the contents of any contract, agreement or other document referred to are not necessarily complete. With respect to each such contract, agreement or other document filed as an exhibit to the Registration Statement, reference is made to the exhibit for a more complete description of the matter involved, and each such statement shall be deemed qualified in its entirety by such reference. The Registration Statement and the exhibits thereto may be inspected and copied at prescribed rates at the public reference facilities maintained by the Commission at Room 1024, Judiciary Plaza, 450 Fifth Street, N.W., Washington, D.C. 20549 and at the regional offices of the Commission located at Seven World Trade Center, 13th Floor, New York, New York 10048 and 500 West Madison Street, Suite 1400, Chicago, Illinois 60661. In addition, the Company is required to file

electronic versions to these documents with the Commission through the Commission's Electronic Data Gathering, Analysis, and Retrieval (EDGAR) system. The Commission maintains a World Wide Web site at <http://www.sec.gov> that contains reports, proxy and information statements and other information regarding registrants that file electronically with the Commission.

The Company intends to distribute to its stockholders annual reports containing audited consolidated financial statements. The Company also intends to make available to its stockholders, within 45 days after the end of each fiscal quarter, reports for the first three quarters of each calendar year containing interim unaudited financial information.

## MKS INSTRUMENTS, INC.

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This is the form of the report that we expect to issue upon the filing of an amendment to the Company's Articles of Organization effecting an increase in the number of authorized shares of Common Stock and the authorization of Preferred Stock as discussed in Note 2 of Notes to Consolidated Financial Statements:

COOPERS & LYBRAND L.L.P.

REPORT OF INDEPENDENT ACCOUNTANTS

To the Board of Directors and Stockholders of  
MKS Instruments, Inc.:

We have audited the accompanying consolidated balance sheets of MKS Instruments, Inc. as of December 31, 1995 and 1996, and September 30, 1997, and the related consolidated statements of income, stockholders' equity, and cash flows for the years ended December 31, 1994, 1995 and 1996, and the nine month period ended September 30, 1997. These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the consolidated financial position of MKS Instruments, Inc. as of December 31, 1995 and 1996, and September 30, 1997, and the consolidated results of its operations and its cash flows for the years ended December 31, 1994, 1995 and 1996, and the nine month period ended September 30, 1997, in conformity with generally accepted accounting principles.

Boston, Massachusetts  
October 28, 1997

## MKS INSTRUMENTS, INC.

CONSOLIDATED BALANCE SHEETS  
(IN THOUSANDS, EXCEPT SHARE DATA)

	DECEMBER 31,		SEPTEMBER 30, 1997	
	1995	1996	ACTUAL	PRO FORMA (NOTE 2) (UNAUDITED)
<b>ASSETS</b>				
Current assets:				
Cash and cash equivalents.....	\$ 3,650	\$ 3,815	\$ 5,421	\$ 5,421
Marketable equity securities.....	563	391	918	918
Trade accounts receivable, net of allowance for doubtful accounts of \$542 and \$482 at December 31, 1995 and 1996, respectively, and \$618 at September 30, 1997.....	28,804	21,734	32,018	32,018
Inventories.....	29,960	25,500	28,081	28,081
Deferred tax asset.....	348	513	658	658
Other current assets.....	3,755	541	462	462
	-----	-----	-----	-----
Total current assets.....	67,080	52,494	67,558	67,558
Property, plant and equipment, net.....	33,210	38,007	34,343	34,343
Other assets.....	4,221	4,499	4,784	4,784
	-----	-----	-----	-----
Total assets.....	\$104,511	\$95,000	\$106,685	\$ 106,685
	=====	=====	=====	=====
<b>LIABILITIES AND STOCKHOLDERS' EQUITY</b>				
Current liabilities:				
Short-term borrowings.....	\$ 12,264	\$12,825	\$ 13,171	\$ 13,171
Current portion of long-term debt.....	2,203	2,258	2,153	2,153
Current portion of capital lease obligations.....	725	1,041	1,048	1,048
Accounts payable.....	8,895	4,776	7,999	7,999
Accrued compensation.....	5,133	5,115	7,597	7,597
Other accrued expenses.....	5,372	3,466	5,228	5,228
Income taxes payable.....	286	609	883	883
Distribution payable.....	--	--	--	30,183
	-----	-----	-----	-----
Total current liabilities.....	34,878	30,090	38,079	68,262
Long-term debt.....	18,617	16,278	14,436	14,436
Long-term portion of capital lease obligations.....	1,845	2,621	1,912	1,912
Deferred tax liability.....	214	109	126	126
Other liabilities.....	565	404	376	376
Commitments and contingencies (Note 7)				
Stockholders' equity:				
Preferred stock, \$.01 par value; 2,000,000 shares authorized, no shares issued or outstanding.....	--	--	--	--
Common Stock, Class A, no par value; 25,000,000 shares authorized, 5,177,940 issued and outstanding.....	40	40	40	40
Common Stock, Class B (non voting) no par value; 25,000,000 shares authorized, 6,857,500 issued and outstanding.....	73	73	73	73
Additional paid-in capital.....	48	48	48	48
Unrealized gain on investments.....	246	115	562	562
Retained earnings.....	45,550	43,553	50,045	19,862
Cumulative translation adjustment.....	2,435	1,669	988	988
	-----	-----	-----	-----
Total stockholders' equity.....	48,392	45,498	51,756	21,573
	-----	-----	-----	-----
Total liabilities and stockholders' equity.....	\$104,511	\$95,000	\$106,685	\$ 106,685
	=====	=====	=====	=====

The accompanying notes are an integral part of the consolidated financial statements.

## MKS INSTRUMENTS, INC.

CONSOLIDATED STATEMENTS OF INCOME  
(IN THOUSANDS, EXCEPT PER SHARE DATA)

	YEAR ENDED DECEMBER 31,			NINE MONTHS ENDED SEPTEMBER 30,	
	1994	1995	1996	1996	1997
				(UNAUDITED)	
Net sales.....	\$106,829	\$157,164	\$ 170,862	\$ 136,097	\$ 134,629
Cost of sales.....	59,813	87,703	102,008	81,078	78,456
Gross profit.....	47,016	69,461	68,854	55,019	56,173
Research and development.....	8,036	10,935	14,195	11,220	10,336
Selling, general and administrative.....	26,893	34,420	37,191	29,409	30,749
Restructuring.....	--	--	1,400	1,400	--
Income from operations.....	12,087	24,106	16,068	12,990	15,088
Interest expense.....	1,330	1,576	2,378	1,963	1,610
Interest income.....	46	128	92	152	144
Other income (expense), net...	--	--	(479)	(230)	460
Income before income taxes....	10,803	22,658	13,303	10,949	14,082
Provision for income taxes....	800	1,000	800	658	1,190
Net income.....	\$ 10,003	\$ 21,658	\$ 12,503	\$ 10,291	\$ 12,892
Pro forma data (unaudited):					
Historical income before income taxes.....			\$ 13,303		\$ 14,082
Pro forma provision for income taxes.....			5,055		5,351
Pro forma net income.....			\$ 8,248		\$ 8,731
Pro forma net income per share.....			\$ 0.59		\$ 0.62
Pro forma weighted average common shares outstanding.....			13,994		14,134

The accompanying notes are an integral part of the consolidated financial statements.

## MKS INSTRUMENTS, INC.

CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY  
FOR THE YEARS ENDED DECEMBER 31, 1994, 1995 AND 1996 AND THE NINE MONTHS ENDED  
SEPTEMBER 30, 1997  
(IN THOUSANDS, EXCEPT SHARE DATA)

	COMMON STOCK						ADDITIONAL PAID-IN CAPITAL
	PREFERRED STOCK		CLASS A		CLASS B		
	SHARES	AMOUNT	SHARES	AMOUNT	SHARES	AMOUNT	
Balance at December 31, 1993.....			5,177,940	\$ 40	6,857,500	\$ 73	\$ 48
Capital contribution.....							
Distributions to stockholders.....							
Foreign currency translation adjustment.....							
Net income.....							
Balance at December 31, 1994.....	--	--	5,177,940	40	6,857,500	73	48
Distributions to stockholders.....							
Foreign currency translation adjustment.....							
Unrealized gain on investments.....							
Net income.....							
Balance at December 31, 1995.....	--	--	5,177,940	40	6,857,500	73	48
Distributions to stockholders.....							
Foreign currency translation adjustment.....							
Unrealized loss on investments.....							
Net income.....							
Balance at December 31, 1996.....	--	--	5,177,940	40	6,857,500	73	48
Distributions to stockholders.....							
Foreign currency translation adjustment.....							
Unrealized gain on investments.....							
Net income.....							
Balance at September 30, 1997.....	--	--	5,177,940	\$ 40	6,857,500	\$ 73	\$ 48

	UNREALIZED GAIN ON INVESTMENTS	RETAINED EARNINGS	CUMULATIVE TRANSLATION ADJUSTMENT	TOTAL STOCKHOLDERS' EQUITY
Balance at December 31, 1993.....		\$27,200	\$1,604	\$ 28,965
Capital contribution.....		14		14
Distributions to stockholders.....		(2,575)		(2,575)
Foreign currency translation adjustment.....			865	865
Net income.....		10,003		10,003
Balance at December 31, 1994.....	--	34,642	2,469	37,272
Distributions to stockholders.....		(10,750)		(10,750)
Foreign currency translation adjustment.....			(34)	(34)
Unrealized gain on investments.....	\$ 246			246
Net income.....		21,658		21,658
Balance at December 31, 1995.....	246	45,550	2,435	48,392
Distributions to stockholders.....		(14,500)		(14,500)
Foreign currency translation adjustment.....			(766)	(766)
Unrealized loss on investments.....	(131)			(131)
Net income.....		12,503		12,503
Balance at December 31, 1996.....	115	43,553	1,669	45,498
Distributions to stockholders.....		(6,400)		(6,400)
Foreign currency translation adjustment.....			(681)	(681)
Unrealized gain on investments.....	447			447
Net income.....		12,892		12,892
Balance at September 30, 1997.....	\$ 562	\$50,045	\$ 988	\$ 51,756

The accompanying notes are an integral part of the consolidated financial statements.

## MKS INSTRUMENTS, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS  
(IN THOUSANDS)

	YEAR ENDED DECEMBER 31,			NINE MONTHS ENDED SEPTEMBER 30,	
	1994	1995	1996	1996	1997
				(UNAUDITED)	
Cash flows from operating activities:					
Net income.....	\$ 10,003	\$ 21,658	\$ 12,503	\$ 10,291	\$ 12,892
Adjustments to reconcile net income to net cash provided by operating activities:					
Depreciation and amortization of property, plant, and equipment.....	3,027	3,925	5,920	4,339	4,267
Loss on disposal of assets.....	--	--	--	--	574
Deferred taxes.....	(178)	(91)	(277)	(228)	(235)
Provision for doubtful accounts.....	241	133	(20)	8	255
Unrealized loss (gain) on investments....	37	(37)	--	--	--
Forward exchange contract loss.....	--	--	302	44	431
Stock option compensation.....	--	--	--	--	40
Changes in operating assets and liabilities:					
(Increase) decrease in trade accounts receivable.....	(5,637)	(6,771)	6,119	2,624	(11,432)
(Increase) decrease in inventories.....	(2,137)	(10,956)	4,145	(1,956)	(3,129)
(Increase) decrease in other current assets.....	(188)	(2,752)	3,239	2,075	294
Increase (decrease) in accrued compensation.....	305	1,466	(220)	360	2,482
Increase (decrease) in other accrued expenses.....	970	3,135	(1,520)	(447)	1,724
Increase (decrease) in accounts payable.....	1,636	3,571	(4,221)	(4,398)	3,192
Increase (decrease) in income taxes payable.....	(365)	(111)	331	212	387
Net cash provided by operating activities.....	7,714	13,170	26,301	12,924	11,742
Cash flows from investing activities:					
Purchase of investments.....	(1,231)	--	--	--	--
Proceeds from maturity of investments.....	--	1,000	--	--	--
Purchases of property, plant and equipment.....	(1,922)	(9,194)	(9,417)	(7,274)	(1,904)
Proceeds from sale of property, plant and equipment.....	--	--	--	--	145
Increase in other assets.....	(824)	(1,047)	(443)	(1,009)	(368)
Cash used to settle forward exchange contracts.....	--	--	(302)	(44)	(431)
Acquisition of business, net of cash acquired.....	--	(3,926)	--	--	--
Net cash used in investing activities.....	(3,977)	(13,167)	(10,162)	(8,327)	(2,558)
Cash flows from financing activities:					
Net (payments) borrowings on demand notes payable.....	(336)	1,407	224	6,510	625
Proceeds from short-term borrowings.....	5,020	7,819	11,025	11,173	12,714
Payments on short-term borrowings.....	(2,670)	(4,150)	(9,628)	(9,135)	(12,698)
Proceeds from long-term debt.....	--	7,000	400	138	--
Principal payments on long-term debt.....	(1,037)	(1,156)	(2,093)	(1,530)	(1,406)
Capital contributions.....	14	--	--	--	--
Cash distributions to stockholders.....	(2,575)	(10,750)	(14,500)	(11,500)	(6,400)
Principal payments under capital lease obligations.....	(722)	(587)	(982)	(704)	(702)
Net cash used in financing activities.....	(2,306)	(417)	(15,554)	(5,048)	(7,867)
Effect of exchange rate changes on cash and cash equivalents.....	240	5	(420)	30	289
Increase (decrease) in cash and cash equivalents.....	1,671	(409)	165	(421)	1,606
Cash and cash equivalents at beginning of period.....	2,388	4,059	3,650	3,650	3,815
Cash and cash equivalents at end of period....	\$ 4,059	\$ 3,650	\$ 3,815	\$ 3,229	\$ 5,421
Supplemental disclosure of cash flow information:					
Cash paid during the period for:					
Interest.....	\$ 1,313	\$ 1,535	\$ 2,363	\$ 1,713	\$ 1,385
Income taxes.....	\$ 1,339	\$ 1,194	\$ 770	\$ 936	\$ 1,016
Noncash transactions during the period:					
Equipment acquired under capital leases...	\$ 626	\$ 1,612	\$ 2,074	\$ 1,852	\$ 89

The accompanying notes are an integral part of the consolidated financial

statements.

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## MKS INSTRUMENTS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS  
(TABLES IN THOUSANDS EXCEPT PER SHARE DATA)  
INFORMATION FOR THE NINE MONTHS ENDED  
SEPTEMBER 30, 1996 IS UNAUDITED.

## 1. DESCRIPTION OF BUSINESS:

MKS Instruments, Inc. (the "Company") operates in one business segment. The Company is a worldwide supplier of instruments and components used to measure, control, analyze and isolate gases in semiconductor manufacturing processes, and in the manufacture of flat panel displays, magnetic and optical storage media, solar cells, fiber optic cables, optical coatings and other devices made possible through advances in materials science. The Company is subject to risks common to companies in the semiconductor industry including, but not limited to, the highly cyclical nature of the semiconductor industry leading to recurring periods of over supply, development by the Company or its competitors of new technological innovations, dependence on key personnel and the protection of proprietary technology.

## 2. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES:

## Basis of Presentation

The consolidated financial statements include the accounts of the Company and its subsidiaries. All significant intercompany accounts and transactions have been eliminated in consolidation. The Company has reflected the approximately 77.5% owned foreign subsidiaries as wholly-owned subsidiaries pursuant to common control accounting. Upon the closing of the offering for which these financial statements are being prepared, the shares of the foreign subsidiaries owned directly by the ultimate stockholders will be contributed to the Company. Prior to the effectiveness of a registration statement relating to the initial public offering of the Common Stock of the Company, the Company will effect a 2,110-for-one stock split, to be effected in the form of a stock dividend of its Common Stock, increase the number of authorized shares of Common Stock to 50,000,000 and authorize 2,000,000 shares of Preferred Stock. Accordingly, all share and per share amounts have been adjusted to reflect the stock split as though it had occurred at the beginning of the initial period presented.

## Interim Financial Information

The consolidated financial statements of the Company as of and for the nine months ended September 30, 1996, and the related footnote information are unaudited. All adjustments (consisting only of normal recurring adjustments) have been made, which in the opinion of management, are necessary for a fair presentation. Results of operations for the nine months ended September 30, 1997 are not necessarily indicative of the results that may be expected for any future period.

## Pro Forma Balance Sheet Presentation (Unaudited)

The Company intends to distribute the balance of its accumulated and undistributed S Corporation earnings (the "S Corporation Distribution") from the proceeds of the offering for which this registration statement is being prepared. The unaudited pro forma balance sheet has been prepared assuming an estimated \$30,183,000 distribution was payable as of September 30, 1997. The remaining balance in retained earnings represents accumulated earnings prior to the Company converting from a C Corporation to an S Corporation in 1987.

## Pro Forma Net Income Per Share (Unaudited)

Pro forma net income per share is based upon the weighted average number of common and common equivalent shares (using the treasury stock method) outstanding. Common equivalent shares are included in the per share calculations where the effect of their inclusion would be dilutive. Common equivalent shares consist of outstanding stock options. Pursuant to Securities and Exchange Commission Staff Accounting

## MKS INSTRUMENTS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS -- (CONTINUED)  
(TABLES IN THOUSANDS EXCEPT PER SHARE DATA)  
INFORMATION FOR THE NINE MONTHS ENDED  
SEPTEMBER 30, 1996 IS UNAUDITED.

Bulletin No. 83, all common and common equivalent shares issued at prices less than the mid-point of the estimated initial public offering price range during the twelve-month period prior to the initial filing of the Registration Statement have been included in the calculation as if they were outstanding for all periods using the treasury stock method and the mid-point of the estimated initial public offering price.

Historical net income has been adjusted for the pro forma provision for income taxes calculated assuming the Company was subject to income taxation as a C Corporation, at a pro forma tax rate of 38%. In accordance with a regulation of the Securities and Exchange Commission, pro forma net income per share has been presented for the year ended December 31, 1996 and the nine months ended September 30, 1997 to reflect the affect of the assumed issuance of that number of shares of Common Stock of the Company necessary to be sold at the mid-point of the estimated initial public offering price in order to fund the intended distribution in the amount of the accumulated and undistributed S corporation earnings as of January 1, 1997. Pro forma fully diluted net income per share is not presented as it does not differ materially from pro forma net income per share.

Historical net income per share is not presented as it is not meaningful based upon the Company's planned conversion from an S Corporation to a C Corporation upon the closing of the offering for which these financial statements are being prepared.

#### Foreign Exchange

The functional currency of the Company's foreign subsidiaries is the applicable local currency. For those subsidiaries, assets and liabilities are translated to U.S. dollars at year-end exchange rates. Income and expense accounts are translated at the average exchange rates prevailing for the year. The resulting translation adjustments are accumulated in a separate component of consolidated stockholders' equity.

The Company enters into forward exchange contracts and local currency purchased options to mitigate its foreign currency exposures. Realized and unrealized gains and losses on forward exchange contracts and local currency purchased options that qualify for hedge accounting are recognized in earnings in the same period as the underlying hedged item. Realized and unrealized gains and losses on forward exchange contracts and local currency purchased option contract that do not qualify for hedge accounting are recognized immediately in earnings. The cash flows resulting from forward exchange contracts and local currency purchased options that qualify for hedge accounting are classified in the statement of cash flows as part of cash flows from operating activities. Cash flows resulting from forward exchange contracts and local currency purchased options that do not qualify for hedge accounting are classified in the statement of cash flows as investing activities.

#### Revenue Recognition

The Company recognizes revenue upon shipment. The Company accrues for anticipated returns and warranty costs upon shipment.

#### Cash and Cash Equivalents

All highly liquid investments with an original maturity of three months or less at the date of purchase are considered to be cash equivalents. Cash equivalents consist of money market instruments.

#### Investments

The appropriate classification of investments in debt and equity securities is determined at the time of purchase. Debt securities that the Company has both the intent and ability to hold to maturity are carried at

## MKS INSTRUMENTS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS -- (CONTINUED)  
(TABLES IN THOUSANDS EXCEPT PER SHARE DATA)  
INFORMATION FOR THE NINE MONTHS ENDED  
SEPTEMBER 30, 1996 IS UNAUDITED.

amortized cost. Debt securities that the Company does not have the intent and ability to hold to maturity or equity securities are classified either as "available-for-sale" or as "trading" and are carried at fair value. Marketable equity securities are carried at fair value and classified either as available for sale or trading. Unrealized gains and losses on securities classified as available-for-sale are carried as a separate component of stockholders' equity. Unrealized gains and losses on securities classified as trading are reported in earnings.

## Inventories

Inventories are stated at the lower of cost or market. Cost is determined on the first-in, first-out method.

## Property, Plant and Equipment

Property, plant and equipment are stated at cost. Equipment acquired under capital leases is recorded at the present value of the minimum lease payments required during the lease period. Expenditures for major renewals and betterments that extend the useful lives of property, plant and equipment are capitalized. Expenditures for maintenance and repairs are charged to expense as incurred. When assets are sold or otherwise disposed of, the cost and related accumulated depreciation are eliminated from the accounts and any resulting gain or loss is recognized in earnings.

Depreciation is provided on the straight-line method over the estimated useful lives of 20 years for buildings and three to five years for machinery and equipment. Leasehold improvements are amortized over the shorter of the lease term or the estimated useful life of the lease.

## Research and Development

Research and development costs are expensed as incurred.

## New Accounting Pronouncements

In February 1997, the Financial Accounting Standards Board (the "FASB") issued Statement of Financial Accounting Standards No. 128, "Earnings Per Share." This statement specifies the computation, presentation and disclosure requirements for earnings per share ("EPS"), to simplify the existing computational guidelines and increase comparability on an international basis. The statement will be effective for interim and annual reporting periods ending after December 15, 1997, and the Company will adopt its provisions during the fourth quarter of 1997. This statement will replace "primary" EPS with "basic" EPS, the principal difference being the exclusion of common stock equivalents in the computation of basic EPS. In addition, this statement will require the dual presentation of basic and diluted EPS on the face of the consolidated statements of income. The Company does not expect this statement to have a material impact on its net income per share as presented.

In June 1997, the FASB issued Statement of Financial Accounting Standards No. 130, "Reporting Comprehensive Income." This statement requires that changes in comprehensive income be shown in a financial statement that is displayed with the same prominence as other financial statements. The statement will be effective for fiscal years beginning after December 15, 1997 and the Company will adopt its provisions in 1998. Reclassification for earlier periods is required for comparative purposes. The Company is currently evaluating the impact this statement will have on its financial statements; however, because the statement requires only additional disclosure, the Company does not expect the statement to have a material impact on its financial position or results of operations. The additional disclosure will include comprehensive income, which will differ from historical net income by the amount of the translation adjustments and unrealized gain (loss) on investments included as separate components of equity.

## MKS INSTRUMENTS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS -- (CONTINUED)  
 (TABLES IN THOUSANDS EXCEPT PER SHARE DATA)  
 INFORMATION FOR THE NINE MONTHS ENDED  
 SEPTEMBER 30, 1996 IS UNAUDITED.

In June 1997, the FASB issued Statement of Financial Accounting Standards No. 131, "Disclosures about Segments of an Enterprise and Related Information." This statement supersedes Statement of Financial Accounting Standards No. 14, "Financial Reporting for Segments of a Business Enterprise." This statement includes requirements to report selected segment information quarterly and entity-wide disclosures about products and services, major customers, and the material countries in which the entity holds assets and reports revenues. The statement will be effective for fiscal years beginning after December 15, 1997 and the Company will adopt its provisions in 1998. Reclassification for earlier periods is required, unless impracticable, for comparative purposes. The Company is currently evaluating the impact this statement will have on its financial statements; however, because the statement requires only additional disclosure, the Company does not expect the statement to have a material impact on its financial position or results of operations.

#### Reclassification of Prior Year Balances

Certain reclassifications have been made to prior years' consolidated financial statements to conform to the current presentation.

### 3. FINANCIAL INSTRUMENTS AND RISK MANAGEMENT:

#### Foreign Exchange Risk Management

The Company uses forward exchange contracts and local currency purchased options in an effort to reduce its exposure to currency fluctuations on future U.S. dollar cash flows derived from foreign currency denominated sales associated with the intercompany purchases of inventory. The Company has entered into forward exchange contracts, and to a lesser extent, local currency purchased options to hedge a portion of its probable anticipated, but not firmly committed transactions. The Company plans to use local currency purchased options prospectively to hedge probable anticipated, but not firmly committed transactions. The Company has also used forward exchange contracts to hedge firm commitments. Market value gains and losses on forward exchange contracts are recognized immediately in earnings unless a firm commitment exists. Market value gains and premiums on local currency purchased options on probable anticipated transactions and market value gains and losses on forward exchange contracts hedging firm commitments are recognized when the hedged transaction occurs. These contracts, which relate primarily to Japanese and European currencies generally have terms of eighteen months or less. The Company does not hold or issue derivative financial instruments for trading purposes.

Forward exchange contracts with notional amounts totaling \$25,700,000, none, and \$8,200,000 to exchange foreign currencies for U.S. dollars, were outstanding at December 31, 1995 and 1996, and September 30, 1997, respectively. Local currency purchased options with notional amounts totaling none, \$3,722,000 and none to exchange foreign currencies for U.S. dollars were outstanding at December 31, 1995 and 1996 and September 30, 1997, respectively.

Foreign exchange losses of \$479,000 and foreign exchange gains of \$460,000 on forward exchange contracts that did not qualify for hedge accounting were recognized in earnings during 1996, and the nine months ended September 30, 1997, respectively, and are classified in other income. Gains on forward exchange contracts that qualify for hedge accounting of \$3,061,000 and \$978,000 were deferred and classified in other accrued expenses at December 31, 1995 and 1996, respectively. Gains of local currency purchased options deferred at December 31, 1996 that qualify for hedge accounting of \$200,000 were deferred in other accrued expenses. Gains on forward exchange contracts and local currency purchased options that qualify for hedge accounting are classified in cost of goods sold and totaled \$927,000, \$1,928,000, \$2,476,000, and \$1,554,000, and \$978,000 for the years ended December 31, 1994, 1995, 1996, and the nine months ended

## MKS INSTRUMENTS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS -- (CONTINUED)  
(TABLES IN THOUSANDS EXCEPT PER SHARE DATA)  
INFORMATION FOR THE NINE MONTHS ENDED  
SEPTEMBER 30, 1996 IS UNAUDITED.

September 30, 1996 and 1997, respectively. There are no forward exchange contracts outstanding at September 30, 1997 which qualify for hedge accounting.

The fair value of forward exchange contracts at September 30, 1997, determined by applying period end currency exchange rates to the notional contract amounts, amounted to \$525,000. The fair value of local currency purchased options at December 31, 1996, obtained through dealer quotes, totaled approximately \$200,000.

The market risk exposure from forward exchange contracts is assessed in light of the underlying currency exposures and is controlled by the initiation of additional or offsetting foreign currency contracts. The market risk exposure from options is limited to the cost of such investments. Credit risk exposure from forward exchange contract and local currency purchased option are minimized as these instruments are contracted with a major financial institution. The Company monitors the credit worthiness of this financial institution and full performance is anticipated.

#### Interest Rate Risk Management

The Company utilizes an interest rate swap to fix the interest rate on certain variable rate term loans in order to minimize the effect of changes in interest rates on earnings. In 1993, the Company entered into a five-year interest rate swap agreement with a major financial institution for the notional amount of \$5,000,000 equal to one half of the term loan described in Note 6. Under the agreement, the Company pays a fixed rate of 5.1% on the notional amount and receives the London Interbank Offering Rate ("LIBOR"). The interest differential paid or received on the swap agreement is recognized as an adjustment to interest expense. At September 30, 1997 the fair value of this interest rate swap, which represents the amount the Company would receive or pay to terminate the agreement, is a net receivable of \$15,000, based on dealer quotes.

The market risk exposure from the interest rate swap is assessed in light of the underlying interest rate exposures. Credit risk exposure from the swap is minimized as the agreement is with a major financial institution. The Company monitors the creditworthiness of this financial institution and full performance is anticipated.

#### Concentrations of Credit Risk

The Company's significant concentrations of credit risk consist principally of cash and cash equivalents and trade accounts receivable. The Company maintains cash and cash equivalents with financial institutions including the bank it has borrowings with. Concentrations of credit risk with respect to trade accounts receivable are limited due to the large number of geographically dispersed customers. Credit is extended for all customers based on financial condition and, collateral is not required.

#### Fair Value of Financial Instruments

The fair value of the term loans, including the current portion, approximates its carrying value given its variable rate interest provisions. The fair value of mortgage notes is based on borrowing rates for similar instruments and approximates its carrying value. For all other balance sheet financial instruments, the carrying amount approximates fair value because of the short period to maturity of these instruments.

#### Use of Estimates

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and

## MKS INSTRUMENTS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS -- (CONTINUED)  
 (TABLES IN THOUSANDS EXCEPT PER SHARE DATA)  
 INFORMATION FOR THE NINE MONTHS ENDED  
 SEPTEMBER 30, 1996 IS UNAUDITED.

disclosure of contingent assets and liabilities at the dates of the financial statements and the reported amounts of revenues and expenses during the reporting periods. Actual results could differ from those estimates.

## 4. INVENTORIES:

Inventories consist of the following:

	DECEMBER 31,		SEPTEMBER 30, 1997
	1995	1996	
Raw material.....	\$ 10,839	\$ 10,337	\$ 10,292
Work in process.....	8,833	6,177	7,066
Finished goods.....	10,288	8,986	10,723
	-----	-----	-----
	\$ 29,960	\$ 25,500	\$ 28,081
	=====	=====	=====

## 5. PROPERTY, PLANT AND EQUIPMENT:

Property, plant and equipment consist of the following:

	DECEMBER 31,		SEPTEMBER 30, 1997
	1995	1996	
Land.....	\$ 7,923	\$ 8,295	\$ 8,581
Buildings.....	22,728	26,885	26,387
Machinery and equipment.....	22,202	24,711	24,025
Furniture and fixtures.....	5,412	8,046	9,372
Leasehold improvements.....	816	1,184	896
	-----	-----	-----
	59,081	69,121	69,261
Less: accumulated depreciation and amortization.....	25,871	31,114	34,918
	-----	-----	-----
	\$ 33,210	\$ 38,007	\$ 34,343
	=====	=====	=====

## 6. DEBT:

## Credit Agreements and Short-term Borrowings

In February 1996, the Company entered into a loan agreement with a bank which provides access to a revolving credit loan and term loan. This agreement has since been amended. The revolving credit facility provides for uncollateralized borrowings up to \$20,000,000, which expires on June 30, 1999. Interest on borrowings is payable quarterly at varying rates based, subject to the Company's option, at the bank's base rate, or money market rate, or LIBOR. At December 31, 1995 and 1996 and September 30, 1997, the interest rate in effect was the bank's base rate of 8.5%, 8.25%, and 8.5%, respectively. At December 31, 1995 and 1996 and September 30, 1997, the Company had \$1,525,000, \$1,875,000, and \$2,500,000, respectively, of borrowings, under this revolving credit loan.

Additionally, certain of the Company's foreign subsidiaries have lines of credit and short-term borrowing arrangements with various financial institutions which provide for aggregate borrowings as of September 30, 1997 of up to \$13,300,000, which generally expire and are renewed at six month intervals. At December 31, 1995 and 1996 and September 30, 1997, total borrowings outstanding under these arrangements were \$10,739,000, \$10,950,000, and \$10,671,000, respectively, at interest rates ranging from 1.3% to 13.7%, 1.3% to

## MKS INSTRUMENTS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS -- (CONTINUED)  
 (TABLES IN THOUSANDS EXCEPT PER SHARE DATA)  
 INFORMATION FOR THE NINE MONTHS ENDED  
 SEPTEMBER 30, 1996 IS UNAUDITED.

15.5%, and 1.3% to 14.5%, respectively. Foreign short-term borrowings are generally collateralized by certain trade accounts receivable and are guaranteed by a domestic bank.

## Long-Term Debt

Long-term debt consists of the following:

	DECEMBER 31,		SEPTEMBER 30, 1997
	1995	1996	
Term loans.....	\$15,528	\$13,861	\$12,611
Mortgage notes.....	5,292	4,675	3,978
Total long-term debt.....	20,820	18,536	16,589
Less: current portion.....	2,203	2,258	2,153
Long-term debt less current portion.....	\$18,617	\$16,278	\$14,436

The term loan facility of the loan agreement entered into on November 1, 1993, provided for borrowings of \$10,000,000. Principal payments are payable in equal monthly installments of \$56,000 through October 1, 2000, with the remaining principal payment due on November 1, 2000. The loan is collateralized by certain land, buildings, and equipment.

On October 31, 1995, the Company entered a loan agreement with the same bank which provided additional uncollateralized term loan borrowings of \$7,000,000. Principal payments on the additional term loan borrowings are payable in equal monthly installments of \$83,000 through June 1, 2002, with the remaining principal payment due on June 30, 2002.

Interest on the term loan borrowings is payable monthly at varying rates based, subject to the Company's option, at the bank's base rate, or money market rate, or LIBOR. At December 31, 1995 and 1996 and September 30, 1997, the interest rates in effect for these borrowings were 7.1%, 7.375%, and 6.925%, respectively.

The terms of the loan agreements, as amended, contain, among other provisions, requirements for maintaining certain levels of tangible net worth and other financial ratios. The agreement also contains restrictions with respect to acquisitions. Under the most restrictive covenant, the operating cash flow to debt service ratio for a fiscal quarter shall not be less than 1.25 to 1.0. In the event of default of these covenants or restrictions, any obligation then outstanding under the loan agreement shall become payable upon demand by the bank. The Company was in compliance with these covenants and restrictions at September 30, 1997.

The Company has loans outstanding from various foreign banks in the form of mortgage notes at interest rates ranging from 2.1% to 10.75%. Principal and interest are payable in monthly installments through 2010. The loans are collateralized by mortgages on certain of the Company's foreign properties.

## MKS INSTRUMENTS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS -- (CONTINUED)  
 (TABLES IN THOUSANDS EXCEPT PER SHARE DATA)  
 INFORMATION FOR THE NINE MONTHS ENDED  
 SEPTEMBER 30, 1996 IS UNAUDITED.

Aggregate maturities of long-term debt over the next five years are as follows:

	AGGREGATE MATURITIES
	-----
October 1, 1997 to December 31, 1997.....	\$ 577
Year ending December 31, 1998.....	2,095
Year ending December 31, 1999.....	2,037
Year ending December 31, 2000.....	7,322
Year ending December 31, 2001.....	1,384
Year ending December 31, 2002.....	1,307
Thereafter.....	1,867
	-----
	\$ 16,589
	=====

## 7. LEASE COMMITMENTS:

The Company leases certain of its facilities and machinery and equipment under capital and operating leases expiring in various years through 2002 and thereafter. Generally, the facility leases require the Company to pay maintenance, insurance and real estate taxes. Rental expense under operating leases totaled \$1,506,000, \$1,985,000 and \$2,487,000, for the years ended December 31, 1994, 1995 and 1996, respectively, and \$1,919,000 and \$1,876,000 for the nine month period ended September 30, 1996 and 1997, respectively.

Minimum lease payments under operating and capital leases are as follows:

	OPERATING LEASES		CAPITAL LEASES
	REAL ESTATE	EQUIPMENT	EQUIPMENT
	-----	-----	-----
October 1, 1997 to December 31, 1997.....	\$ 523	\$ 149	\$ 313
Year ending December 31, 1998.....	1,073	447	1,187
Year ending December 31, 1999.....	362	268	915
Year ending December 31, 2000.....	78	82	691
Year ending December 31, 2001.....	9	33	209
Year ending December 31, 2002.....	--	19	9
Thereafter.....	--	29	--
	-----	-----	-----
Total minimum lease payments.....	\$ 2,045	\$ 1,027	3,324
	=====	=====	
Less: amounts representing interest.....			364
			-----
Present value of minimum lease payments.....			2,960
Less: current portion.....			1,048
			-----
Long-term portion.....			\$ 1,912
			=====

## 8. STOCKHOLDERS' EQUITY:

Prior to the effectiveness of a registration statement relating to the initial public offering of Common Stock of the Company, the Company will effect a 2,110 to one stock split, to be effected in the form of a stock dividend, of its common stock, increase the number of authorized shares of common stock to 50,000,000 and will authorize 2,000,000 shares of \$0.01 par value Preferred Stock. Accordingly, all share data has been restated to reflect the Common Stock split.

## MKS INSTRUMENTS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS -- (CONTINUED)  
 (TABLES IN THOUSANDS EXCEPT PER SHARE DATA)  
 INFORMATION FOR THE NINE MONTHS ENDED  
 SEPTEMBER 30, 1996 IS UNAUDITED.

## Common Stock

The Company has two classes of Common Stock. Stockholders of Class A Common Stock are entitled to voting rights with one vote for each share of Common Stock. Stockholders of Class B Common Stock are not entitled to voting rights.

Upon the closing of the offering for which this Registration Statement is being prepared each outstanding share of Class A and Class B Common Stock of the Company will be converted into an aggregate of 12,035,440 shares of Common Stock.

## Stock Option Plans

The Company grants options to employees under the 1995 Stock Incentive Plan (the "Plan") and to Directors under the 1996 Directors' Stock Plan (the "Directors' Plan").

Under the Plan, options to purchase 1,804,050 shares of the Company's authorized but unissued Common Stock may be granted. Under the Director's Plan, 42,200 such options may be granted. Stock options are granted at 100% of the fair value of the Company's Common Stock as determined by the Board of Directors on the date of grant. In reaching the determination of fair value at the time of each grant, the Board considered a range of factors, including the Company's current financial position, its recent revenues, results of operations and cash flows, its assessment of the Company's competitive position in its markets and prospects for the future, the status of the Company's product development and marketing efforts, current valuations for comparable companies and the illiquidity of an investment in the Company's common stock. Generally, stock options under the Plan vest 20% after one year and 5% per quarter thereafter, and expire 10 years after the grant date. Under the Directors' Plan, the options granted in 1996 vest over three years and options granted in 1997 and later vest at the earlier of (a) the next annual meeting, (b) 13 months from date of grant or (c) the effective date of an acquisition as defined in the Directors' Plan.

The following table presents the activity for options under the Plan.

	YEAR ENDED DECEMBER 31, 1995		YEAR ENDED DECEMBER 31, 1996		NINE MONTHS ENDED SEPTEMBER 30, 1997	
	OPTIONS	WEIGHTED AVERAGE EXERCISE PRICE	OPTIONS	WEIGHTED AVERAGE EXERCISE PRICE	OPTIONS	WEIGHTED AVERAGE EXERCISE PRICE
Outstanding -- beginning of period....	--	--	405,513	\$16.59	540,292	\$ 6.64
Granted.....	405,513	\$16.59	540,292	6.64	502,669	6.64
Exercised.....	--	--	--	--	--	--
Forfeited or Expired.....	--	--	(405,513)	16.59	(21,100)	6.64
Outstanding -- end of period.....	405,513	\$16.59	540,292	\$ 6.64	1,021,861	\$ 6.64
Exercisable at end of period.....	--	--	76,521	\$ 6.64	274,980	\$ 6.64

At September 30, 1997, Plan options for 1,021,861 shares were outstanding at an exercise price of \$6.64. The weighted average remaining contractual life of these options was 8.5 years.

During 1996, 18,088 options were granted at an exercise price of \$6.64 per share under the Directors' Plan and were outstanding at December 31, 1996. Of these options, 3,016 were exercisable. During 1997, options for 2,412 shares were granted at an exercise price of \$6.64 per share. At September 30, 1997, 20,500 options were outstanding with 7,536 exercisable at the \$6.64 per share price.

## MKS INSTRUMENTS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS -- (CONTINUED)  
 (TABLES IN THOUSANDS EXCEPT PER SHARE DATA)  
 INFORMATION FOR THE NINE MONTHS ENDED  
 SEPTEMBER 30, 1996 IS UNAUDITED.

The Company has adopted the disclosure-only provisions of Statement of Financial Accounting Standards No. 123 (SFAS No. 123), "Accounting for Stock-Based Compensation" for the year ended December 31, 1996. The Company has chosen to continue to account for stock-based compensation using the intrinsic value method prescribed in Accounting Principles Board Opinion No. 25, "Accounting for Stock Issued to Employees" and related interpretations. Accordingly, compensation cost for stock options is measured as the excess, if any, of the fair value of the Company's stock at the date of grant over the amount an employee must pay to acquire the stock.

The disclosures required under SFAS No. 123 have been omitted as they are not meaningful based upon the Company's planned conversion from an S Corporation to a C Corporation upon the closing of the offering for which these financial statements are being prepared. Had the fair value based method prescribed in SFAS No. 123 been used to account for stock-based compensation cost, there would have been no change in pro forma net income and pro forma earnings per share from that reported.

## 9. INCOME TAXES:

The Company has elected to be taxed as an S Corporation for federal and certain states income tax purposes and, as a result, is not subject to Federal taxation but is subject to state taxation on income in certain states. The stockholders are liable for individual Federal and certain state income taxes on their allocated portions of the Company's taxable income.

The components of income before income taxes and the historical related provision for income taxes consist of the following:

	YEAR ENDED DECEMBER 31,			NINE MONTHS ENDED
	1994	1995	1996	SEPTEMBER 30, 1997
Income before income taxes:				
United States.....	\$ 9,888	\$21,183	\$11,953	\$13,101
Foreign.....	915	1,475	1,350	981
	-----	-----	-----	-----
	\$10,803	\$22,658	\$13,303	\$14,082
	=====	=====	=====	=====
Current taxes:				
State.....	\$ 368	\$ 434	\$ 285	\$ 853
Foreign.....	610	657	792	572
	-----	-----	-----	-----
	978	1,091	1,077	1,425
	-----	-----	-----	-----
Deferred taxes:				
State.....	(55)	(88)	(156)	(128)
Foreign.....	(123)	(3)	(121)	(107)
	-----	-----	-----	-----
	(178)	(91)	(277)	(235)
	-----	-----	-----	-----
Provision for income taxes.....	\$ 800	\$ 1,000	\$ 800	\$ 1,190
	=====	=====	=====	=====

As the Company is not subject to Federal income taxes, a reconciliation of the effective tax rate to the Federal statutory rate is not meaningful.

## MKS INSTRUMENTS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS -- (CONTINUED)  
 (TABLES IN THOUSANDS EXCEPT PER SHARE DATA)  
 INFORMATION FOR THE NINE MONTHS ENDED  
 SEPTEMBER 30, 1996 IS UNAUDITED.

At December 31, 1995, 1996, and September 30, 1997 the components of the deferred tax asset and deferred tax liability were as follows:

	DECEMBER 31,		SEPTEMBER 30,
	1995	1996	1997
	----	----	-----
Deferred tax assets (liabilities):			
Inventory.....	\$143	\$234	\$ 314
Intercompany profits.....	125	160	193
Compensation.....	62	72	103
Investment booked under the equity method.....	(17)	(28)	(41)
Other.....	(179)	(34)	(37)
	----	----	-----
Total.....	\$134	\$404	\$ 532
	====	====	====

## 10. EMPLOYEE BENEFIT PLANS:

The Company has a 401(k) profit-sharing plan for U.S. employees meeting certain requirements in which eligible employees may contribute from 1% up to 12% of their compensation. The Company, at its discretion, may provide a matching contribution which will generally match up to the first 2% of each participant's compensation, plus 25% of the next 4% of compensation. At the discretion of the Board of Directors, the Company may also make additional contributions for the benefit of all eligible employees. The Company's contributions are generally paid annually, and were \$1,324,000, \$1,850,000, and \$2,170,000 for the years ended December 31, 1994, 1995, and 1996. Approximately \$2,100,000 has been accrued as the Company's contribution for the nine month period ended September 30, 1997 and is included in accrued compensation.

The Company maintains a bonus plan which provides cash awards to key employees, at the discretion of the Board of Directors, based upon operating results and employee performance. Bonus expense to key employees was \$1,231,000, \$764,000, and none, for the years ended December 31, 1994, 1995, and 1996, respectively, and none and \$956,000 for the nine months ended September 30, 1996 and 1997, respectively.

On September 30, 1995, the Board of Directors voted to terminate the Company's stock appreciation plan covering certain key employees. Performance shares awarded under the Plan entitled the employee to a pro rata share increase in the adjusted net book value of the Company. The Company recorded compensation expense of \$160,000 and \$199,000 under this plan for the years ended December 31, 1994 and 1995, respectively.

## 11. RESTRUCTURING:

In 1996, the Company recorded a restructuring charge of \$1,400,000, primarily related to reduction of personnel and the closure of facilities in Phoenix, AZ and San Jose, CA. These charges include \$425,000 of severance pay, \$710,000 of lease commitments, and \$265,000 for the write-off of leasehold improvements. The closure concluded during fiscal year 1997. The remaining balance of the restructuring charge of approximately \$400,000 for lease commitments is included in "Other Accrued Expenses" in the accompanying balance sheet as of September 30, 1997.



## MKS INSTRUMENTS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS -- (CONTINUED)  
(TABLES IN THOUSANDS EXCEPT PER SHARE DATA)  
INFORMATION FOR THE NINE MONTHS ENDED  
SEPTEMBER 30, 1996 IS UNAUDITED.

## 13. SUBSEQUENT EVENT (UNAUDITED)

On January 14, 1998, the Company amended their Articles of Organization to increase the number of authorized shares of Class A Common Stock, no par value per share, from 10,000 shares to 6,000,000 shares and to increase the number of authorized shares of Class B Common Stock, no par value per share from 10,000 to 10,000,000 shares. In addition, the Company effected a 2,110 for 1 stock split in the form of a stock dividend.

## INSIDE BACK COVER (PG.5):

The inside back cover graphically depicts MKS Instruments' message of being a worldwide provider of process control solutions. It is produced in four-color process. In the center of the page is a photo of the Earth, with the tag line "Providing Solutions Around the Process, Around the World" wrapping around the photo. The background of the page is dark, with the MKS logo appearing at the top, knocking out to white. Photos of MKS products surround the globe image--above, below, left, and right--and include MKS Baratron Capacitance Manometers, a Throttling Poppet Valve, a Pressure Controller, Mass Flow Controllers, an In Situ Flow Verifier, a Direct Liquid Injection Subsystem, and a Residual Gas Analyzer.

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No dealer, sales representative or any other person has been authorized to give any information or to make any representations in connection with this Offering other than those contained in this Prospectus, and, if given or made, such information or representation must not be relied upon as having been authorized by the Company or the Underwriters. This Prospectus does not constitute an offer to sell or a solicitation of an offer to buy any of the securities other than the shares of Common Stock to which it relates or an offer to, or a solicitation of, any person in any jurisdiction in which such an offer or solicitation is unlawful. Neither the delivery of this Prospectus nor any sale made hereunder shall, under any circumstances, create any implication that there has been no change in the affairs of the Company or that the information contained herein is correct as of any time subsequent to the date hereof.

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Until , 1998 (25 days after the date of this Prospectus), all dealers effecting transactions in the Common Stock, whether or not participating in this distribution, may be required to deliver a Prospectus. This is in addition to the obligation of dealers to deliver a Prospectus when acting as Underwriters and with respect to their unsold allotments or subscriptions

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4,000,000 SHARES  
MKS INSTRUMENTS, INC.  
COMMON STOCK

-----

PROSPECTUS

-----

NATIONSBANC MONTGOMERY  
SECURITIES, INC.

DONALDSON, LUFKIN & JENRETTE

SECURITIES CORPORATION

PAINWE BBER INCORPORATED

, 1998

=====

## PART II

## INFORMATION NOT REQUIRED IN PROSPECTUS

## ITEM 13. OTHER EXPENSES OF ISSUANCE AND DISTRIBUTION.

Estimated expenses payable in connection with the sale of the Common Stock offered hereby are as follows:

SEC Registration Fee.....	\$20,209
NASD Filing Fee.....	7,400
Printing, Engraving and Mailing Expenses.....	*
Nasdaq Listing Fee.....	*
Legal Fees and Expenses.....	*
Accounting Fees and Expenses.....	*
Blue Sky Fees and Expenses.....	*
Transfer Agent and Registrar Fees.....	*
Miscellaneous.....	*
	-----
Total.....	\$ *
	=====

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\* To be filed by amendment

The Company will bear all expenses shown above.

## ITEM 14. INDEMNIFICATION OF DIRECTORS AND OFFICERS.

Section 67 of Chapter 156B of the Massachusetts General Laws provides that a corporation may indemnify its directors and officers to the extent specified in or authorized by (i) the articles of organization; (ii) a by-law adopted by the stockholders; or (iii) a vote adopted by the holders of a majority of the shares of stock entitled to vote on the election of directors. In all instances, the extent to which a corporation provides indemnification to its directors and officers under Section 67 is optional. In its Amended and Restated Articles of Organization (the "Articles of Organization"), the Registrant has elected to commit to provide indemnification to its directors and officers in specified circumstances. Generally, Article 6 of the Registrant's Articles of Organization provides that the Registrant shall indemnify directors and officers of the Registrant against liabilities and expenses arising out of legal proceedings brought against them by reason of their status as directors or officers or by reason of their agreeing to serve, at the request of the Registrant, as a director or officer with another organization. Under this provision, a director or officer of the Registrant shall be indemnified by the Registrant for all costs and expenses (including attorneys' fees), judgments, liabilities and amounts paid in settlement of such proceedings, even if he is not successful on the merits, if he acted in good faith in the reasonable belief that his action was in the best interests of the Registrant. The Board of Directors may authorize advancing litigation expenses to a director or officer at his request upon receipt of an undertaking by any such director or officer to repay such expenses if it is ultimately determined that he is not entitled to indemnification for such expenses.

Article 6 of the Registrant's Articles of Organization eliminates the personal liability of the Registrant's directors to the Registrant or its stockholders for monetary damages for breach of a director's fiduciary duty, except to the extent Chapter 156B of the Massachusetts General Laws prohibits the elimination or limitation of such liability.

The Underwriting Agreement, a form of which is filed at Exhibit 1.1 to this Registration Statement on Form S-1 (the "Underwriting Agreement"), provides that the Underwriters are obligated under certain circumstances to indemnify directors, officers and controlling persons of the Registrant against certain liabilities, including liabilities under the Securities Act of 1933, as amended (the "Securities Act"). Reference is made to the form of Underwriting Agreement.

The Company has obtained directors and officers liability insurance for the benefit of its directors and certain of its officers.

ITEM 15. RECENT SALES OF UNREGISTERED SECURITIES.

In the three years preceding the filing of this Registration Statement, the Registrant has not sold any securities. The registrant has awarded to employees and directors options to purchase 1,042,361 shares of Common Stock. The grant of options were exempt from registration under the Securities Act by virtue of the provisions of Section 4(2) of the Securities Act or Rule 701 thereunder.

ITEM 16. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES.

(a) Exhibits:

EX. NO.	DESCRIPTION
+1.1	Form of Underwriting Agreement
3.1	Restated Articles of Organization, as amended
3.2	Form of Amended and Restated Articles of Organization
+3.3	By-laws, as amended
3.4	Form of Amended and Restated By-laws
4.1	Specimen certificate representing the Common Stock
*5.1	Opinion of Hale and Dorr LLP
10.1	Amended and Restated 1995 Stock Incentive Plan
10.2	1996 Director Stock Option Plan, as amended
10.3	1997 Director Stock Option Plan
10.4	1997 Employee Stock Purchase Plan
+10.5	Amended and Restated Employment Agreement dated as of December 15, 1995 between Leo Berlinghieri and the Registrant
+10.6	Amended and Restated Employment Agreement dated as of December 15, 1995 between John J. Sullivan and the Registrant
+10.7	Amended and Restated Employment Agreement dated as of December 15, 1995 between Ronald C. Weigner and the Registrant
+10.8	Amended and Restated Employment Agreement dated as of December 15, 1995 between William D. Stewart and the Registrant
+10.9	Loan Agreement dated as of October 31, 1995, as amended February 23, 1996, by and between the First National Bank of Boston and the Registrant
+10.10	Lease Agreement dated as of October 12, 1989, as extended October 14, 1994, by and between Aspen Industrial Park Partnership and the Registrant
+10.11	Loan Agreement dated as of November 1, 1993, as last amended February 4, 1997 between the First National Bank of Boston and the Registrant
+10.12	Lease dated as of September 21, 1995 by and between General American Life Insurance Company and the Registrant
+10.13	Loan Agreement dated as of February 23, 1996, as last amended February 4, 1997 between the First National Bank of Boston, Chemical Bank and the Registrant
+10.14	Revolving Credit Note (\$8,000,000) dated February 23, 1996 between Chemical Bank, The First National Bank of Boston and the Registrant
+10.15	Revolving Credit Note (\$12,000,000) dated February 23, 1996 between Chemical Bank, The First National Bank of Boston and the Registrant
+10.16	Promissory Note dated as of August 1990 between Jefferson National Life Insurance Company and the Registrant
+**10.17	Purchase Agreement dated June 1, 1996 by and between Applied Materials, Inc. and the Registrant

EX. NO.	DESCRIPTION
+10.18	Management Incentive Program
+10.19	Lease dated as of December 21, 1989, as last amended December 1996, between Walpole Park South II Trust and the Registrant
+10.20	Lease dated as of January 1, 1996 between MiFuji Kanzai Co. Ltd. and the Registrant (covering Floor 5)
+10.21	Lease dated as of April 21, 1997 between MiFuji Kanzai Co. Ltd. and the Registrant (covering Floors 1 and 2)
+10.22	Split-Dollar Agreement dated as of September 12, 1991 between the Registrant, John R. Bertucci and Claire R. Bertucci and Richard S. Chute, Trustees of the John R. Bertucci Insurance Trust of January 10, 1986
+10.23	Split-Dollar Agreement dated as of September 12, 1991 between the Registrant, John R. Bertucci and John R. Bertucci and Thomas H. Belknap, Trustees of the Claire R. Bertucci Insurance Trust of January 10, 1986
10.24	Tax Indemnification and S Corporation Distribution Agreement
+11.1	Statement re Computation of Per Share Earnings
+21.1	Subsidiaries of the Registrant
*23.1	Consent of Hale and Dorr LLP (contained in Exhibit 5.1)
+23.2	Consent of Coopers & Lybrand L.L.P.
+24	Power of Attorney (included on Page II-4)
+27	Financial Data Schedule

+ Previously filed.

\* To be filed by amendment.

\*\* Confidential materials omitted and filed separately with the Securities and Exchange Commission.

(b) FINANCIAL STATEMENTS SCHEDULES

Report of Independent Accountants on Schedule II -- Valuation and Qualifying Accounts

Schedule II -- Valuation and Qualifying Accounts

ITEM 17. UNDERTAKINGS.

Insofar as indemnification for liabilities arising under the Securities Act of 1933 may be permitted to directors, officers and controlling persons of the registrant pursuant to the foregoing provisions, or otherwise, the registrant has been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the registrant of expenses incurred or paid by a director, officer or controlling person of the registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer and controlling person in connection with the securities being registered, the registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the questions whether such indemnification by it is against public policy as expressed in the Act and will be governed by the final adjudication of such issue.

The undersigned registrant hereby undertakes that:

(1) For purposes of determining any liability under the Securities Act of 1933, the information omitted from the form of prospectus filed as part of a registration statement in reliance upon Rule 430A and contained in the form of prospectus filed by the registrant pursuant to Rule 424(b)(1) or (4) or 497(h) under the Securities Act shall be deemed to be part of this registration statement as of the time it was declared effective.

(2) For the purpose of determining any liability under the Securities Act of 1933, each post-effective amendment that contains a form of prospectus shall be deemed to be a new registration statement relating to the securities offer therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

The undersigned registrant hereby further undertakes to provide to the underwriters at the closing specified in the underwriting agreements, certificates in such denominations and registered in such names as required by the underwriters to permit prompt delivery to each purchaser.

SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, the Registrant has duly caused this Amendment No. 2 to its Registration Statement (File No. 333-40269) to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Andover, Commonwealth of Massachusetts, on this 15th day of January, 1998.

MKS INSTRUMENTS, INC.

By: /s/ JOHN R. BERTUCCI  
 -----  
 JOHN R. BERTUCCI  
 CHAIRMAN OF THE BOARD, PRESIDENT AND  
 CHIEF EXECUTIVE OFFICER

Pursuant to the requirements of the Securities Act of 1933, this Registration Statement has been signed by the following persons in the capacities and on the dates indicated.

SIGNATURES	TITLE	DATE
/s/ JOHN R. BERTUCCI ----- JOHN R. BERTUCCI	Chairman of the Board of Directors, President and Chief Executive Officer (Principal Executive Officer)	January 15, 1998
* ----- RONALD C. WEIGNER	Vice President and Chief Financial Officer (Principal Financial and Accounting Officer)	January 15, 1998
* ----- RICHARD S. CHUTE	Director	January 15, 1998
* ----- OWEN W. ROBBINS	Director	January 15, 1998
* ----- ROBERT J. THERRIEN	Director	January 15, 1998
* ----- LOUIS P. VALENTE	Director	January 15, 1998
*By /s/ JOHN R. BERTUCCI ----- JOHN R. BERTUCCI Attorney-in-Fact		

## EXHIBIT INDEX

EX. NO.	DESCRIPTION
+1.1	Form of Underwriting Agreement
3.1	Restated Articles of Organization, as amended
3.2	Form of Amended and Restated Articles of Organization
+3.3	By-laws, as amended
3.4	Form of Amended and Restated By-laws
4.1	Specimen certificate representing the Common Stock
*5.1	Opinion of Hale and Dorr LLP
10.1	Amended and Restated 1995 Stock Incentive Plan
10.2	1996 Director Stock Option Plan, as amended
10.3	1997 Director Stock Option Plan
10.4	1997 Employee Stock Purchase Plan
+10.5	Amended and Restated Employment Agreement dated as of December 15, 1995 between Leo Berlinghieri and the Registrant
+10.6	Amended and Restated Employment Agreement dated as of December 15, 1995 between John J. Sullivan and the Registrant
+10.7	Amended and Restated Employment Agreement dated as of December 15, 1995 between Ronald C. Weigner and the Registrant
+10.8	Amended and Restated Employment Agreement dated as of December 15, 1995 between William D. Stewart and the Registrant
+10.9	Loan Agreement dated as of October 31, 1995, as amended February 23, 1996, by and between the First National Bank of Boston and the Registrant
+10.10	Lease Agreement dated as of October 12, 1989, as extended October 14, 1994, by and between Aspen Industrial Park Partnership and the Registrant
+10.11	Loan Agreement dated as of November 1, 1993, as last amended February 4, 1997 between the First National Bank of Boston and the Registrant
+10.12	Lease dated as of September 21, 1995 by and between General American Life Insurance Company and the Registrant
+10.13	Loan Agreement dated as of February 23, 1996, as last amended February 4, 1997 between the First National Bank of Boston, Chemical Bank and the Registrant
+10.14	Revolving Credit Note (\$8,000,000) dated February 23, 1996 between Chemical Bank, The First National Bank of Boston and the Registrant
+10.15	Revolving Credit Note (\$12,000,000) dated February 23, 1996 between Chemical Bank, The First National Bank of Boston and the Registrant
+10.16	Promissory Note dated as of August 1990 between Jefferson National Life Insurance Company and the Registrant
+**10.17	Purchase Agreement dated June 1, 1996 by and between Applied Materials, Inc. and the Registrant
+10.18	Management Incentive Program
+10.19	Lease dated as of December 21, 1989, as last amended December 1996, between Walpole Park South II Trust and the Registrant
+10.20	Lease dated as of January 1, 1996 between MiFuji Kanzai Co. Ltd. and the Registrant (covering Floor 5)
+10.21	Lease dated as of April 21, 1997 between MiFuji Kanzai Co. Ltd. and the Registrant (covering Floors 1 and 2)
+10.22	Split-Dollar Agreement dated as of September 12, 1991 between the Registrant, John R. Bertucci and Claire R. Bertucci and Richard S. Chute, Trustees of the John R. Bertucci Insurance Trust of January 10, 1986

EX. NO.	DESCRIPTION
+10.23	Split-Dollar Agreement dated as of September 12, 1991 between the Registrant, John R. Bertucci and John R. Bertucci and Thomas H. Belknap, Trustees of the Claire R. Bertucci Insurance Trust of January 10, 1986
*10.24	Tax Indemnification and S Corporation Distribution Agreement
+11.1	Statement re Computation of Per Share Earnings
+21.1	Subsidiaries of the Registrant
*23.1	Consent of Hale and Dorr LLP (contained in Exhibit 5.1)
+23.2	Consent of Coopers & Lybrand L.L.P.
+24	Power of Attorney (included on Page II-4)
+27	Financial Data Schedule

- -----  
+ Previously filed.

\* To be filed by amendment.

\*\* Confidential materials omitted and filed separately with the Securities and Exchange Commission.

LM

The Commonwealth of Massachusetts

EXHIBIT 3.1

-----  
Examiner

MICHAEL JOSEPH CONNOLLY  
Secretary of State  
ONE ASHBURTON PLACE, BOSTON, MASS. 02108

FEDERAL IDENTIFICATION No. 04-2277512

RESTATED ARTICLES OF ORGANIZATION

General Laws, Chapter 156B, Section 74

This certificate must be submitted to the Secretary of the Commonwealth within sixty days after the date of the vote of stockholders adopting the restated articles of organization. The fee for filing this certificate is prescribed by General Laws, Chapter 156B, Section 114. Make check payable to the Commonwealth of Massachusetts.

-----

We, John R. Bertucci, President, and  
Richard S. Chute, Clerk of

MKS Instruments, Inc.

-----  
(Name of Corporation)

located at 34 Third Avenue, Burlington, Massachusetts 01803  
-----

do hereby certify that the following restatement of the articles of organization of the corporation was duly adopted and authorized by unanimous written consent of all the Directors dated January 15, 1982.

-----  
-----  
-----

1. The name by which the corporation shall be known is:  
MKS Instruments, Inc.
2. The purposes for which the corporation is formed are as follows:  
See Continuation Sheets 2A and 2B.

Note: If the space provided under any article or item on this form is insufficient, additions shall be set forth on separate 8 1/2 x 11 sheets of paper leaving a left hand margin of at least 1 inch for binding. Additions to more than one article may be continued on a single sheet so long as each article requiring each such addition is clearly indicated.

3. The total number of shares and the par value, if any, of each class of stock which the corporation is authorized to issue is as follows:

CLASS OF STOCK	WITHOUT PAR VALUE	WITH PAR VALUE	
	NUMBER OF SHARES	NUMBER OF SHARES	PAR VALUE
Preferred	None	None	None
Class A Common	10,000	None	None
Class B Common	10,000	None	None

- \*4. If more than one class is authorized, a description of each of the different classes of stock with, if any, the preferences, voting powers, qualifications, special or relative rights or privileges as to each class thereof and any series now established:

See Continuation Sheet 4A.

- \*5. The restrictions, if any, imposed by the articles of organization upon the transfer of shares of stock of any class are as follows:

See Continuation Sheets 5A, 5B, 5C and 5D.

- \*6. Other lawful provisions, if any, for the conduct and regulation of the business and affairs of the corporation, for its voluntary dissolution, or for limiting, defining, or regulating the powers of the corporation, or of its directors or stockholders, or of any class of stockholders:

See Continuation Sheet 6A.

\*If there are no such provisions state "None".

## 2. The purposes for which the corporation is formed are as follows:

To design, manufacture, sell, lease and license instruments of all kinds, including electromechanical, electronic and mechanical gauges for the measurement of pressure, temperature, acceleration, flow and level of liquids and gases; to design, manufacture, sell, lease and license control systems incorporating measuring devices, and control systems separate from measuring devices, for the control of production processes and operations of all kinds; to design, manufacture, sell, lease and license instrumentation for military use; to design, manufacture, sell, lease and license instrumentation for use in research laboratories, in industry, in educational institutions, for medical purposes and for use elsewhere and for other purposes; and in general to design, manufacture, sell, lease and license electro-mechanical, electronic and mechanical devices of all kinds.

To buy and sell at wholesale and retail, or otherwise, to manufacture, produce, adapt, repair, dispose of, export, import and in any other manner to deal in goods, wares, merchandise, articles and things of manufacture or otherwise of all materials, supplies and other articles and things necessary or convenient for use in connection with any of said businesses or any other business or any part thereof; and to manufacture, repair, purchase, sell, lease, dispose of and otherwise deal in machinery, tools, and appliances which are or may be used in connection with the purchase, sale, production, adaptation, repair, disposition of, export, import or other dealings in said goods, wares, merchandise, articles and things.

To purchase, lease or otherwise acquire as a going concern or otherwise all or any part of the franchises, rights, property, assets, business, good will or capital stock of any persons, firm, corporation, trust or association engaged in whole or in part in any business in which this corporation is empowered to engage, or in any other business; to pay for the same in whole or in part in cash, stock, bonds, notes, securities or other evidence of indebtedness of this corporation or in any other manner; to assume as part of the consideration or otherwise any and all debts, contracts or liabilities, matured or unmatured, fixed or contingent, of any such person, firm or corporation, trust or association; and to operate, manage, develop and generally to carry on the whole or any part of any such business under any name or names which it may select or designate.

To construct, lease, hire, purchase or otherwise acquire and hold or maintain, and to rebuild, enlarge, improve, furnish, equip, alter, operate and dispose of warehouses, factories, offices and other buildings, real estate, structures or parts thereof, and appliances for the preparation, manufacture, purchase, sale and distribution of goods, wares, merchandise, things, and articles of all kinds.

To acquire, hold, use, sell, assign, lease, grant licenses in respect of, mortgage, or otherwise dispose of franchises, letters patent of the United States or of any foreign country, patent rights, licenses and privileges, inventions, improvements and processes, systems, copyrights, trade-marks and trade names, relating to, or useful in connection with, any business of this corporation.

To buy or otherwise acquire, to sell, assign, pledge, or otherwise dispose of and deal in stocks, bonds, securities, notes and other obligations of any person, firm or corporation, including this corporation, organized for or engaged in similar or cognate purposes; also stocks, bonds, securities, notes, and other obligations of any person, firm, or corporation, including this corporation, which it may be found or deemed necessary, valuable, or convenient for this corporation to acquire and deal in, in pursuance or furtherance of or in connection with the businesses herein specified, or any other business.

To borrow money and contract indebtedness for all proper corporate purposes, to issue bonds, notes, and other evidences of indebtedness, to secure the same by pledge, mortgage, or lien on all or any part of the property of the corporation, tangible or intangible; and to assume or guarantee or secure in like manner or otherwise, the leases, contracts, or other obligations, fixed or contingent, or the payment of any dividends on any stock or shares or of the principal or interest on any bonds, notes, or other evidences of indebtedness of any person, firm, corporation, trust, or association in which this corporation has a financial interest.

To enter into, make, and perform contracts of every name, nature, and kind with any person, firm, association, or corporation which may be deemed valuable, expedient, or convenient for this corporation in pursuance of or in furtherance of or in connection with any of the objects of incorporation of this corporation or in connection with any of the businesses or purposes herein specified.

The enumeration of specific powers herein shall not be construed as limiting or restricting in any way the general powers herein set forth, but nothing herein contained shall be construed as authorizing the business of banking.

4. If more than one class is authorized, a description of each of the different classes of stock with, if any, the preferences, voting powers, qualifications, special or relative rights or privileges as to each class thereof and any series now established:

The holders of shares of Class B Common stock of the corporation shall not be entitled to vote for the election of Officers or Directors or with respect to any other aspect of the business of the corporation, or any matter or thing which may come or be brought before any meeting of the Stockholders of the corporation; and said Class B Common stock shall not be deemed to be a class of stock entitled to vote for any purpose whatsoever. In all other respects, however, the Class B Common stock and the Class A Common stock of the corporation, and the respective rights and preferences thereof shall be equal, and neither class shall have any priority over the other with respect to the payment of dividends or to distributions in liquidation.

5. The restrictions, if any, imposed by the articles of organization upon the transfer of shares of stock of any class are as follows:

Section 5. Restrictions. None of the corporation's stock, of any class, may be transferred except as hereinafter provided:

(a) Before making any proposed disposition of any of the corporation's stock, the holder of the stock shall give written notice to the Board of Directors specifying in detail the nature of the proposed disposition and its terms, the class and number of the shares involved, and the consideration for the proposed disposition, if any. Such notice shall constitute an offer by the holder to sell the shares involved to the corporation at their Agreed Value, as determined hereunder, or, if such proposed disposition is one for a pecuniary consideration less than the Agreed Value of the shares involved, such notice shall constitute an offer to sell the shares to the corporation for such proposed pecuniary consideration.

(b) Within thirty days after receipt of such notice, the Board of Directors shall give written notice to the offering holder stating whether the corporation accepts or rejects the holder's offer. If the offer is accepted, such notice by the corporation shall state the price to be paid for the shares and shall specify whether the corporation elects to pay a part of the purchase price by means of the corporation's note, as provided for in subsection (d) hereof. The offering holder of such shares shall deliver the shares to the corporation, suitably endorsed, within ten days after receipt of the corporation's notice of acceptance, and upon receipt of the shares, the corporation shall make payment therefor in the manner hereinafter provided.

If such offer is rejected by the corporation, the Directors shall transmit forthwith such offer to the record owners of the Class A Common Stock of the corporation who shall, subject to the provisions of this subsection (b), have the right to purchase the offered shares, in amounts proportionate to their respective holdings of said Class A Common stock, upon all of the same terms and conditions upon which the corporation might have purchased said offered shares, except that payment for offered shares shall be made in cash unless otherwise agreed upon between the parties. Each such owner to whom such shares are offered shall have the right within thirty (30) days of such offer to purchase the entire number of shares apportioned to him as above or to purchase none, and such acceptance shall be extended by written notice to the Board of Directors given within such time. If any owner of Class A Common stock shall

not accept such offer, the Board of Directors shall forthwith notify the remaining shareholders of Class A Common stock that they may purchase in proportion to their respective holdings of such stock the shares which such owner was entitled to purchase. Each such shareholder to whom such shares are offered shall have the right within ten (10) days of such offer to purchase the entire number of shares apportioned to him as above or to purchase none. Within three days after the expiration of said ten-day period the Board of Directors shall give written notice to the offering holder advising him in detail of the elections made with respect to the offered shares by the owners of the Class A Common stock. If the offer has been accepted with respect to all of the offered shares, then the offering holder of such shares shall deliver the same to the corporation, suitably endorsed, for the account of the accepting owners, within ten days after receipt of said last-mentioned notice from the Board of Directors and upon receipt of the shares by the corporation the accepting owners of the Class A Common stock shall make payment therefor in accordance with the terms of their respective acceptances.

If such offer is rejected by the corporation and if such offer to the holders of the Class A Common stock is rejected, in whole or in part, the offering shareholder, at any time within six months after receipt of any such notice of rejection, may effect the disposition of the shares which was set forth in such offering shareholder's notice to the Board.

(c) The Agreed Value of the stock of the corporation shall be such as may from time to time be determined by the unanimous agreement in writing of the holders of the corporation's Class A Common stock, such determination to be reviewed and either confirmed or adjusted at reasonable intervals. The Agreed Value of the Class B Common stock shall be ninety (90) percent of the Agreed Value of the Class A Common stock, to reflect the fact that the Class B Common stock is not entitled to vote.

The Agreed Value of the stock of the corporation shall be reviewed as herein provided at six-month intervals following the adoption of this by-law and at the expiration of any such six-month period, if no agreement is arrived at, any owner of stock may demand from the owners of Class A Common stock that an agreement be reached and in the absence of such agreement within ten days thereafter, such value shall be determined by an arbitrator appointed by the President, or by some other appropriate official, of the American Arbitration Association, upon written request for such appointment made by any owner of stock of the corporation. The decision of such arbitrator shall be binding upon the parties, and may be enforced by any court having jurisdiction, but each owner of stock of the corporation shall

be entitled to appear before such arbitrator, to be represented by counsel, and to present evidence. The expenses of arbitration, other than expenses for counsel and witnesses, shall be borne pro rata, according to the number of shares held, by the owners of the stock of the corporation.

(d) In the event the corporation shall elect to accept the offer of the holder of its stock, as herein provided, the corporation may pay the full purchase price for such stock in cash at the time of the delivery of the stock to the corporation or, at the corporation's sole election, it may pay said purchase price partly in cash and partly in the form of an unsecured note of the corporation. If the corporation shall make the latter election, then in such event the corporation shall pay at least one-third (1/3) of the purchase price for the stock at the time the stock is delivered to the corporation, and the corporation shall then deliver to the selling shareholder the note of the corporation for the unpaid balance of the purchase price for the stock, bearing interest at the rate of 6% per annum on the unpaid principal balance and payable in or within two years from its date.

(e) Each share of stock of the corporation is subject to the requirements and restrictions upon the transfer of such shares set forth in this Section 5, and the same shall constitute a contract of each shareholder with the corporation, shall be binding upon each shareholder and his heirs, assigns, executors, administrators, or other legal representatives and upon all other persons succeeding to or standing in the place of or holding under the shareholder, whether by act of the shareholder or by operation of law. These provisions shall not be discharged by any transfer of shares which may be made in compliance with the provisions hereof, but shall apply anew to such shares in the hands of the new holder thereof. These provisions shall not restrict the making of a bona fide pledge of any shares to secure an indebtedness, but shall apply fully with respect to any proposed transfer from the name of the shareholder pursuant to such pledge, whether upon foreclosure or otherwise and whether to the pledgee or to any other person. These provisions shall not restrict the transfer of shares, without consideration, to the transferor's spouse or to the transferor's issue or to the spouses or the transferor's issue, or any of them (or to a form of joint ownership between the transferor and the transferees described next above, or any of them, or to a trust for the sole benefit of the transferor and the transferees described next above or any of them), but shall apply fully with respect to any proposed disposition by any such transferee, except as provided in this and the preceding sentence.

## Continuation Sheet 5D

(f) The determination of the Board of Directors under the provisions of this Section 5 shall be made by majority vote except that no waiver of the provisions of this Section 5 in the case of any proposed disposition of stock shall be granted by the vote of less than eighty (80) percent of the members of the Board of Directors. No Director shall be disqualified from voting on any matter arising under the provisions of this Section 5 by reason of such Director's ownership of stock of the corporation which might, directly or indirectly, be affected by such vote.

(g) In the event of any breach of any of the provisions of this Section 5 by any holder of any of the corporation's stock, none of the rights or privileges attaching to such stock (including, without limitation, voting rights and rights to dividends) may be exercised or enjoyed with respect to such stock by such holder or by any purported transferee from such holder while such breach shall continue, but nothing herein contained shall be deemed to preclude lawful action by the corporation to enforce the provisions of this Section 5.

6. Other lawful provisions, if any, for the conduct and regulation of the business and affairs of the corporation, for its voluntary dissolution, or for limiting, defining, or regulating the powers of the corporation, or of its directors or stockholders, or of any class of stockholders:

Pre-Emptive Rights. No stockholder shall, by reason of ownership of stock of the corporation, have any pre-emptive right to purchase unissued stock of the corporation, or to subscribe to stock of the corporation, or to purchase stock of the corporation previously issued and held in the treasury of the corporation, and, subject to the provisions of applicable law, the authorized and unissued stock of the corporation shall be issued to such person, firm, corporation or other legal entity, in such amounts, at such times, and for such consideration as a majority of the Board of Directors may from time to time determine.

\*We further certify that the foregoing restated articles of organization effect no amendments to the articles of organization of the corporation as heretofore amended,

None

-----  
(\*If there are no such amendments, state "None".)

Briefly describe amendments in space below:

None

IN WITNESS WHEREOF AND UNDER THE PENALTIES OF PERJURY, we have hereto signed our names this 15th day of January in the year 1982.

/s/ John R. Bertucci  
----- President  
John R. Bertucci

/s/ Richard S. Chute  
----- Clerk  
Richard S. Chute

## THE COMMONWEALTH OF MASSACHUSETTS

## RESTATED ARTICLES OF ORGANIZATION

(General Laws, Chapter 156B, Section 74)

I hereby approve the within restated articles of organization and, the filing fee in the amount of \$15.00 having been paid, said articles are deemed to have been filed with me this 19th day of January, 1982.

/s/ Michael Joseph Connolly

-----  
MICHAEL JOSEPH CONNOLLY  
Secretary of State

TO BE FILLED IN BY CORPORATION  
PHOTOCOPY OF RESTATED ARTICLES OF ORGANIZATION TO BE SENT

TO: Richard S. Chute, Esquire  
Hill & Barlow  
225 Franklin Street  
Boston, Massachusetts 02110  
Telephone 617/423-6200

Copy Mailed [SEAL OF WILLIAM FRANCIS GALVIN  
SECRETARY OF THE COMMONWEALTH  
DATED 2/20/96]

## THE COMMONWEALTH OF MASSACHUSETTS

MICHAEL JOSEPH CONNOLLY

SECRETARY OF STATE

ONE ASHBURTON PLACE  
BOSTON, MASS. 02108FEDERAL IDENTIFICATION  
NO. 04-2277512ARTICLES OF  
MERGER OF PARENT AND SUBSIDIARY CORPORATIONS  
PURSUANT TO GENERAL LAWS, CHAPTER 156B, SECTION 82

The fee for filing this certificate is prescribed by General Laws, Chapter 156B, Section 114. Make check payable to the Commonwealth of Massachusetts.

We, John R. Bertucci and Richard S. Chute, President\*/and Clerk\*/ of  
MKS Instruments, Inc. 042277512

-----  
name of corporation  
organized under the laws of the Commonwealth of Massachusetts and herein called  
the parent corporation, do hereby certify as follows:

1. That the subsidiary corporation(s) to be merged into the parent corporations is as follows\*:

Name	State of Organization	Date of Organization
MKS Disc, Inc. 046311363	Massachusetts	10/31/72

2. That the parent corporation owns at least ninety per cent of the outstanding shares of each class of the stock of each subsidiary corporation to be merged into the parent corporation.

3.

\*Delete the inapplicable words. In case the parent corporation is organized under the laws of a state other than Massachusetts these articles are to be signed by officers having corresponding powers and duties.

4. That at a meeting of the directors of the parent corporation the following vote, pursuant to subsection (a) of General Laws, Chapter 156B, Section 82, was duly adopted:

VOTED: That MKS Disc, Inc., a Massachusetts corporation and a wholly-owned subsidiary corporation of the Corporation, be merged with and into the Corporation in accordance with the provisions of Section 82 of the Massachusetts Business Corporation Law, the effective date of the merger to be the date of filing of the Articles of Merger of Parent and Subsidiary Corporations with the State Secretary of the Commonwealth of Massachusetts; that the President and Clerk of the Corporation be and hereby are authorized in the name and on behalf of the Corporation to execute the Articles of Merger of Parent and Subsidiary Corporations attached hereto (the "Articles of Merger") and to file the Articles of Merger with the State Secretary of the Commonwealth of Massachusetts; and in furtherance thereof that the President, any Vice President, Treasurer, Clerk, and Assistant Clerk of the Corporation or any one or more of them be and hereby are authorized in the name and on behalf of the Corporation to execute and deliver any and all documents and instruments and to take any and all action as they or any one or more of them may deem necessary or appropriate to effectuate the merger of MKS Disc, Inc. with and into the Corporation.

5. The effective date of the merger as specified in the vote set out under Paragraph 4 is the date of filing of these articles of merger of parent and subsidiary corporations.

6.

IN WITNESS WHEREOF and under the penalties of perjury we have hereto signed our names this 15th day of December, 1986.

/s/ John R. Burtucci                      President\*  
-----

/s/ Richard S. Chute                      Clerk\*  
-----

\*Delete the inapplicable words. In case the parent corporation is organized under the laws of a state other than Massachusetts these articles are to be signed by officers having corresponding powers and duties.

COMMONWEALTH OF MASSACHUSETTS

ARTICLES OF MERGER OF PARENT AND SUBSIDIARY CORPORATIONS  
(General Laws, Chapter 156B, Section 82)

I hereby approve the within articles of merger of parent and subsidiary corporations and, the filing fee in the amount of \$200.00 having been paid, said articles are deemed to have been filed with me this 15th day of December, 1986.

/s/ Michael J. Connolly  
-----  
MICHAEL JOSEPH CONNOLLY  
Secretary of State

TO BE FILLED IN BY CORPORATION  
Photo Copy of Merger To Be Sent

TO: Richard S. Chute, Esquire  
  
Hill & Barlow  
-----  
225 Franklin Street  
-----  
Boston, MA 02110  
-----  
Telephone 617-423-6200  
-----

Copy Mailed [SEAL OF WILLIAM FRANCIS GALVIN  
SECRETARY OF THE COMMONWEALTH  
DATED 2/20/96]

THE COMMONWEALTH OF MASSACHUSETTS

MICHAEL JOSEPH CONNOLLY

FEDERAL IDENTIFICATION

Secretary of State

NO. 04-2277512

ONE ASHBURTON PLACE, BOSTON, MASS. 02108

ARTICLES OF AMENDMENT

GENERAL LAWS, CHAPTER 156B, SECTION 72

This certificate must be submitted to the Secretary of the Commonwealth within sixty days after the date of the vote of stockholders adopting the amendment. The fee for filing this certificate is prescribed by General Laws, Chapter 156B, Section 114. Make check payable to the Commonwealth of Massachusetts.

We, John R. Bertucci, President and Richard S. Chute, Clerk of

MKS Instruments, Inc.

(Name of Corporation)

located at 34 Third Avenue, Burlington, Massachusetts 01803 do hereby certify that the following amendment to the restated articles of organization of the corporation was duly adopted by written consent dated December 15, 1986, by vote of 2454 shares of Class A Common out of 2454 shares outstanding, (Class of Stock)

CROSS OUT being all of each class outstanding and entitled to vote thereon.(2) INAPPLICABLE CLAUSE

C / / P / / M / /

(1)For amendments adopted pursuant to Chapter 156B, Section 70. (2)For amendments adopted pursuant to Chapter 156B, Section 71.

Note: If the space provided under any Amendment or item on this form is insufficient, additions shall be set forth on separate 8 1/2 - 11 sheets of paper leaving a left hand margin of at least 1 inch for binding. Additions to more than one Amendment may be continued on a single sheet so long as each Amendment requiring each such addition is clearly indicated.

FOR INCREASE IN CAPITAL FILL IN THE FOLLOWING:

	(-----shares preferred	) with par value
	(-----shares common	)
The total amount of capital stock		:
already authorized is	(-----shares preferred	) without par value
	(-----shares common	)
	(-----shares preferred	) with par value
	(-----shares common	)
The amount of additional capital		:
stock authorized is	(-----shares preferred	) without par value
	(-----shares common	)

Voted: That the Restated Articles of Organization of the Corporation be and hereby are amended by deleting and striking in their entirety the restrictions upon the transfer of shares of stock contained in article 5. of the Restated Articles of Organization of the Corporation so that there are no restrictions imposed by the articles of organization of the Corporation upon the transfer of shares of stock of any class of the Corporation; that the President and Clerk of the Corporation be and hereby are authorized in the name and on behalf of the Corporation to execute Articles of Amendment to effectuate such amendment of the Restated Articles of Organization of the Corporation, a copy of which is attached hereto (the "Articles of Amendment"), and to file the Articles of Amendment with the State Secretary of the Commonwealth of Massachusetts; and in furtherance thereof that the President, any Vice President, Treasurer, Clerk, and Assistant Clerk of the Corporation or any one or more of them be and hereby are authorized in the name and on behalf of the Corporation to execute and deliver any and all documents and instruments and to take any and all action as they or any one or more of them may deem necessary or appropriate to effectuate such amendment of the Restated Articles of Organization of the Corporation.

The foregoing amendment will become effective when these articles of amendment are filed in accordance with Chapter 156B, Section 6 of The General Laws unless these articles specify, in accordance with the vote adopting the amendment, a later effective date not more than thirty days after such filing, in which event the amendment will become effective on such later date.

IN WITNESS WHEREOF AND UNDER THE PENALTIES OF PERJURY, we have hereto signed our names this 15th day of December, in the year 1986

/s/ John R. Bertucci President

-----  
John R. Bertucci

/s/ Richard S. Chute Clerk

-----  
Richard S. Chute

THE COMMONWEALTH OF MASSACHUSETTS

ARTICLES OF AMENDMENT

(General Laws, Chapter 156B, Section 72)

I hereby approve the within articles of amendment  
and, the filing fee in the amount of \$75.00  
having been paid, said articles are deemed to have  
been filed with me this 16th  
day of December, 1986.

/s/ Michael Joseph Connolly

-----  
MICHAEL JOSEPH CONNOLLY  
Secretary of State

TO BE FILLED IN BY CORPORATION  
PHOTO COPY OF AMENDMENT TO BE SENT

TO: Richard S. Chute  
Hill & Sarlow

-----  
225 Franklin Street

-----  
Boston, MA 02110

-----  
Telephone 617-423-6200  
-----

Copy Mailed

[STATE SEAL]

THE COMMONWEALTH OF MASSACHUSETTS  
OFFICE OF THE MASSACHUSETTS SECRETARY OF STATE  
MICHAEL JOSEPH CONNOLLY, Secretary  
ONE ASHBURTON PLACE, BOSTON, MASS. 02180

FEDERAL IDENTIFICATION  
NO. 04-2277512

EXAMINER

N/A

Name  
Approved

C [ ]  
P [ ]  
M [ ]

4

P.C.

ARTICLES OF AMENDMENT

General Laws, Chapter 156B, Section 72

This certificate must be submitted to the Secretary of the Commonwealth within sixty days after the date of the vote of stockholders adopting the amendment. The fee for filing this certificate is prescribed by General Laws, Chapter 156B, Section 114. Make check payable to the Commonwealth of Massachusetts.

We, John R. Bertucci, President and  
Richard S. Chute, Clerk of

MKS Instruments, Inc.

(Name of Corporation)

located at Six Shattuck Road, Andover, Massachusetts 01810

do hereby certify that the following amendment to the restated articles of organization of the corporation was duly adopted by written consent dated January 8, 1987, by vote of

2454 shares of Class A Common out of 2454 shares outstanding,  
(Class of Stock)

3250 shares of Class B Common out of 3250 shares outstanding,  
(Class of Stock)

being all of each class outstanding and entitled to vote thereon and of each class of series of stock whose rights are adversely affected thereby:

- (1) for amendments adopted pursuant in Chapter 156B, Section 70.
- (2) for amendments adopted pursuant to Chapter 156B, Section 71.

Note: If the space provided under any Amendment or item on this form is insufficient, additions shall be set forth on separate 8 1/2 x 11 sheets of paper leaving a left hand margin of at least 1 inch for binding. Additions to more than one Amendment may be continued on a single sheet so long as each Amendment requiring each such addition is clearly indicated

TO CHANGE the number of shares and the par value, if any, of each class of stock within the corporation fill in the following:

The total presently authorized is:

KIND OF STOCK	NO PAR VALUE NUMBER OF SHARES	WITH PAR VALUE NUMBER OF SHARES	PAR VALUE
COMMON			
PREFERRED			

CHANGE the total to:

KIND OF STOCK	NO PAR VALUE NUMBER OF SHARES	WITH PAR VALUE NUMBER OF SHARES	PAR VALUE
COMMON			
PREFERRED			

VOTED: That the Restated Articles of Organization of the Corporation be and hereby are amended by adding the following provision to article 6 of the Restated Articles of Organization of the Corporation so that article 6 of the Restated Articles of Organization of the Corporation shall contain the following provision:

"A director of the corporation shall not be personally liable to the corporation or its stockholders for monetary damages for breach of fiduciary duty as a director notwithstanding any provision of law imposing such liability, except for liability (i) for any breach of the director's duty of loyalty to the corporation or its stockholders, (ii) for acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law, (iii) under Section 61 or 62 of the Massachusetts Business Corporation Law, or (iv) for any transaction from which the director derived an improper personal benefit.

If the Massachusetts Business Corporation Law is amended, after approval by the stockholders of the corporation of this provision, to authorize corporate action further eliminating or limiting the personal liability of directors, then the liability of a director of the corporation shall be eliminated or limited to the fullest extent permitted by the Massachusetts Business Corporation Law, as so amended. Any amendment, repeal, or modification of this provision by the stockholders of the corporation shall not adversely affect any right or protection of a director of the corporation existing at the time of such amendment, repeal, or modification."

; that the President and Clerk of the Corporation be and hereby are authorized in the name and on behalf of the Corporation to execute Articles of Amendment to effectuate such amendment of the Restated Articles of Organization of the Corporation, a copy of which is attached hereto (the "Articles of Amendment"), and to file the Articles of Amendment with the State Secretary of the Commonwealth of Massachusetts; and in furtherance thereof that the President, any Vice President, Treasurer, Clerk, and Assistant Clerk of the Corporation or any one or more of them be and hereby are authorized in the name and on behalf of the Corporation to execute and deliver any and all documents and instruments and to take any and all action as they or any one or more of them may deem necessary or appropriate to effectuate such amendment of the Restated Articles of Organization of the Corporation.

The foregoing amendment will become effective when these articles of amendment are filed in accordance with Chapter 156B, Section 6 of The General Laws unless these articles specify, in accordance with the vote adopting the amendment, a later effective date not more than thirty days after such filing, in which event the amendment will become effective on such later date.

IN WITNESS WHEREOF AND UNDER THE PENALTIES OF PERJURY, we have hereto signed our names this 9th day of February, in the year 1987.

/s/ John R. Bertucci President  
-----  
John R. Bertucci

/s/ Richard S. Chute Clerk  
-----  
Richard S. Chute

THE COMMONWEALTH OF MASSACHUSETTS

ARTICLES OF AMENDMENT

(General Laws, Chapter 156B, Section 72)

I hereby approve the within articles of amendment and, the filing fee in the amount of \$75.00 having been paid, said articles are deemed to have been filed with me this 11th day of February, 1987.

/s/ Michael J. Connolly

MICHAEL JOSEPH CONNOLLY  
Secretary of State

TO BE FILLED IN BY CORPORATION

PHOTO COPY OF AMENDMENT TO BE SENT

TO: Richard S. Chute, Esq.  
Hill & Barlow

-----  
225 Franklin Street  
Boston, MA 02110  
-----

-----  
Telephone (617) 423-6200  
-----

Copy Mailed

[SEAL OF WILLIAM FRANCIS GALVIN,  
SECRETARY OF THE COMMONWEALTH  
DATED 2/20/96]

The Commonwealth of Massachusetts  
WILLIAM FRANCIS GALVIN  
Secretary of the Commonwealth  
ONE ASHBURTON PLACE  
BOSTON, MASS. 02108

FEDERAL IDENTIFICATION NO. 004-2277512

ARTICLES OF  
MERGER OF PARENT AND SUBSIDIARY CORPORATIONS  
PURSUANT TO GENERAL LAWS, CHAPTER 156B, SECTION 82

The fee for filing this certificate is prescribed by  
General Laws, Chapter 156B, Section 114.  
Make check payable to the Commonwealth of Massachusetts.

\* \* \* \*

We, John R. Bertucci and Richard S. Chute, President\* and Clerk\* of  
MKS Instruments, Inc.

-----  
name of corporation

organized under the laws of Massachusetts and herein called the parent  
corporation, do hereby certify as follows:

1. That the subsidiary corporation(s) to be merged into the parent  
corporations are/is as follows:

Name	State of Organization	Date of Organization
UTI Instruments Company	CA	09/26/73

2. That the parent corporation owns at least ninety per cent of the  
outstanding shares of each class of the stock of each subsidiary corporation to  
be merged into the parent corporation.

3. That in the case of each of the above-named corporations the laws of  
the state of its organization, if other than Massachusetts, permit the merger  
herein provided for and that all action required under the laws of each such  
state in connection with this merger has been duly taken. (If all the  
corporations are organized under the laws of Massachusetts and if General Laws,  
Chapter 156B is applicable to them, then Paragraph 3 may be deleted.)

\* Delete the inapplicable words. In case the parent corporation is organized  
under the laws of a state other than Massachusetts these articles are to be  
signed by officers having corresponding powers and duties.

4. That at a meeting of the directors of the parent corporation the following vote, pursuant to subsection (a) of General Laws, Chapter 156B, Section 82, was duly adopted:

VOTED:           That the Corporation merge into itself UTI  
----- Instruments Company, a California corporation,  
                  with the Corporation surviving the merger  
                  (the "Merger"), in accordance with the  
                  provisions of Section 82 of Chapter 156B of the  
                  Massachusetts General Laws.

FURTHER  
VOTED:           That the effective date of the Merger shall be  
----- the date of filing of appropriate Articles of  
                  Merger with the Secretary of State of Massachusetts.

FURTHER  
VOTED:           That any officer of the Corporation, acting singly,  
----- be and he hereby is, authorized and directed to  
                  take any further actions, and to execute and deliver  
                  any further documents and certificates, which may  
                  be necessary or appropriate to effectuate the Merger  
                  described herein.

5. The effective date of the merger as specified in the vote set out under Paragraph 4 is

IN WITNESS WHEREOF and under the penalties of perjury we have hereto signed our names this 17th day of November, 1995.

/s/ John R. Bertucci  
----- President\*  
John R. Bertucci

/s/ Richard S. Chute  
----- Clerk\*  
Richard S. Chute

\* Delete the inapplicable words. In case the parent corporation is organized under the laws of a state other than Massachusetts these articles are to be signed by officers having corresponding powers and duties.

COMMONWEALTH OF MASSACHUSETTS  
ARTICLES OF MERGER OF PARENT AND SUBSIDIARY CORPORATIONS  
(General Laws, Chapter 156B, Section 82)

I hereby approve the within articles of merger of parent and subsidiary corporations and, the filing fee in the amount of \$250 having been paid, said articles are deemed to have been filed with me this 17th day of November, 1995.

/s/ William Francis Galvin  
William Francis Galvin  
Secretary of the Commonwealth

TO BE FILLED IN BY CORPORATION  
Photo Copy of Merger To Be Sent

TO: Terrence W. Mahoney, Esq.  
Hill & Barlow  
-----  
One International Place  
-----  
Boston, MA 02110  
-----  
Telephone 617-428-3000  
-----

THE COMMONWEALTH OF MASSACHUSETTS  
WILLIAM FRANCIS GALVIN  
Secretary of the Commonwealth  
One Ashburton Place, Boston, Massachusetts 02108-1512

ARTICLES OF AMENDMENT  
(General Laws, Chapter 156B, Section 72)

We, John R. Bertucci, \*President,

and Richard S. Chute, \*Clerk,

of MKS Instruments, Inc.,

(Exact name of corporation)

located at Six Shattuck Road, Andover, MA 01810,

(Street address of corporation in Massachusetts)

certify that these Articles of Amendment affecting articles numbered: 3

3

(Number those articles 1, 2, 3, 4, 5 and/or 6 being amended)

of the Articles of Organization were duly adopted at a meeting held on  
January 9, 1998 by vote of:

-----

2,454 shares of Class A Common of 2,454 shares outstanding,

(type, class & series, if any)

3,250 shares of Class B Common of 3,250 shares outstanding,

(type, class & series, if any)

and

shares of of shares outstanding,

(type, class & series, if any)

(1)\*\*being all and of each type, class or series of stock whose rights are  
adversely affected thereby:

\*Delete the inapplicable words. \*\*Delete the inapplicable clause.

(1)For amendments adopted pursuant to Chapter 156B, Section 70.

(2)For amendments adopted pursuant to Chapter 156B, Section 71.

Note: If the space provided under any article or item on this form is  
insufficient, additions shall be set forth on one side only of separate 8 1/2 x  
11 sheets of paper with a left margin of at least 1 inch. Additions to more  
than one article may be made on a single sheet so long as each article  
requiring each addition is clearly indicated.

To change the number of shares and the par value (if any) of any type, class or series of stock which the corporation is authorized to issue, fill in the following:

The total presently authorized is:

WITHOUT PAR VALUE STOCKS			WITH PAR VALUE STOCKS		
TYPE	NUMBER OF SHARES		TYPE	NUMBER OF SHARES	PAR VALUE
Common:	Class A	10,000	Common:	None	None
	Class B	10,000		None	None
Preferred:	None		Preferred:	None	None

Change the total authorized to:

WITHOUT PAR VALUE STOCKS			WITH PAR VALUE STOCKS		
TYPE	NUMBER OF SHARES		TYPE	NUMBER OF SHARES	PAR VALUE
Common:	Class A	6,000,000	Common:	None	None
	Class B	10,000,000		None	None
Preferred:	None		Preferred:	None	None

VOTED: To amend the Restated Articles of Organization, as amended, to increase the authorized Class A Common Stock, no par value per share, of the Corporation from 10,000 shares to 6,000,000 shares and to increase the authorized Class B Common Stock, no par value per share of the Corporation from 10,000 shares to 10,000,000 shares, so that after the effective date of such amendment the total authorized capital stock of the Corporation shall consist of 6,000,000 shares of Class A Common Stock, no par value per share, and 10,000,000 shares of Class B Common Stock, no par value per share.

The foregoing amendment(s) will become effective when these Articles of Amendment are filed in accordance with General Laws, Chapter 156B, Section 6 unless these articles specify, in accordance with the vote adopting the amendment, a later effective date not more than thirty days after such filing, in which event the amendment will become effective on such later date.

Later effective date: \_\_\_\_\_.

SIGNED UNDER THE PENALTIES OF PERJURY, this 14th day of January, 1998,  
-----

/s/ John R. Bertucci, \*President  
-----

/s/ Richard S. Chute, \*Clerk  
-----

\*Delete the inapplicable words.

THE COMMONWEALTH OF MASSACHUSETTS  
ARTICLES OF AMENDMENT  
(GENERAL LAWS, CHAPTER 156B, SECTION 72)

=====

I hereby approve the within Articles of Amendment and, the filing fee in the amount of \$15,980 having been paid, said articles are deemed to have been filed with me this 14th day of January 1998.

Effective date: January 14, 1998

WILLIAM FRANCIS GALVIN  
Secretary of the Commonwealth

TO BE FILLED IN BY CORPORATION  
PHOTOCOPY OF DOCUMENT TO BE SENT TO:

Richard N. Kimball, Esq.  
-----  
Hale and Dorr LLP  
60 State Street  
-----  
Boston, MA 02109  
-----  
Tel: (617) 526-6000

FORM CD-74-10M-10-79-152328

THE COMMONWEALTH OF MASSACHUSETTS  
MICHAEL JOSEPH CONNOLLY FEDERAL IDENTIFICATION  
Secretary of State No. 04-2277512  
ONE ASHBURTON PLACE, BOSTON, MASS: 02108

AMENDED AND RESTATED ARTICLES OF ORGANIZATION

GENERAL LAWS, CHAPTER 156B, SECTION 74

This certificate must be submitted to the Secretary of the Commonwealth within sixty days after the date of the vote of stockholders adopting the restated articles or organization. The fee for filing this certificate is prescribed by General Laws, Chapter 156B, Section 114. Make check payable to the Commonwealth of Massachusetts.

-----  
We, John R. Bertucci, President and  
Richard S. Chute, Clerk  
MKS Instruments, Inc.

-----  
(Name of Corporation)

located at SIX SHATTUCK ROAD, ANDOVER, MASSACHUSETTS 01810 do hereby certify that the following amendment and restatement of the articles or organization of the corporation was duly adopted by a vote of the stockholders on January 9, 1998, by vote of \_\_\_\_\_ shares of \_\_\_\_\_ out of \_\_\_\_\_ shares outstanding,  
(Class of Stock)

2454 shares of CLASS A COMMON out of 2454 shares outstanding, and  
(Class of Stock)

3250 shares of CLASS B COMMON out of 3250 shares outstanding,  
(Class of Stock)

being at least two-thirds of each class of stock outstanding and entitled to vote and of each class or series of stock adversely affected thereby:-

1. The name by which the corporation shall be known is: --  
MKS Instruments, Inc.
2. The purposes for which the corporation is formed are as follows: --  
See Continuation Sheets 2A and 2B.

C [ ]  
P [ ]  
M [ ]  
RA [ ]

Note: If the space provided under any article or item on this form is insufficient, additions shall be set forth on separate 8 1/2 x 11 sheets of paper leaving a left hand margin of at least 1 inch for binding. Additions to more than one article may be continued on a single sheet so long as each article requiring each such addition is clearly indicated.

## CONTINUATION SHEET 2A

## 2. THE PURPOSES FOR WHICH THE CORPORATION IS FORMED ARE AS FOLLOWS:

To design, manufacture, sell, lease and license instruments of all kinds, including electromechanical, electronic and mechanical gauges for the measurement of pressure, temperature, acceleration, flow and level of liquids and gases; to design, manufacture, sell, lease and license control systems incorporating measuring devices, and control systems separate from measuring devices, for the control of production processes and operations of all kinds; to design, manufacture, sell, lease and license instrumentation for military use; to design, manufacture, sell, lease and license instrumentation for use in research laboratories, in industry, in educational institutions, for medical purposes and for use elsewhere and for other purposes; and in general to design, manufacture, sell, lease and license electro-mechanical, electronic and mechanical devices of all kinds.

To buy and sell at wholesale and retail, or otherwise, to manufacture, produce, adapt, repair, dispose of, export, import and in any other manner to deal in goods, wares, merchandise, articles and things of manufacture or otherwise of all materials, supplies and other articles and things necessary or convenient for use in connection with any of said businesses or any other business or any part thereof; and to manufacture, repair, purchase, sell, lease, dispose of and otherwise deal in machinery, tools, and appliances which are or may be used in connection with the purchase, sale, production, adaption, repair, disposition of, export, import or other dealings in said goods, wares, merchandise, articles and things.

To purchase, lease or otherwise acquire as a going concern or otherwise all or any part of the franchises, rights, property, assets, business, good will or capital stock of any persons, firm, corporation, trust or association engaged in whole or in part in any business in which this corporation is empowered to engage, or in any other business; to pay for the same in whole or in part in cash, stock, bonds, notes, securities or other evidence of indebtedness of this corporation or in any other manner; to assume as part of the consideration or otherwise any and all debts, contracts or liabilities, matured or unmatured, fixed or contingent, of any such person, firm or corporation, trust or association; and to operate, manage, develop and generally to carry on the whole or any part of any such business under any name or names which it may select or designate.

## CONTINUATION SHEET 2B

To construct, lease, hire, purchase or otherwise acquire and hold or maintain, and to rebuild, enlarge, improve, furnish, equip, alter, operate and dispose of warehouses, factories, offices and other buildings, real estate, structures or parts thereof, and appliances for the preparation, manufacture, purchase, sale and distribution of goods, wares, merchandise, things, and articles of all kinds.

To acquire, hold, use, sell, assign, lease, grant licenses in respect of, mortgage, or otherwise dispose of franchises, letters patent of the United States or of any foreign country, patent rights, licenses and privileges, inventions, improvements and processes, systems, copyrights, trade-marks and trade names, relating to, or useful in connection with, any business of this corporation.

To buy or otherwise acquire, to sell, assign, pledge, or otherwise dispose of and deal in stocks, bonds, securities, notes and other obligations of any person, firm or corporation, including this corporation, organized for or engaged in similar or cognate purposes; also stocks, bonds, securities, notes, and other obligations of any person, firm, or corporation, including this corporation, which it may be found or deemed necessary, valuable, or convenient for this corporation to acquire and deal in, in pursuance or furtherance of or in connection with the businesses herein specified, or any other business.

To borrow money and contract indebtedness for all proper corporate purposes, to issue bonds, notes, and other evidences of indebtedness, to secure the same by pledge, mortgage, or lien on all or any part of the property of the corporation, tangible or intangible; and to assume or guarantee or secure in like manner or otherwise, the leases, contracts, or other obligations, fixed or contingent, or the payment of any dividends on any stock or shares or of the principal or interest on any bonds, notes, or other evidences of indebtedness of any person, firm, corporation, trust, or association in which this corporation has a financial interest.

To enter into, make, and perform contracts of every name, nature, and kind with any person, firm, association, or corporation which may be deemed valuable, expedient, or convenient for this corporation in pursuance of or in furtherance of or in connection with any of the objects of incorporation of this corporation or in connection with any of the businesses or purposes herein specified.

The enumeration of specific powers herein shall not be construed as limiting or restricting in any way the general powers herein set forth, but nothing herein contained shall be construed as authorizing the business of banking.

3. The total number of shares and the par value, if any, of each class of stock which the corporation is authorized to issue as follows:

WITHOUT PAR VALUE		WITH PAR VALUE	
CLASS OF STOCK	NUMBER OF SHARES	NUMBER OF SHARES	PAR VALUE
Preferred		2,000,000	\$.01
Common	50,000,000		

- \*4. If more than one class is authorized, a description of each of the different classes of stock with, if any, the preferences, voting powers, qualifications, special or relative rights or privileges as to each class thereof and any series now established:

See Continuation Sheets 4A, 4B and 4C

- \*5. The restrictions, if any, imposed by the articles of organization upon the transfer of shares of stock of any class are as follows:

None.

- \*6. Other lawful provisions, if any, for the conduct and regulation of the business and affairs of the corporation, for its voluntary dissolution, or for limiting, defining, or regulating the powers of the corporation, or of its directors or stockholders, or of any class of stockholders:

See Continuation Sheets 6A, 6B, 6C, 6D, 6E, 6F and 6G

- \* If there are no such provisions, state "None".

The total number of shares of all classes of stock which the corporation shall have authority to issue is 52,000,000 shares, consisting of (i) 50,000,000 shares of Common Stock, no par value per share ("Common Stock"), and (ii) 2,000,000 shares of Preferred Stock, \$.01 par value per share ("Preferred Stock"). Upon the filing of the corporation's Amended and Restated Articles of Organization on February \_\_, 1998 (the "Mandatory Conversion Date") each share of Class A Common Stock, no par value per share, and each share of Class B Common Stock, no par value per share (together with the Class A Common Stock, the "Class Common Stock"), shall be converted into one share of Common Stock, no par value per share. All holders of record of shares of Class Common Stock shall be given written notice of the Mandatory Conversion Date and the place designated for mandatory conversion of all such shares of Class Common Stock pursuant to this provision. Such notice need not be given in advance of the occurrence of the Mandatory Conversion Date. Such notice shall be sent by first class or registered mail, postage prepaid, to each record holder of Class Common Stock at such holder's address last shown on the records of the transfer agent for the Class Common Stock (or the records of the corporation, if it serves as its own transfer agent). Upon receipt of such notice, each holder of shares of Class Common Stock shall surrender his or its certificate or certificates for all such shares to the corporation at the place designated in such notice, and shall thereafter receive certificates for the number of shares of Common Stock equal to the number of shares of Class Common Stock represented by such certificates. On the Mandatory Conversion Date, all rights with respect to the Class Common Stock so converted, including the rights, if any, to receive notices and vote (other than as a holder of Common Stock) will terminate, except only the rights of the holders thereof, upon surrender of their certificate or certificates therefor, to receive certificates for the number of shares of Common Stock into which such Class Common Stock has been converted, and payment of any declared but unpaid dividends thereon. If so required by the corporation, certificates surrendered for conversion shall be endorsed or accompanied by written instrument or instruments of transfer, in form satisfactory to the corporation, duly executed by the registered holder or by his or its attorney duly authorized in writing. As soon as practicable after the Mandatory Conversion Date and the surrender of the certificate or certificates for Class Common Stock, the corporation shall cause to be issued and delivered to such holder, or on his or its written order, a certificate or certificates for the number of full shares of Common Stock issuable on such conversion in accordance with the provisions hereof.

All certificates evidencing shares of Class Common Stock which are required to be surrendered for conversion in accordance with the provisions hereof shall, from and after the Mandatory Conversion Date, be deemed to have been retired and cancelled and the shares of Class Common Stock represented thereby converted into Common Stock for all purposes, notwithstanding the failure of the holder or holders thereof to surrender such certificates on or prior to such date.

## CONTINUATION SHEET 4B

The following is a statement of the designation and the powers, privileges and rights, and the qualifications, limitations or restrictions thereof in respect of each class of capital stock of the corporation.

## A. COMMON STOCK.

1. GENERAL. The voting, dividend and liquidation rights of the holders of the Common Stock are subject to and qualified by the rights of the holders of the Preferred Stock of any series as may be designated by the Board of Directors upon any issuance of the Preferred Stock of any series.

2. VOTING. The holders of the Common Stock are entitled to one vote for each share held at all meetings of stockholders (and written actions in lieu of meetings). There shall be no cumulative voting.

3. DIVIDENDS. Dividends may be declared and paid on the Common Stock from funds lawfully available therefor as and when determined by the Board of Directors and subject to any preferential dividend rights of any then outstanding Preferred Stock.

4. LIQUIDATION. Upon the dissolution or liquidation of the corporation, whether voluntary or involuntary, holders of Common Stock will be entitled to receive all assets of the corporation available for distribution to its stockholders, subject to any preferential rights of any then outstanding Preferred Stock.

## B. PREFERRED STOCK.

Preferred Stock may be issued from time to time in one or more series, each of such series to have such terms as stated or expressed herein and in the resolution or resolutions providing for the issue of such series adopted by the Board of Directors of the corporation as hereinafter provided. Any shares of Preferred Stock which may be redeemed, purchased or acquired by the corporation may be reissued except as otherwise provided by law. Different series of Preferred Stock shall not be construed to constitute different classes of shares for the purposes of voting by classes unless expressly provided.

## CONTINUATION SHEET 4C

Authority is hereby expressly granted to the Board of Directors from time to time to issue the Preferred Stock in one or more series, and in connection with the creation of any such series, by resolution or resolutions providing for the issue of the shares thereof, to determine and fix such voting powers, full or limited, or no voting powers, and such designations, preferences and relative participating, optional or other special rights, and qualifications, limitations or restrictions thereof, including without limitation thereof, dividend rights, conversion rights, redemption privileges and liquidation preferences, as shall be stated and expressed in such resolutions, all to the full extent now or hereafter permitted by Chapter 156B of the Massachusetts General Laws. Without limiting the generality of the foregoing, the resolutions providing for issuance of any series of Preferred Stock may provide that such series shall be superior or rank equally or be junior to the Preferred Stock of any other series to the extent permitted by law. No vote of the holders of the Preferred Stock or Common Stock shall be a prerequisite to the issuance of any shares of any series of the Preferred Stock authorized by and complying with the conditions of the Articles of Organization, the right to have such vote being expressly waived by all present and future holders of the capital stock of the corporation.

## CONTINUATION SHEET 6A

## 6A. LIMITATION OF DIRECTOR LIABILITY

Except to the extent that Chapter 156B of the Massachusetts General Laws prohibits the elimination or limitation of liability of directors for breaches of fiduciary duty, no director of the corporation shall be personally liable to the corporation or its stockholders for monetary damages for any breach of fiduciary duty as a director, notwithstanding any provision of law imposing such liability. No amendment to or repeal of this provision shall apply to or have any effect on the liability or alleged liability of any director of the corporation for or with respect to any acts or omissions of such director occurring prior to such amendment.

## 6B. INDEMNIFICATION

1. ACTIONS SUITS AND PROCEEDINGS. The corporation shall indemnify each person who was or is a party or is threatened to be made a party to any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative or investigative, by reason of the fact that he is or was, or has agreed to become, a director or officer of the corporation, or is or was serving, or has agreed to serve, at the request of the corporation, as a director or officer of, or in a similar capacity with, another organization or in any capacity with respect to any employee benefit plan of the corporation (all such persons being referred to hereafter as an "Indemnitee"), or by reason of any action alleged to have been taken or omitted in such capacity, against all expenses (including attorneys' fees), judgments and fines incurred by him or on his behalf in connection with such action, suit or proceeding and any appeal therefrom, unless the Indemnitee shall be finally adjudicated in such action, suit or proceeding not to have acted in good faith in the reasonable belief that his action was in the best interests of the corporation or, to the extent such matter relates to service with respect to an employee benefit plan, in the best interests of the participants or beneficiaries of such employee benefit plan. Notwithstanding anything to the contrary in this Article, except as set forth in Section 6 below, the corporation shall not indemnify an Indemnitee seeking indemnification in connection with a proceeding (or part thereof) initiated by the Indemnitee unless the initiation thereof was approved by the Board of Directors of the

## CONTINUATION SHEET 6B

corporation. Notwithstanding anything to the contrary in this Article, the corporation shall not indemnify an Indemnitee to the extent such Indemnitee is reimbursed from the proceeds of insurance, and in the event the corporation makes any indemnification payments to an Indemnitee and the Indemnitee is subsequently reimbursed from the proceeds of insurance, such Indemnitee shall promptly refund such indemnification payments to the corporation to the extent of such insurance reimbursement.

2. SETTLEMENTS AND COMPROMISE. The right to indemnification conferred in this Article shall include the right to be paid by the corporation for amounts paid in settlement or compromise of any such action, suit or proceeding and any appeal therefrom, and all expenses (including attorneys' fees) incurred in connection with such settlement or compromise, pursuant to a consent decree or otherwise, unless and to the extent it is determined pursuant to Section 5 below that the Indemnitee did not act in good faith in the reasonable belief that his action was in the best interests of the corporation or, to the extent such matter relates to service with respect to an employee benefit plan, in the best interests of the participants or beneficiaries of such employee benefit plan.

3. NOTIFICATION AND DEFENSE OF CLAIM. As a condition precedent to his right to be indemnified, the Indemnitee must notify the corporation in writing as soon as practicable of any action, suit, proceeding or investigation involving him for which indemnity will or could be sought. With respect to any action, suit, proceeding or investigation of which the corporation is so notified, the corporation will be entitled to participate therein at its own expense and/or to assume the defense thereof at its own expense, with legal counsel reasonably acceptable to the Indemnitee. After notice from the corporation to the Indemnitee of its election so to assume such defense, the corporation shall not be liable to the Indemnitee for any legal or other expenses subsequently incurred by the Indemnitee in connection with such claim, other than as provided below in this Section 3. The Indemnitee shall have the right to employ his own counsel in connection with such claim, but the fees and expenses of such counsel incurred after notice from the corporation of its assumption of the defense thereof shall be at the expense of the Indemnitee unless (i) the employment of counsel by the Indemnitee has been authorized by the corporation, (ii) counsel to the Indemnitee shall have reasonably concluded that there may be a conflict of interest or position on any significant issue

## CONTINUATION SHEET 6C

between the corporation and the Indemnitee in the conduct of the defense of such action or (iii) the corporation shall not in fact have employed counsel to assume the defense of such action, in each of which cases the fees and expenses of counsel for the Indemnitee shall be at the expense of the corporation, except as otherwise expressly provided by this Article. The corporation shall not be entitled, without the consent of the Indemnitee, to assume the defense of any claim brought by or in the right of the corporation or as to which counsel for the Indemnitee shall have reasonably made the conclusion provided for in clause (ii) above.

4. ADVANCE OF EXPENSES. Subject to the provisions of Section 5 below, in the event that the corporation does not assume the defense pursuant to Section 3 of this Article of any action, suit, proceeding or investigation of which the corporation receives notice under this Article, any expenses (including attorneys' fees) incurred by an Indemnitee in defending a civil or criminal action, suit, proceeding or investigation or any appeal therefrom shall be paid by the corporation in advance of the final disposition of such matter; PROVIDED, HOWEVER, that the payment of such expenses incurred by an Indemnitee in advance of the final disposition of such matter shall be made only upon receipt of an undertaking by or on behalf of the Indemnitee to repay all amounts so advanced in the event that it shall ultimately be determined that the Indemnitee is not entitled to be indemnified by the corporation as authorized in this Article. Such undertaking shall be accepted without reference to the financial ability of the Indemnitee to make such repayment.

5. PROCEDURE FOR INDEMNIFICATION. In order to obtain indemnification or advancement of expenses pursuant to Section 1, 2 or 4 of this Article, the Indemnitee shall submit to the corporation a written request, including in such request such documentation and information as is reasonably available to the Indemnitee and is reasonably necessary to determine whether and to what extent the Indemnitee is entitled to indemnification or advancement of expenses. Any such indemnification or advancement of expenses shall be made promptly, and in any event within 60 days after receipt by the corporation of the written request of the Indemnitee, unless the corporation determines within such 60-day period that the Indemnitee did not meet the applicable standard of conduct set forth in Section 1 or 2, as the case may be. Such determination shall be made in each instance by (a) a majority vote of a quorum of the directors of the corporation, (b) a majority vote of a

## CONTINUATION SHEET 6D

quorum of the outstanding shares of stock of all classes entitled to vote for directors, voting as a single class, which quorum shall consist of stockholders who are not at that time parties to the action, suit or proceeding in question, (c) independent legal counsel (who may, to the extent permitted by law, be regular legal counsel to the corporation), or (d) a court of competent jurisdiction.

6. REMEDIES. The right to indemnification or advances as granted by this Article shall be enforceable by the Indemnitee in any court of competent jurisdiction if the corporation denies such request, in whole or in part, or if no disposition thereof is made within the 60-day period referred to above in Section 5. Unless otherwise required by law, the burden of proving that the Indemnitee is not entitled to indemnification or advancement of expenses under this Article shall be on the corporation. Neither the failure of the corporation to have made a determination prior to the commencement of such action that indemnification is proper in the circumstances because the Indemnitee has met the applicable standard of conduct, nor an actual determination by the corporation pursuant to Section 5 that the Indemnitee has not met such applicable standard of conduct, shall be a defense to the action or create a presumption that the Indemnitee has not met the applicable standard of conduct. The Indemnitee's expenses (including attorneys' fees) incurred in connection with successfully establishing his right to indemnification, in whole or in part, in any such proceeding shall also be indemnified by the corporation.

7. SUBSEQUENT AMENDMENT. No amendment, termination or repeal of this Article or of the relevant provisions of Chapter 156B of the Massachusetts General Laws or any other applicable laws shall affect or diminish in any way the rights of any Indemnitee to indemnification under the provisions hereof with respect to any action, suit, proceeding or investigation arising out of or relating to any actions, transactions or facts occurring prior to the final adoption of such amendment, termination or repeal.

8. OTHER RIGHTS. The indemnification and advancement of expenses provided by this Article shall not be deemed exclusive of any other rights to which an Indemnitee seeking indemnification or advancement of expenses may be entitled under any law (common or statutory), agreement or vote of stockholders or directors or otherwise, both

## CONTINUATION SHEET 6E

as to action in his official capacity and as to action in any other capacity while holding office for the corporation, and shall continue as to an Indemnatee who has ceased to be a director or officer, and shall inure to the benefit of the estate, heirs, executors and administrators of the Indemnatee. Nothing contained in this Article shall be deemed to prohibit, and the corporation is specifically authorized to enter into, agreement with officers and directors providing indemnification rights and procedures different from those set forth in this Article. In addition, the corporation may, to the extent authorized from time to time by its Board of Directors, grant indemnification rights to other employees or agents of the corporation or other persons serving the corporation and such rights may be equivalent to, or greater or less than, those set forth in this Article.

9. PARTIAL INDEMNIFICATION. If an Indemnatee is entitled under any provision of this Article to indemnification by the corporation for some or a portion of the expenses (including attorneys' fees), judgments, fines or amounts paid in settlement or compromise actually and reasonably incurred by him or on his behalf in connection with any action, suit, proceeding or investigation and any appeal therefrom but not, however, for the total amount thereof, the corporation shall nevertheless indemnify the Indemnatee for the portion of such expenses (including attorneys' fees), judgments, fines or amounts paid in settlement or compromise to which the Indemnatee is entitled.

10. INSURANCE. The corporation may purchase and maintain insurance, at its expense, to protect itself and any director, officer, employee or agent of the corporation or another organization or employee benefit plan against any expense, liability or loss incurred by him in any such capacity, or arising out of his status as such, whether or not the corporation would have the power to indemnify such person against such expense, liability or loss under Chapter 156B of the Massachusetts General Laws.

11. MERGER OR CONSOLIDATION. If the corporation is merged into or consolidated with another corporation and the corporation is not the surviving corporation, the surviving corporation shall assume the obligations of the corporation under this Article with respect to any action, suit, proceeding or investigation arising out of or relating to any actions, transactions or facts occurring prior to the date of such merger or consolidation.

## CONTINUATION SHEET 6F

12. SAVINGS CLAUSE. If this Article or any portion hereof shall be invalidated on any ground by any court of competent jurisdiction, then the corporation shall nevertheless indemnify each Indemnitee as to any expenses (including attorneys' fees), judgments, fines and amounts paid in settlement or compromise in connection with any action, suit, proceeding or investigation, whether civil, criminal or administrative, including an action by or in the right of the corporation, to the fullest extent permitted by any applicable portion of this Article that shall not have been invalidated and to the fullest extent permitted by applicable law.

13. SUBSEQUENT LEGISLATION. If the Massachusetts General Laws are amended after adoption of this Article to expand further the indemnification permitted to Indemnitees, then the corporation shall indemnify such persons to the fullest extent permitted by the Massachusetts General Laws, as so amended.

## 6C. OTHER PROVISIONS

(a) The directors may make, amend, or repeal the By-Laws in whole or in part, except with respect to any provision of such By-Laws which by law or these Articles of Organization or the By-Laws requires action by the stockholders.

(b) Meetings of the stockholders of the corporation may be held anywhere in the United States.

(c) The corporation shall have the power to be a partner in any business enterprise which this corporation would have the power to conduct by itself.

(d) The corporation, by vote of at least sixty-six and two-thirds ( $66 \frac{2}{3}$ ) of the stock outstanding and entitled to vote thereon (or if there are two or more classes of stock entitled to vote as separate classes, then by vote of at least sixty-six and two-thirds ( $66 \frac{2}{3}$ ) of each such class of stock outstanding), may (i) authorize any amendment to its Articles of Organization pursuant to Section 71 of Chapter 156B of the Massachusetts General Laws, as amended from time to time, (ii) authorize the sale, lease or exchange of all or substantially all of its property and assets, including its goodwill, pursuant to

## CONTINUATION SHEET 6G

Section 75 of Chapter 156B of the Massachusetts General Laws, as amended from time to time, and (iii) approve an agreement of merger or consolidation pursuant to Section 78 of Chapter 156B of the Massachusetts General Laws, as amended from time to time; PROVIDED, however, that if any such (i) amendment to its Articles of Organization, (ii) sale, lease, or exchange or (iii) merger or consolidation (each as more fully described above) has been approved by a majority of the Board of Directors of the corporation, then the corporation may authorize or approve such action by vote of a majority of the stock outstanding and entitled to vote thereon (or if there are two or more classes of stock entitled to vote as separate classes, then by vote of a majority of each such class outstanding).

(e) Chapter 110F of the Massachusetts General Laws, as it may be amended from time to time, shall not apply to the corporation.

\* We further certify that the foregoing restated articles of organization effect no amendments to the articles of organization of the corporation as heretofore amended, except amendments to the following articles 3, 4 and 6.

(\*If there are no such amendments, state "None".)

Briefly describe amendments in space below:

Article 3. Is amended to: (i) eliminate authorized shares of Class A Common Stock, no par value per share ("Class A Common Stock"), and Class B Common Stock, no par value per share ("Class B Common Stock"); (ii) increase the authorized number of shares of Common Stock, no par value per share ("Common Stock") to 50,000,000 shares and; (iii) authorize issuance of up to 2,000,000 shares of Preferred Stock.

Article 4. Is amended to: (i) delete the paragraph relating to rights and preferences of Class A Common Stock and Class B Common Stock ; (ii) provide that each outstanding share of Class A Common Stock and Class B Common Stock has been converted into one share of Common Stock; (iii) provide a statement of the designation and the powers, privileges and rights, and the qualification, limitations or restrictions thereof in respect of each class of capital stock of the corporation; and (iv) authorize the Board of Directors to issue Preferred Stock in one or more series and create any such series of Preferred Stock without requiring a vote of the holders of Preferred Stock or Common Stock as a prerequisite to the issuance of any shares of any such Preferred Stock and restate Article 4 in its entirety.

Article 6. Is amended to (i) delete the provision relating to limitation of director liability and replace with Section 6A, "Limitation of Director Liability;" (ii) add Section 6B "Indemnification;" and (iii) add Section 6C "Other Provisions."



AMENDED AND RESTATED  
BY-LAWS  
OF  
MKS INSTRUMENTS, INC.

## AMENDED AND RESTATED

## BY-LAWS

## OF

## MKS INSTRUMENTS, INC.

## ARTICLE I

## NAME, LOCATION, CORPORATE SEAL, AND FISCAL YEAR

Section 1. NAME. The name of the corporation is MKS Instruments, Inc.

Section 2. LOCATION. The principal office of the corporation in Massachusetts shall be located at the place set forth on the form of the Articles of Organization or on a certificate filed with the State Secretary. The Board of Directors may change the location of the principal office in Massachusetts and establish such other offices as it deems appropriate.

Section 3. CORPORATE SEAL. The Board of Directors may adopt and alter the form of seal of the corporation.

Section 4. FISCAL YEAR. Except as otherwise determined from time to time by the Board of Directors, the fiscal year of the corporation shall in each year end on December 31.

## ARTICLE II

## STOCKHOLDERS

Section 1. ANNUAL MEETING. The annual meeting of stockholders shall be held within six months after the end of each fiscal year of the corporation on a date to be fixed by the Board of Directors or the President (which date shall not be a legal

holiday in the place where the meeting is to be held) at the time and place to be fixed by the Board of Directors or the President and stated in the notice of the meeting. The purposes for which the annual meeting is to be held, in addition to those prescribed by law, by the Articles of Organization or by these By-Laws, may be specified by the Board of Directors or the President. If no annual meeting is held in accordance with the foregoing provisions, a special meeting may be held in lieu of the annual meeting, and any action taken at that special meeting shall have the same effect as if it had been taken at the annual meeting, and in such case all references in these By-Laws to the annual meeting of stockholders shall be deemed to refer to such special meeting.

Section 2. BUSINESS AT ANNUAL MEETINGS. Except as otherwise provided by law, at an annual meeting of the stockholders, only such business shall be conducted as shall have been properly brought before the meeting. To be properly brought before an annual meeting, business must be (a) specified in the notice of meeting (or any supplement thereto) given by or at the direction of the Board of Directors, (b) otherwise properly brought before the meeting by or at the direction of the Board of Directors, or (c) otherwise properly brought before the meeting by a stockholder.

For business to be properly brought before an annual meeting by a stockholder, the stockholder must give timely notice thereof in writing to the Clerk of the corporation. To be timely, a stockholder's notice must be delivered to or mailed and received at the principal executive offices of the corporation not less than 60 days nor more than 90 days prior to the meeting; PROVIDED; HOWEVER, that in the event that

less than 40 days' notice or prior public disclosure of the date of the meeting is given or made to stockholders, notice by the stockholder to be timely must be so received not later than the close of business on the 10th day following the day on which such notice of the date of the annual meeting was mailed or such public disclosure was made. A stockholder's notice to the Clerk shall set forth as to each matter the stockholder proposes to bring before the annual meeting (a) a brief description of the business desired to be brought before the annual meeting and the reasons for conducting such business at the annual meeting, (b) the name and address, as they appear on the corporation's books, of the stockholder proposing such business, (c) the class and number of shares of the corporation which are beneficially owned by the stockholder, and (d) any material interest of the stockholder in such business. No later than the tenth day following the date of receipt of a stockholder notice pursuant to this Section 2, the Chairman of the Board of Directors of the corporation shall, if the facts warrant, determine and notify in writing the stockholder submitting such notice that such notice was not made in accordance with the time limits and/or other procedures prescribed by these By-Laws. If no such notification is mailed to such stockholder within such ten-day period, such stockholder notice containing a matter of business shall be deemed to have been made in accordance with the provisions of this Section 2. Notwithstanding anything in these By-Laws to the contrary, no business shall be conducted at an annual meeting except in accordance with the procedures set forth in this Section 2.

Section 3. SPECIAL MEETINGS. Special meetings of stockholders may be called by the President or by the Board of Directors. In addition, upon written application of one or more stockholders who are entitled to vote and who hold at least the Required Percentage (as defined below) of the capital stock entitled to vote at the meeting, special meetings shall be called by the Clerk, or in case of the death, absence, incapacity or refusal of the Clerk, by any other officer.

For purposes of this Section 3, the "Required Percentage" shall be (i) 10% at any time at which the corporation shall not have a class of voting stock registered under the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and (ii) 40% at any time at which the corporation shall have a class of voting stock registered under the Exchange Act.

Any request for a call of a special meeting of stockholders (a "Call") by the holders of the Required Percentage of the capital stock entitled to vote at the meeting (the "Voting Stock") shall be governed by and subject to the following:

(a) Any stockholder of record seeking to solicit requests for a Call pursuant to this Section 3 shall so notify the corporation in writing to the Clerk of the corporation and such written notification shall set forth the reason or reasons for the Call and the purpose or purposes of such special meeting.

(b) No solicitation of stockholder requests for a Call (a "Call Solicitation") may be commenced (i) before the Call Request Record Date (as defined in paragraph (c) of this Section 3) or (ii) during the period of 90 days following the most recent meeting of the stockholders of the corporation.

(c) In order that the corporation may determine the stockholders entitled to request a Call, the Board of Directors of the corporation shall fix a record date (the "Call Request Record Date"). Any stockholder of record seeking to solicit stockholder requests for a Call shall, with delivery to the corporation of the written information specified in paragraph (a), request in writing that the Board of Directors fix the Call Request Record Date. The Board of Directors shall, within 10 days after the date on which such request is received, adopt a resolution fixing the Call Request Record Date and such Call Request Record Date shall be not more than 10 days after the date upon which such resolution is adopted by the Board of Directors.

(d) All requests for a Call and revocations thereof shall be delivered to the corporation no later than the 30th day (the "Delivery Date") after the Call Request Record Date.

(e) Any stockholder may revoke a prior request for a Call or opposition to a Call by an instrument in writing delivered prior to the Delivery Date.

(f) Promptly after the Delivery Date, requests for a Call and revocations thereof shall be counted and verified by an independent party selected by the corporation.

(g) If, in response to any Call Solicitation, the holders of record of the Required Percentage of the Voting Stock as of the Call Request Record Date submit valid and unrevoked requests for a Call no later than the Delivery Date, the Board of Directors of the corporation shall fix a record date pursuant to Section 6 of Article V hereof and a meeting date for the special meeting; PROVIDED that the date to be fixed

for such meeting shall be no earlier than 60 days or later than 90 days after the Delivery Date; and PROVIDED FURTHER that the Board of Directors shall not be obligated to fix a meeting date or to hold any meeting of stockholders within 60 days of the next scheduled meeting of the stockholders of the corporation.

(h) In the absence of a quorum at any special meeting called pursuant to a Call Solicitation, such special meeting may be postponed or adjourned from time to time only by the officer of the corporation entitled to preside at such meeting.

Section 4. TIME AND PLACE OF MEETINGS. All meetings of stockholders shall be held at a suitable time at the principal office of the corporation or at such other suitable place within Massachusetts or, to the extent permitted by the Articles of Organization, elsewhere in the United States, as shall be selected by the President or the Board of Directors in the case of an annual meeting and, in the case of a special meeting, by the President, the Board of Directors or the applying stockholders calling such meeting.

Section 5. NOTICE OF MEETINGS. A written notice of each meeting of stockholders containing the place, date and hour, and the purposes for which it is to be held, shall be given by the Clerk or, in the case of the death, absence, incapacity, or refusal of the Clerk, by any other officer, at least seven days before the date of the meeting, to each stockholder entitled to vote at the meeting and to each stockholder who is otherwise entitled by law or by the Articles of Organization or these By-Laws to such notice, by leaving such notice with him or at his residence or usual place of

business or by mailing it postage prepaid and addressed to each stockholder at his address as it shall appear in the stock and transfer records of the corporation. Notice of a meeting need not be given to a stockholder if a written waiver of notice, executed before or after the meeting by such stockholder or his attorney thereunto authorized, is filed with the records of the meeting.

Section 6. QUORUM. The holder or holders of a majority in interest of all stock issued, outstanding, and entitled to vote at a meeting, present in person or represented by proxy, shall constitute a quorum, but the majority of a lesser interest so present may, from time to time, postpone to a new time or place any meeting and the postponed meeting may be held without further notice.

Section 7. VOTING AND PROXIES. Each stockholder entitled to vote shall have one vote, to be exercised in person or by proxy, for each share of stock held by him, and a proportionate vote for a fractional share. When a quorum is present at any meeting the vote of the holders of a majority in interest of the stock represented which is entitled to vote and voting shall decide any matter properly brought before the meeting, except in the case of elections by stockholders, which shall be decided by a plurality of the votes cast by stockholders entitled to vote at the election, and except when a larger vote is required by law, the articles of organization or these by-laws. No vote need be taken by ballot unless so requested by any stockholder entitled to vote thereon. Proxies must be in writing and filed with the clerk of the meeting before being voted. The person named in a proxy may vote at any adjournment of the meeting for which the proxy was given, but the proxy shall

terminate after final adjournment of the meeting. No proxy dated more than six months before the meeting named in it shall be valid. A proxy purporting to be executed by or on behalf of a stockholder shall be deemed valid unless challenged at or prior to its exercise and the burden of proving invalidity shall rest on the challenger. A proxy with respect to stock held in the name of two or more persons shall be valid if executed by any one of them unless at or prior to the exercise of the proxy the corporation receives a specific notice to the contrary from any one of them. Inspectors of election, if any, shall be appointed by the Board of Directors or, in the absence of such appointment, by the officer presiding at any meeting of the stockholders.

Section 8. ACTION BY CONSENT. Any action required or permitted to be taken by stockholders may be taken without a meeting if all stockholders entitled to vote on the matter consent in writing to the action and such written consents are filed with the records of the meetings of stockholders. Such consents shall be treated for all purposes as a vote at a meeting.

### ARTICLE III

#### THE BOARD OF DIRECTORS

Section 1. NUMBER, ELECTION AND QUALIFICATION. The number of directors which shall constitute the whole Board of Directors shall be determined by vote of the stockholders or the Board of Directors, but shall consist of not less than three directors (except that whenever there shall be only two stockholders the number of directors shall be not less than two and whenever there shall be only one stockholder

or prior to the issuance of any stock, there shall be at least one director). The number of directors may be decreased at any time and from time to time either by the stockholders or by a majority of the directors then in office, but only to eliminate vacancies existing by reason of the death, resignation, removal or expiration of the term of one or more directors. The directors shall be elected at the annual meeting of stockholders by such stockholders as have the right to vote on such election. No director need be a stockholder of the corporation.

Notwithstanding the foregoing provisions, if the corporation is a "registered corporation" within the meaning of Section 50A of the Massachusetts Business Corporation Law, as amended, and has not elected, pursuant to paragraph (b) of such Section 50A, to be exempt from the provisions of paragraph (a) of such Section 50A, then:

(i) In accordance with paragraph (d), clause (iv) of such Section 50A, the number of directors shall be fixed only by vote of the Board of Directors.

(ii) In accordance with paragraph (a) of such Section 50A, the directors of the corporation shall be classified with respect to the time for which they severally hold office, into three classes, as nearly equal in number as possible; the term of office of those of the first class ("Class I Directors") to continue until the first annual meeting following the date the corporation becomes subject to such paragraph (a) and until their successors are duly elected and qualified; the term of office of those of the second class ("Class II Directors") to continue until the second annual meeting following the date the corporation becomes subject to such

paragraph (a) and until their successors are duly elected and qualified; and the term of office of those of the third class ("Class III Directors") to continue until the third annual meeting following the date the corporation becomes subject to such paragraph (a) and until their successors are duly elected and qualified. At each annual meeting of the corporation, the successors to the class of directors whose term expires at that meeting shall be elected to hold office for a term continuing until the annual meeting held in the third year following the year of their election and until their successors are duly elected and qualified.

Section 2. ENLARGEMENT OF THE BOARD. The number of directors may be increased at any time and from time to time by a majority of the directors then in office. Notwithstanding the foregoing provisions, if the directors of the corporation are classified with respect to the time for which they severally hold office pursuant to paragraph (a) of Section 50A of the Massachusetts Business Corporation Law, as it may be amended from time to time, the Board of Directors may be enlarged only in accordance with the provisions of paragraph (d) of such Section 50A.

Section 3. TENURE. Except as otherwise provided by law, these By-Laws or the Articles of Organization, each director shall hold office until the next annual meeting or stockholders and until his successor is elected and qualified, or until his earlier death, resignation or removal.

Section 4. VACANCIES. Unless and until filled by the stockholders, any vacancy in the Board of Directors, however occurring, including a vacancy resulting from an enlargement of the Board, may be filled by vote of a majority of the directors present

at any meeting of directors at which a quorum is present. Each such successor shall hold office for the unexpired term of his predecessor and until his successor is chosen and qualified or until his earlier death, resignation or removal. Notwithstanding the foregoing provisions, if the directors of the corporation are classified with respect to the time for which they severally hold office pursuant to paragraph (a) of Section 50A of the Massachusetts Business Corporation Law, as it may be amended from time to time, any vacancy in the Board of Directors, however occurring, shall be filled solely in accordance with the provisions of paragraph (d) of such Section 50A.

Section 5. RESIGNATION. Any director may resign by delivering his written resignation to the corporation at its principal office or to the President or Clerk. Such resignation shall be effective upon receipt unless it is specified to be effective at some other time or upon the happening of some other event.

Section 6. REMOVAL. A director may be removed from office with or without cause by vote of the holders of a majority of the shares entitled to vote in the election of directors. However, the directors elected by the holders of a particular class or series of stock may be removed from office with or without cause only by vote of the holders of a majority of the outstanding shares of such class or series. In addition, a director may be removed from office for cause by vote of a majority of the directors then in office. A director may be removed for cause only after reasonable notice and opportunity to be heard before the body proposing to remove him. Notwithstanding the foregoing provision, if the directors of the corporation are classified with respect to the time for which they severally hold office pursuant to paragraph (a) of

Section 50A of the Massachusetts Business Corporation Law, as it may be amended from time to time, directors may only be removed for cause pursuant to paragraph (c) of such Section 50A.

Section 7. NOMINATION OF DIRECTORS. Only persons who are nominated in accordance with the procedures set forth in this Section 7 shall be eligible for election as directors. Nominations of persons for election to the Board of Directors of the corporation may be made at a meeting of stockholders by, or at the direction of, the Board of Directors or by any stockholder of the corporation entitled to vote for the election of directors at the meeting who complies with the notice procedures set forth in this Section 7. Any such nomination by a stockholder shall be made pursuant to timely notice in writing to the Clerk of the corporation. To be timely, a stockholder's notice shall be delivered to the principal executive offices of the corporation not less than 30 days nor more than 90 days prior to the date of the meeting; PROVIDED, HOWEVER, that in the event that less than 40 days' notice or prior public disclosure of the date of the meeting is given or made to stockholders, timely notice by the stockholder must be received not later than the close of business on the 10th day following the day on which such notice of the date of the meeting was mailed or such public disclosure was made. Such stockholder's notice shall set forth (a) as to each person whom the stockholder proposes to nominate for election or re-election as a director, (i) the name, age, business address and residence address of such person; (ii) the principal occupation or employment of such person, (iii) the class and number of shares of the corporation which are beneficially owned by such person and

(iv) any other information relating to such person that is required to be disclosed in solicitations of proxies for election of directors or is otherwise required in each case pursuant to Regulation 14A under the Securities Exchange Act of 1934, as amended (including without limitation such person's written consent to being named in the proxy statement as a nominee and to serving as a director if elected); and (b) as to the stockholder giving the notice, (i) the name and address, as they appear on the corporation's books, of such stockholder and (ii) the class and number of shares of the corporation which are beneficially owned by such stockholder. At the request of the Board of Directors, any person nominated by the Board of Directors for election as a director shall furnish to the Clerk of the corporation that information required to be set forth in a stockholder's notice of nomination which pertains to the nominee. No later than the tenth day following the date of receipt of a stockholder nomination submitted pursuant to this Section 7, the Chairman of the Board of Directors of the corporation shall, if the facts warrant, determine and notify in writing the stockholder making such nomination that such nomination was not made in accordance with the time limits and/or other procedures prescribed by these By-Laws. If no such notification is mailed to such stockholder within such ten-day period, such nomination shall be deemed to have been made in accordance with the provisions of this Section 7.

Section 8. POWERS. The business of the corporation shall be managed by a Board of Directors, who may exercise all the powers of the corporation except as otherwise provided by law, by the Articles of Organization or by these By-Laws. In

the event of a vacancy in the Board of Directors, the remaining Directors, except as otherwise provided by law, may exercise the powers of the full Board until the vacancy is filled.

Section 9. CHAIRMAN OF THE BOARD AND VICE-CHAIRMAN OF THE BOARD. The Board of Directors may appoint a Chairman of the Board. If the Board of Directors appoints a Chairman of the Board, he shall perform such duties and possess such powers as are assigned to him by the Board of Directors. If the Board of Directors appoints a Vice-Chairman of the Board, he shall, in the absence or disability of the Chairman of the Board, perform the duties and exercise the powers of the Chairman of the Board and shall perform such other duties and possess such other powers as may from time to time be vested in him by the Board of Directors.

Section 10. REGULAR MEETINGS. Regular meetings of the Directors may be held without call or notice at such places, within or without Massachusetts, and at such times as the Directors may from time to time determine, provided that any Director who is absent when such determination is made shall be given notice of the determination. A regular meeting of the Directors may be held without a call or notice immediately after and at the same place as the annual meeting of stockholders.

Section 11. SPECIAL MEETINGS. Special meetings of the Directors may be held at any time and place, within or without Massachusetts, designated in a call by the Chairman of the Board, President, Treasurer, two or more Directors or by one Director in the event that there is only a single Director in office.

Section 12. MEETINGS BY TELEPHONE CONFERENCE CALLS. Directors or members of any committee designated by the Board of Directors may participate in a meeting of the Board of Directors or such committee by means of a conference telephone or similar communications equipment by means of which all persons participating in the meeting can hear each other at the same time and participation by such means shall constitute presence in person at a meeting.

Section 13. NOTICE OF SPECIAL MEETINGS. Notice of any special meeting of the Board of Directors shall be given to each director by the Clerk or by the officer or one of the directors calling the meeting. Notice shall be duly given to each director (i) by notice given to such director in person or by telephone at least 24 hours in advance of the meeting, (ii) by sending a telegram or telex, or by delivering written notice by hand, to his last known business or home address at least 24 hours in advance of the meeting or (iii) by mailing written notice to his last known business or home address at least 72 hours in advance of the meeting. Notice need not be given to any director if a written waiver of notice, executed by him before or after the meeting, is filed with the records of the meeting, or to any director who attends the meeting without protesting prior to the meeting or at its commencement the lack of notice to him. A notice or waiver of notice of a Board of Directors meeting need not specify the purposes of the meeting. If notice is given in person or by telephone, an affidavit of the Clerk, officer or director who gives such notice that the notice has been duly given shall, in the absence of fraud, be conclusive evidence that such notice was duly given.

Section 14. QUORUM. At any meeting of the Board of Directors, a majority of the directors then in office shall constitute a quorum. Less than a quorum may adjourn any meeting from time to time without further notice.

Section 15. ACTION AT MEETING. At any meeting of the Board of Directors at which a quorum is present, the vote of a majority of those present shall be sufficient to take any action, unless a different vote is specified by law, by the Articles of Organization or by these By-Laws.

Section 16. ACTION BY CONSENT. Any action required or permitted to be taken at any meeting of the Board of Directors may be taken without a meeting if all of the directors consent to the action in writing and such consents are filed with the records of the meetings of the Board of Directors. Such consents shall be treated for all purposes as a vote at a meeting.

Section 17. COMMITTEES. The Board of Directors may, by vote of a majority of the directors then in office, elect from their number an executive committee or other committees and may by like vote delegate to committees so elected some or all of their powers to the extent permitted by law. Except as the Board of Directors may otherwise determine, any such committee may make rules for the conduct of its business, but unless otherwise provided by the directors or in such rules, its business shall be conducted as nearly as possible in the same manner as is provided by these By-Laws for the directors. The Board of Directors shall have the power at any time to fill vacancies in any such committee, to change its membership or to discharge the committee.

Section 18. COMPENSATION OF DIRECTORS. Directors may be paid such compensation for their services and such reimbursement for expenses of attendance at meetings as the Board of Directors may from time to time determine. No such payment shall preclude any director from serving the corporation in any other capacity and receiving compensation therefor.

#### ARTICLE IV

##### OFFICERS

Section 1. DESIGNATION AND QUALIFICATION. The officers of the corporation shall consist of a President, a Treasurer, a Clerk, and such other officers including one or more Vice Presidents, Assistant Treasurers and Assistant Clerks as the Board of Directors may elect. No officer need be a stockholder or a director. The Clerk shall be a resident of The Commonwealth of Massachusetts unless the corporation has a resident agent appointed to accept service of process. A person may hold more than one office at the same time provided that the President and Clerk may not be the same person except when there is only one stockholder. Any officer may be required by the Board of Directors to give bond for the faithful performance of his duties to the corporation in such amount and with such sureties as the Board of Directors may determine.

Section 2. ELECTION AND TERM. The President, Treasurer and Clerk shall be elected annually by the Board of Directors at the annual meeting of the Board of Directors and shall hold office until the next annual meeting of the Board of Directors and until their respective successors are chosen and qualified. All other officers may

be elected by the Board of Directors at any time and shall hold office for such term as the Board of Directors determines.

Section 3. PRESIDENT. The President shall be the chief executive officer of the corporation, except as the Board of Directors may otherwise provide, and shall have general supervision and control of the business of the corporation subject to the direction of the Board of Directors. The President shall also have such other powers and duties as the Board of Directors may decide. It shall be his duty, and he shall have the power, to see that all orders and resolutions of the directors are carried into effect. Unless the Board of Directors provides otherwise, the President or his designee shall preside at all meetings of the stockholders and at all meetings of the Board of Directors. Unless otherwise directed by the Board of Directors, the President may on behalf of the corporation vote or consent to any action with respect to or in connection with any interest that the corporation may hold or have in any other corporation or in any partnership, joint venture, association, trust, proprietorship, business entity or common undertaking whatsoever, and may appoint any other person or persons to act as proxy or attorney-in-fact for the corporation, with or without power of substitution. The Board of Directors may from time to time confer like powers upon any other officer.

Section 4. VICE PRESIDENT. The Vice President or Vice Presidents, if any, shall have such powers and perform such duties as may be assigned to them by the Board of Directors or the President. In the absence of the President or in the event of his inability to act, the Vice President, if any, or, if there is more than one Vice President,

the First Vice President, or, if no First Vice President has been designated, the Vice President senior in office, shall have and may exercise all the powers and duties of the President.

Section 5. TREASURER AND ASSISTANT TREASURERS. The Treasurer shall have, subject to the direction of the Board of Directors, general charge of the financial affairs of the corporation and shall keep full and accurate records thereof, which shall always be open to the inspection of the President or of any director. He shall render to the President or to the Board of Directors, whenever either may require it, a statement of the accounts of his transactions as Treasurer and of the financial condition of the corporation. The Treasurer shall perform such duties and have such powers additional to the foregoing as the directors may designate.

Any Assistant Treasurer shall have such powers and duties as the Board of Directors may decide.

Section 6. CLERK AND ASSISTANT CLERKS. The Clerk shall record in books kept for that purpose all votes, consents and the proceedings of all meetings of the stockholders and of the Board of Directors. Record books of stockholders' meetings shall be open at all reasonable times to the inspection of any stockholder. The Clerk shall notify the stockholders and directors of all meetings in accordance with the By-Laws.

In the absence of the Clerk from any meeting of the stockholders or from any meeting of the directors, the Assistant Clerk, if one be elected, or, if there be more than one, the one designated for the purpose by the directors, and otherwise a

temporary clerk designated by the person presiding at the meeting, shall perform the duties of the Clerk.

Any Assistant Clerks shall have such other powers and duties as the Board of Directors may decide.

Section 7. VACANCIES. A vacancy in any office may be filled by the Board of Directors by the election of a successor to hold office for the unexpired term of the officer whose place is vacant and until his successor is chosen and qualified.

Section 8. REMOVAL. All officers may be removed from their respective offices with or without cause by vote of a majority of the directors then in office. An officer may be removed for cause only after a reasonable notice and opportunity to be heard before the Board of Directors.

Section 9. RESIGNATION. Any officer may at any time resign his office by delivering a written resignation to the Board of Directors, the President or the Clerk. Such resignation, unless a later date is specified therein, shall take effect upon receipt by the addressee or at the principal office of the corporation, and acceptance thereof shall not be necessary to make it effective.

Section 10. SALARIES. Officers of the corporation shall be entitled to such salaries, compensation or reimbursement as shall be fixed or allowed from time to time by the Board of Directors.

ARTICLE V  
CAPITAL STOCK

Section 1. CERTIFICATES OF STOCK. Each stockholder shall be entitled to a certificate in the form approved by the Board of Directors stating the number, class, and designation of series, if any, of the shares held by him. Such certificate shall be signed by the President or a Vice President and by the Treasurer or an Assistant Treasurer. Such signatures may be facsimiles if the certificate is countersigned by a transfer agent, or by a registrar of transfers, other than a director, officer or employee of the corporation. In case any officer who has signed or whose facsimile signature has been placed on such certificate shall have ceased to be such officer before such certificate is issued, it may be issued by the corporation with the same effect as if he were such officer at the time of its issue.

Every certificate for shares of stock subject to any restriction on transfer pursuant to the Articles of Organization, these By-Laws, or any agreement to which the corporation is a party shall have the restriction noted conspicuously on the certificate and shall also set forth on the face or back either the full text of the restriction or a statement of the existence of such restriction and a statement that the corporation will furnish a copy to the holder of such certificate upon written request and without charge. If the corporation is authorized to issue more than one class or series of stock, every certificate issued shall set forth on its face or back either the full text of the preferences, voting powers, qualifications and special and relative rights of the shares of each class and series authorized to be issued or a statement of the

existence of such preferences, powers, qualification and rights, and a statement that the corporation will furnish a copy thereof to the holder of such certificate upon written request and without charge.

Section 2. TRANSFER. Shares of stock shall be transferred of record on the books of the corporation only upon the surrender to the corporation or its transfer agent of the certificate therefor properly endorsed for transfer (or accompanied by a written assignment and power of attorney properly executed for transfer), and only upon compliance with provisions, if any, respecting restrictions on transfer contained in the Articles of Organization, these By-Laws or any agreement to which the corporation is a party. The corporation may require proof of the genuineness of the signature and the capacity of the party presenting the certificate for transfer.

It shall be the duty of each stockholder to notify the corporation of his post office address and of his taxpayer identification number.

Section 3. INTERESTS NOT RECOGNIZED. The corporation shall be entitled to treat the holder of record of any share or shares of stock as the holder in fact thereof and shall not be bound to recognize any other claim to or interest in such share or shares on the part of any other person except as may be otherwise expressly provided by law.

Section 4. LOST, MUTILATED, OR DESTROYED CERTIFICATES. Subject to Section 8-405 of the Massachusetts Uniform Commercial Code, as amended from time to time, the Board of Directors may determine the conditions upon which a new certificate of stock may be issued in place of any certificate alleged to have been lost, mutilated or

destroyed. It may, in its discretion, require the owner of a lost, mutilated or destroyed certificate, or his legal representative, to give a bond, with or without surety, sufficient in its opinion to indemnify the corporation against any loss, claim or expense which may arise by reason of the issuance of a new certificate in place of such lost, mutilated or destroyed stock certificate.

Section 5. TRANSFER AGENT AND REGISTRAR. The Board of Directors may appoint a transfer agent or a registrar, or both, and require all stock certificates to bear the signature or facsimile thereof of any such transfer agent or registrar. Unless the Board of Directors shall appoint a transfer agent, registrar or other officer or officers for the purpose, the Clerk shall be charged with the duty of keeping, or causing to be kept, accurate records of all stock outstanding, stock certificates issued, and stock transfers. Subject to any other rules which may be adopted from time to time by the Board of Directors, such records may be kept solely in the stock certificate books.

Section 6. SETTING RECORD DATE AND CLOSING TRANSFER RECORDS. The Board of Directors may fix in advance a time not more than sixty days before (i) the date of any meeting of the stockholders or (ii) the date for the payment of any dividend or the making of any distribution to stockholders or (iii) the last day on which the consent or dissent of stockholders may be effectively expressed for any purpose, as the record date for determining the stockholders having the right to notice of, and to vote at such meeting or any adjournment thereof, or the right to receive such dividend or distribution, or the right to give such consent or dissent. If a record date is fixed by the Board of Directors, only stockholders of record on such date shall have

such rights notwithstanding any transfer of stock on the records of the corporation after such date. Without fixing such record date, the Board of Directors may close the transfer records of the corporation for all or any part of such sixty-day period.

If no record date is fixed and the transfer books are not closed, then the record date for determining stockholders having the right to notice of or to vote at a meeting of stockholders shall be at the close of business on the day next preceding the day on which notice is given, and the record date for determining stockholders for any other purpose shall be at the close of business on the date on which the Board of Directors acts with respect thereto.

Section 7. ISSUE OF STOCK. Unless otherwise voted by the stockholders, the whole or any part of any unissued balance of the authorized capital stock of the corporation or the whole or any part of the capital stock of the corporation held in its treasury may be issued or disposed of by vote of the Board of Directors, in such manner, for such consideration and on such terms as the directors may determine.

#### ARTICLE VI

##### INSPECTION OF RECORDS

The original, or attested copies of the Articles of Organization, By-Laws and records of all meetings of the incorporators and stockholders, and the stock and transfer records, which shall contain the names of all stockholders and the record address and the amount of stock held by each, shall be kept in The Commonwealth of Massachusetts at the principal office of the corporation, or at an office of its transfer agent or of the Clerk or of its resident agent. Said copies and records need

not all be kept in the same office. They shall be available at all reasonable times to the inspection of any stockholder for any proper purpose but not to secure a list of stockholders for the purpose of selling said list or copies thereof or of using the same for a purpose other than in the interest of the applicant, as a stockholder, relative to the affairs of the corporation.

#### ARTICLE VII

##### CHECKS, NOTES, DRAFTS AND OTHER INSTRUMENTS

Checks, notes, drafts and other instruments for the payment of money drawn or endorsed in the name of the corporation may be signed by any officer or officers or person or persons authorized by the directors to sign the same. No officer or person shall sign any such instrument as aforesaid unless authorized by the directors to do so.

#### ARTICLE VIII

##### AMENDMENTS

These By-Laws may be amended by vote of the holders of a majority of the shares of each class of the capital stock at the time outstanding and entitled to vote at any annual or special meeting of stockholders, if notice of the substance of the proposed amendment is stated in the notice of such meeting. If authorized by the Articles of Organization, the Board of Directors, by a majority of their number then in office, may also make, amend or repeal these By-Laws, in whole or in part, except with respect to (a) the provisions of these By-Laws governing (i) the removal of directors and (ii) the amendment of these By-Laws and (b) any provision of these By-

Laws which by law, the Articles of Organization or these By- Laws requires action by the stockholders.

Not later than the time of giving notice of the meeting of stockholders next following the making, amending or repealing by the Board of Directors of any By-Law, notice stating the substance of such change shall be given to all stockholders entitled to vote on amending the By-Laws.

#### ARTICLE IX

##### MISCELLANEOUS PROVISIONS

###### Section 1. TRANSACTIONS WITH INTERESTED PARTIES.

(a) A director who has a financial, family or other interest in a contract or other transaction may be counted for purposes of establishing the existence of a quorum at a meeting of the Board of Directors (or of a committee of the Board of Directors) at which action with respect to the transaction is taken and may vote to approve the transaction and any related matters.

(b) A contract or other transaction in which a director or officer has a financial, family or other interest shall not be void or voidable for that reason, if any one of the following is met:

(1) The material facts as to the director's or officer's interest are disclosed or are known to the Board of Directors or committee of the Board of Directors acting on the transaction, and the Board of Directors or committee authorizes, approves or ratifies the transaction by the affirmative vote of a majority of the disinterested directors (or, if applicable, the sole disinterested

director) on the Board of Directors or committee, as the case may be, even though the disinterested directors be less than a quorum; or

(2) The material facts as to the director's or officer's interest are disclosed or are known to the holders of the shares of the corporation's capital stock then entitled to vote for directors and such holders, voting such shares as a single class, by a majority of the votes cast on the question, specifically authorize, approve or ratify the transaction; or

(3) The transaction was fair to the corporation as of the time it was entered into by the corporation.

A failure to meet any of the requirements in subparagraphs (1), (2) or (3) shall not create an inference that the transaction is void or voidable for that reason.

Section 2. MASSACHUSETTS CONTROL SHARE ACQUISITION ACT. The provisions of Chapter 110D of the Massachusetts General Laws shall not apply to the corporation.

Section 3. EVIDENCE OF AUTHORITY. A certificate by the Clerk or an Assistant Clerk or a temporary Clerk as to any action taken by the stockholders, the Board of Directors, any committee or any officer or representative of the corporation shall as to all persons who rely on the certificate in good faith be conclusive evidence of such action.

Section 4. ARTICLES OF ORGANIZATION. All references in these By-Laws to the Articles of Organization shall be deemed to refer to the Articles of Organization of the corporation, as amended and in effect from time to time.

Section 5. SEVERABILITY. Any determination that any provision of these By-Laws is for any reason inapplicable, illegal or ineffective shall not affect or invalidate any other provision of these By-Laws.

Section 6. PRONOUNS. All pronouns used in these By-Laws shall be deemed to refer to the masculine, feminine or neuter, singular or plural, as the identity of the person or persons may require.

Approved as Amended and Restated by the  
Board of Directors on December 31, 1997

Approved as Amended and Restated by the  
Stockholders on January 9, 1998

[LOGO] MKS  
INSTRUMENTS, INC.

NUMBER

SHARES

MKS

MKS INSTRUMENTS, INC.

COMMON STOCK

THIS CERTIFICATE IS TRANSFERABLE  
IN BOSTON, MA OR NEW YORK, NY

SEE REVERSE FOR CERTAIN DEFINITIONS

INCORPORATED UNDER THE LAWS OF THE COMMONWEALTH OF MASSACHUSETTS

CUSIP 55306N 10 4

THIS CERTIFIES THAT

is the owner of

FULLY PAID AND NON-ASSESSABLE SHARES OF COMMON STOCK, NO PAR VALUE OF

===== MKS INSTRUMENTS, INC. =====  
transferable only the books of the Corporation by the holder hereof in person or by duly authorized attorney upon surrender of  
this Certificate properly endorsed. This Certificate and the shares represented hereby are issued under and subject to the laws of  
The Commonwealth of Massachusetts and to the Articles of Organization and By-laws of the Corporation, all as amended from time to  
time. This Certificate is not valid unless countersigned and registered by the Transfer Agent and Registrar.

IN WITNESS WHEREOF, the Corporation has caused this Certificate to be signed by the facsimile signatures of its duly authorized  
officers and a facsimile of its corporate seal to be hereunto affixed.

Dated:

/s/ Robert J. O'Brien  
TREASURER

[SEAL]

/s/ John R. Bertucci  
PRESIDENT

COUNTERSIGNED AND REGISTERED:

BANKBOSTON, N.A.  
TRANSFER AGENT AND REGISTRAR

BY

AUTHORIZED SIGNATURE

-----  
AMERICAN BANK NOTE COMPANY    DEC 10, 1997 fm  
3504 ATLANTIC AVENUE  
SUITE 12                            053699fc  
LONG BEACH, CA 90807  
(562) 989-2333  
(FAX) (562) 426-7450    270-19x    Proof X REV 3  
-----

MKS INSTRUMENTS, INC.

The Corporation has more than one class of stock authorized to be issued. The Corporation will furnish without charge to each stockholder upon written request, a copy of the full text of the preferences, voting powers, qualifications and special and relative rights of the shares of each class of stock (and any series thereof) authorized to be issued by the Corporation.

The following abbreviations, when used in the inscription on the face of this Certificate, shall be construed as though they were written out in full according to applicable laws or regulations:

TEN COM -- as tenants in common UNIF GIFT MIN ACT -- Guardian (Cust) (Minor)
TEN ENT -- as tenants by the entireties
JT TEN -- as joint tenants with right of survivorship and not as tenants in common under Uniform Gifts to Minors Act (State)

Additional abbreviations may also be used though not in the above list.

For value received hereby sell, assign and transfer unto

PLEASE INSERT SOCIAL SECURITY OR OTHER IDENTIFYING NUMBER OF ASSIGNEE

(PLEASE PRINT OR TYPEWRITE NAME AND ADDRESS, INCLUDING ZIP CODE OF ASSIGNEE)

Shares of the capital stock represented by the within Certificate, and do hereby irrevocably constitute and appoint

Attorney to transfer the said stock on the books of the within named Corporation with full power of substitution in the premises.

Dated

(Signature) NOTICE: THE SIGNATURE TO THIS ASSIGNMENT MUST CORRESPOND WITH THE NAME AS WRITTEN UPON THE FACE OF THE CERTIFICATE IN EVERY PARTICULAR, WITHOUT ALTERATION OR ENLARGEMENT OR ANY CHANGE WHATEVER.

Signature Guaranteed: ALL GUARANTEES MUST BE MADE BY A FINANCIAL INSTITUTION (SUCH AS A BANK OR BROKER) WHICH IS A PARTICIPANT IN THE SECURITIES TRANSFER AGENTS MEDALLION PROGRAM ("STAMP"), THE NEW YORK STOCK EXCHANGE, INC. MEDALLION SIGNATURE PROGRAM ("MSP") OR THE STOCK EXCHANGES MEDALLION PROGRAM ("SEMP") AND MUST NOT BE DATED. GUARANTEES BY A NOTARY PUBLIC ARE NOT ACCEPTABLE.

AMERICAN BANK NOTE COMPANY NOV 12, 1997 fm
3504 ATLANTIC AVENUE
SUITE 12
LONG BEACH, CA 90807 053699bk
(562) 989-2333
(FAX) (562) 426-7450 Proof X NEW

## MKS INSTRUMENTS, INC.

## AMENDED AND RESTATED 1995 STOCK INCENTIVE PLAN

## 1. PURPOSE

The purpose of this Amended and Restated 1995 Stock Incentive Plan (the "Plan") of MKS Instruments, Inc., a Massachusetts corporation (the "Company"), is to advance the interests of the Company's stockholders by enhancing the Company's ability to attract, retain and motivate persons who make (or are expected to make) important contributions to the Company by providing such persons with equity ownership opportunities and performance-based incentives and thereby better aligning the interests of such persons with those of the Company's stockholders. Except where the context otherwise requires, the term "Company" shall include any present or future subsidiary corporations of MKS Instruments, Inc. as defined in Section 424(f) of the Internal Revenue Code of 1986, as amended, and any regulations promulgated thereunder (the "Code").

## 2. ELIGIBILITY

All of the Company's employees, officers, directors, consultants and advisors are eligible to be granted options, restricted stock, or other stock-based awards (each, an "Award") under the Plan. Any person who has been granted an Award under the Plan shall be deemed a "Participant."

## 3. ADMINISTRATION, DELEGATION

(a) ADMINISTRATION BY BOARD OF DIRECTORS. The Plan will be administered by the Board of Directors of the Company (the "Board"). The Board shall have authority to grant Awards and to adopt, amend and repeal such administrative rules, guidelines and practices relating to the Plan as it shall deem advisable. The Board may correct any defect, supply any omission or reconcile any inconsistency in the Plan or any Award in the manner and to the extent it shall deem expedient to carry the Plan into effect and it shall be the sole and final judge of such expediency. All decisions by the Board shall be made in the Board's sole discretion and shall be final and binding on all persons having or claiming any interest in the Plan or in any Award. No director or person acting pursuant to the authority delegated by the Board shall be liable for any action or determination relating to or under the Plan made in good faith.

(b) DELEGATION TO EXECUTIVE OFFICERS. To the extent permitted by applicable law, the Board may delegate to one or more executive officers of the Company the power to make Awards and exercise such other powers under the Plan as the Board may determine, provided that the Board shall fix the maximum number of shares subject to Awards and the maximum number of shares for any one Participant to be made by such executive officers. The Chief Executive Officer of the Company may grant Awards to non-executive officer employees of the Company in amounts not to exceed 300,000 shares in the aggregate or 20,000 shares to any one employee.

(c) APPOINTMENT OF COMMITTEES. To the extent permitted by applicable law, the Board may delegate any or all of its powers under the Plan to one or more committees or subcommittees of the Board (a "Committee"). If and when the Common Stock (as defined below in Section 4(d)) is registered under the Securities Exchange Act of 1934 (the "Exchange Act"), the Board shall appoint one such Committee of not less than two members, each member of which shall be an "outside director" within the meaning of Section 162(m) of the Code and a "non-employee director" as defined in Rule 16b-3 promulgated under the Exchange Act." All references in the Plan to the "Board" shall mean the Board or a Committee of the Board or the executive officer referred to in Section 3(b) to the extent that the Board's powers or authority under the Plan have been delegated to such Committee or executive officer.

#### 4. STOCK AVAILABLE FOR AWARDS

(a) NUMBER OF SHARES. Subject to adjustment under Section 4(c), Awards may be made under the Plan for up to 2,500,000 shares of Common Stock (as defined below in Section 4(d)). If any Award expires or is terminated, surrendered or canceled without having been fully exercised or is forfeited in whole or in part or results in any Common Stock not being issued, the unused Common Stock (as defined below in Section 4(d)) covered by such Award shall again be available for the grant of Awards under the Plan, subject, however, in the case of Incentive Stock Options (as hereinafter defined), to any limitation required under the Code. Shares issued under the Plan may consist in whole or in part of authorized but unissued shares or treasury shares. All share amounts set forth in this plan reflect the 2,110-for-1 stock split approved by the Board of Directors of the Company on December 31, 1997 (the "1997 Stock Split").

(b) PER-PARTICIPANT LIMIT. Subject to adjustment under Section 4(c), for Awards granted after the Common Stock (as defined below in Section 4(d)) is registered under the Exchange Act, the maximum number of shares with respect to which an Award may be granted to any Participant under the Plan shall be 900,000 per calendar year. The per-participant limit described in this Section 4(b) shall be construed and applied consistently with Section 162(m) of the Code.

(c) ADJUSTMENT TO COMMON STOCK. In the event, at any time after the 1997 Stock Split, of any stock split, stock, dividend, recapitalization, reorganization, merger, consolidation, combination, exchange of shares, liquidation, spin-off or other similar change in capitalization or event, or any distribution to holders of Common Stock (as defined below in Section 4(d)) other than a normal cash dividend, (i) the number and class of securities available under this Plan, (ii) the number and class of security and exercise price per share subject to each outstanding Option, (iii) the repurchase price per security subject to each outstanding Restricted Stock Award and (iv) the terms of each other outstanding stock-based Award shall be appropriately adjusted by the Company (or substituted Awards may be made, if applicable) to the extent the Board shall determine, in good faith, that such an adjustment (or substitution) is necessary and appropriate. If this Section 4(c) applies and Section 8(e)(1) also applies to any event, Section 8(e)(1) shall be applicable to such event and this Section 4(c) shall not be applicable.

(d) DEFINITION OF COMMON STOCK. "Common Stock" means (i) prior to the closing of the Company's initial public offering of common stock pursuant to an effective registration statement under the Securities Act of 1933 ("IPO"), the Class B Common Stock, no par value per share, of the Company, and (ii) from and after the closing of the IPO, the Common Stock, no par value per share, of the Company.

## 5. STOCK OPTIONS

(a) GENERAL. The Board may grant options to purchase Common Stock (each, an "Option") and determine the number of shares of Common Stock to be covered by each Option, the exercise price of each Option and the conditions and limitations applicable to the exercise of each Option, including conditions relating to applicable federal or state securities laws, as it considers necessary or advisable. An Option which is not intended to be an Incentive Stock Option (as hereinafter defined) shall be designated a "Nonstatutory Stock Option."

(b) INCENTIVE STOCK OPTIONS. An Option that the Board intends to be an "incentive stock option" as defined in Section 422 of the Code (an "Incentive Stock Option") shall only be granted to employees of the Company and shall be subject to and shall be construed consistently with the requirements of Section 422 of the Code. The Company shall have no liability to a Participant, or any other party, if an Option (or any part thereof) which is intended to be an Incentive Stock Option is not an Incentive Stock Option.

(c) EXERCISE PRICE. The Board shall establish the exercise price at the time each Option is granted and specify it in the applicable option agreement.

(d) DURATION OF OPTIONS. Each Option shall be exercisable at such times and subject to such terms and conditions as the Board may specify in the applicable

option agreement. No Option will be granted for a term in excess of 10 years.

(e) EXERCISE OF OPTION. Options may be exercised only by delivery to the Company of a written notice of exercise signed by the proper person together with payment in full as specified in Section 5(f) for the number of shares for which the Option is exercised.

(f) PAYMENT UPON EXERCISE. Common Stock purchased upon the exercise of an Option granted under the Plan shall be paid for as follows:

(i) in cash or by check, payable to the order of the Company;

(ii) except as the Board may otherwise provide in an Option Agreement, delivery of an irrevocable and unconditional undertaking by a creditworthy broker to deliver promptly to the Company sufficient funds to pay the exercise price, delivery by the Participant to the Company of a copy of irrevocable and unconditional instructions to a creditworthy broker to deliver promptly to the Company cash or a check sufficient to pay the exercise price, or by delivery of shares of Common Stock owned by the Participant valued at the fair market value as determined by the Board in good faith ("Fair Market Value"), which Common Stock was owned by the Participant at least six months prior to such delivery;

(iii) to the extent permitted by the Board and explicitly provided in an Option Agreement (i) by delivery of a promissory note of the Participant to the Company on terms determined by the Board, or (ii) by payment of such other lawful consideration as the Board may determine; or

(iv) any combination of the above permitted forms of payment.

#### 6. RESTRICTED STOCK

(a) GRANTS. The Board may grant Awards entitling recipients to acquire shares of Common Stock, subject to the right of the Company to repurchase all or part of such shares at their issue price or other stated or formula price (or to require forfeiture of such shares if issued at no cost) from the recipient in the event that conditions specified by the Board in the applicable Award are not satisfied prior to the end of the applicable restriction period or periods established by the Board for such Award (each, "Restricted Stock Award").

(b) TERMS AND CONDITIONS. The Board shall determine the terms and conditions of any such Restricted Stock Award, including the conditions for repurchase (or forfeiture) and the issue price, if any. Any stock certificates issued in respect of a Restricted Stock Award shall be registered in the name of the Participant and, unless otherwise determined by the Board, deposited by the Participant, together

with a stock power endorsed in blank, with the Company (or its designee). At the expiration of the applicable restriction periods, the Company (or such designee) shall deliver the certificates no longer subject to such restrictions to the Participant or if the Participant has died, to the beneficiary designated, in a manner determined by the Board, by a Participant to receive amounts due or exercise rights of the Participant in the event of the Participant's death (the "Designated Beneficiary"). In the absence of an effective designation by a Participant, Designated Beneficiary shall mean the Participant's estate.

7. OTHER STOCK-BASED AWARDS

The Board shall have the right to grant other Awards based upon the Common Stock, having such terms and conditions as the Board may determine including the grant of shares based upon certain conditions, the grant of securities convertible into Common Stock and the grant of stock appreciation rights.

8. GENERAL PROVISIONS APPLICABLE TO AWARDS

(a) TRANSFERABILITY OF AWARDS. Except as the Board may otherwise determine or provide in an Award, Awards shall not be sold, assigned, transferred, pledged or otherwise encumbered by the person to whom they are granted, either voluntarily or by operation of law, except by will or the laws of descent and distribution, and, during the life of the Participant, shall be exercisable only by the Participant. References to a Participant, to the extent relevant in the context, shall include references to authorized transferees.

(b) DOCUMENTATION. Each Award under the Plan shall be evidenced by a written instrument in such form as the Board shall determine. Each Award may contain terms and conditions in addition to those set forth in the Plan.

(c) BOARD DISCRETION. Except as otherwise provided by the Plan, each type of Award may be made alone or in addition or in relation to any other type of Award. The terms of each type of Award need not be identical, and the Board need not treat Participants uniformly.

(d) TERMINATION OF STATUS. The Board shall determine the effect on an Award of the disability, death, retirement, authorized leave of absence or other change in the employment or other status of a Participant and the extent to which, and the period during which, the Participant, the Participant's legal representative, conservator, guardian or Designated Beneficiary may exercise rights under the Award.

## (e) ACQUISITION EVENTS

(1) CONSEQUENCES OF ACQUISITION EVENTS. Upon the occurrence of an Acquisition Event (as defined below), or the execution by the Company of any agreement with respect to an Acquisition Event, the Board shall take any one or more of the following actions with respect to then outstanding Awards: (i) provide that outstanding Options shall be assumed, or equivalent Options shall be substituted, by the acquiring or succeeding corporation (or an affiliate thereof), provided that any such Options substituted for Incentive Stock Options shall satisfy, in the determination of the Board, the requirements of Section 424(a) of the Code; (ii) if the acquisition or succeeding corporation refuses or is unable to assume outstanding Options or grant Options in substitution therefor pursuant to clause (i), upon written notice to the Participants, provide that all then unexercised Options will become exercisable in full as of a specified time (the "Acceleration Time") prior to the Acquisition Event and will terminate immediately prior to the consummation of such Acquisition Event, except to the extent exercised by the Participants between the Acceleration Time and the consummation of such Acquisition Event; (iii) in the event of an Acquisition Event under the terms of which holders of Common Stock will receive upon consummation thereof a cash payment for each share of Common Stock surrendered pursuant to such Acquisition Event (the "Acquisition Price"), provide that all outstanding Options shall terminate upon consummation of such Acquisition Event and each Participant shall receive, in exchange therefor, a cash payment equal to the amount (if any) by which (A) the Acquisition Price multiplied by the number of shares of Common Stock subject to such outstanding Options (whether or not then exercisable), exceeds (B) the aggregate exercise price of such Options; (iv) provide that all Restricted Stock Awards then outstanding shall become free of all restrictions prior to the consummation of the Acquisition Event; and (v) provide that any other stock-based Awards outstanding (A) shall become exercisable, realizable or vested in full, or shall be free of all conditions or restrictions, as applicable to each such Award, prior to the consummation of the Acquisition Event, or (B), if applicable, shall be assumed, or equivalent Awards shall be substituted, by the acquiring or succeeding corporation (or an affiliate thereof).

An "Acquisition Event" shall mean: (a) any merger or consolidation which results in the voting securities of the Company outstanding immediately prior thereto representing immediately thereafter (either by remaining outstanding or by being converted into voting securities of the surviving or acquiring entity) less than 50% of the combined voting power of the voting securities of the Company or such surviving or acquiring entity outstanding immediately after such merger or consolidation; (b) any sale of all or substantially all of the assets of the Company; or (c) the complete liquidation of the Company.

(2) ASSUMPTION OF OPTIONS UPON CERTAIN EVENTS. The Board may grant Awards under the Plan in substitution for stock and stock-based awards held by employees of another corporation who become employees of the Company as a result of a merger or consolidation of the employing corporation with the Company or the acquisition by the Company of property or stock of the employing corporation. The substitute Awards shall be granted on such terms and conditions as the Board considers appropriate in the circumstances.

(f) WITHHOLDING. Each Participant shall pay to the Company, or make provision satisfactory to the Board for payment of, any taxes required by law to be withheld in connection with Awards to such Participant no later than the date of the event creating the tax liability. The Board may allow Participants to satisfy such tax obligations in whole or in part in shares of Common Stock, including shares retained from the Award creating the tax obligation, valued at their Fair Market Value. The Company may, to the extent permitted by law, deduct any such tax obligations from any payment of any kind otherwise due to a Participant.

(g) AMENDMENT OF AWARD. The Board may amend, modify or terminate any outstanding Award, including but not limited to, substituting therefor another Award of the same or a different type, changing the date of exercise or realization, and converting an Incentive Stock Option to a Nonstatutory Stock Option, provided that the Participant's consent to such action shall be required unless the Board determines that the action, taking into account any related action, would not materially and adversely affect the Participant.

(h) CONDITIONS ON DELIVERY OF STOCK. The Company will not be obligated to deliver any shares of Common Stock pursuant to the Plan or to remove restrictions from shares previously delivered under the Plan until (i) all conditions of the Award have been met or removed to the satisfaction of the Company, (ii) in the opinion of the Company's counsel, all other legal matters in connection with the issuance and delivery of such shares have been satisfied, including any applicable securities laws and any applicable stock exchange or stock market rules and regulations, and (iii) the Participant has executed and delivered to the Company such representations or agreements as the Company may consider appropriate to satisfy the requirements of any applicable laws, rules or regulations.

(i) ACCELERATION. The Board may at any time provide that any Options shall become immediately exercisable in full or in part, that any Restricted Stock Awards shall be free of all restrictions or that any other stock-based Awards may become exercisable in full or in part or free of some or all restrictions or conditions, or otherwise realizable in full or in part, as the case may be.

## 9. MISCELLANEOUS

(a) NO RIGHT TO EMPLOYMENT OR OTHER STATUS. No person shall have any claim or right to be granted an Award, and the grant of an Award shall not be construed as giving a Participant the right to continued employment or any other relationship with the Company. The Company expressly reserves the right at any time to dismiss or otherwise terminate its relationship with a Participant free from any liability or claim under the Plan, except as expressly provided in the applicable Award.

(b) NO RIGHTS AS STOCKHOLDER. Subject to the provisions of the applicable Award, no Participant or Designated Beneficiary shall have any rights as a stockholder with respect to any shares of Common Stock to be distributed with respect to an Award until becoming the record holder of such shares.

(c) EFFECTIVE DATE AND TERM OF PLAN. The Plan shall become effective on the date on which it is adopted by the Board, but no Award granted to a Participant designated as subject to Section 162(m) by the Board shall become exercisable, vested or realizable, as applicable to such Award, unless and until the Plan has been approved by the Company's stockholders. No Awards shall be granted under the Plan after the completion of ten years from the earlier of (i) the date on which the Plan was adopted by the Board or (ii) the date the Plan was approved by the Company's stockholders, but Awards previously granted may extend beyond that date.

(d) AMENDMENT OF PLAN. The Board may amend, suspend or terminate the Plan or any portion thereof at any time, provided that no Award granted to a Participant designated as subject to Section 162(m) by the Board after the date of such amendment shall become exercisable, realizable or vested, as applicable to such Award (to the extent that such amendment to the Plan was required to grant such Award to a particular Participant), unless and until such amendment shall have been approved by the Company's stockholders.

(e) STOCKHOLDER APPROVAL. For purposes of this Plan, stockholder approval shall mean approval by a vote of the stockholders in accordance with the requirements of Section 162(m) of the Code.

(f) GOVERNING LAW. The provisions of the Plan and all Awards made hereunder shall be governed by and interpreted in accordance with the laws of The Commonwealth of Massachusetts, without regard to any applicable conflicts of law rules or provisions.

Adopted by the Board of Directors  
on November 30, 1995

Adopted by the Stockholders on  
May 17, 1996

Approved as Amended and Restated  
by the Board of Directors on  
December 31, 1997

Approved as Amended and Restated  
by the Stockholders on January 9,  
1998

## MKS INSTRUMENTS, INC.

## AMENDED AND RESTATED 1996 DIRECTOR STOCK OPTION PLAN

## 1. PURPOSE

The purpose of this Amended and Restated 1996 Director Stock Option Plan (the "Plan") of MKS Instruments, Inc., a Massachusetts corporation (the "Company"), is to encourage ownership in the Company by outside directors of the Company whose continued services are considered essential to the Company's future progress and to provide them with a further incentive to remain as directors of the Company.

## 2. ADMINISTRATION

The Board of Directors shall supervise and administer the Plan. Grants of stock options under the Plan and the amount and nature of the awards to be granted shall be automatic in accordance with Section 5. However, all questions of interpretation of the Plan or of any options issued under it shall be determined by the Board of Directors and such determination shall be final and binding upon all persons having an interest in the Plan.

## 3. PARTICIPATION IN THE PLAN

Directors of the Company who are not employees of the Company or any subsidiary of the Company shall be eligible to participate in the Plan.

## 4. STOCK SUBJECT TO THE PLAN

(a) The maximum number of shares which may be issued under the Plan shall be 20 shares of the Company's Class B Common Stock, no par value per share (the "Common Stock"). From and after the closing of the Company's initial public offering of Common Stock pursuant to an effective Registration Statement under the Securities Act of 1933, all references herein to "Common Stock" shall be deemed to be references to the Company's Common Stock, and all references to numbers of shares of Common Stock in the Plan and in outstanding options under the Plan shall be adjusted to reflect the rate at which outstanding shares of Class B Common Stock are exchanged for shares of Common Stock pursuant to the recapitalization effected in connection with such public offering.

(b) If any outstanding option under the Plan for any reason expires or is terminated without having been exercised in full, the shares allocable to the

unexercised portion of such option shall again become available for grant pursuant to the Plan.

(c) All options granted under the Plan shall be nonstatutory options not entitled to special tax treatment under Section 422 of the Internal Revenue Code of 1986, as amended to date and as it may be amended from time to time (the "Code").

#### 5. TERMS, CONDITIONS AND FORM OF OPTIONS

Each option granted under the Plan shall be evidenced by a written agreement in such form as the Board of Directors shall from time to time approve, which agreements shall comply with and be subject to the following terms and conditions:

##### (a) OPTION GRANT DATES.

Options will be granted in accordance with the following:

(i) CURRENT OUTSIDE DIRECTORS. An option for 2.1429 shares shall automatically be granted to each non-employee director of the Company on the date of the original adoption of the Plan by the Board of Directors (the "Adoption Date").

(ii) FUTURE OUTSIDE DIRECTORS. An option for 2.1429 shares shall automatically be granted to each non-employee director elected to the Board of Directors after the Adoption Date upon his initial election to the Board.

(ii) ANNUAL GRANTS. An option for 0.2857 shares shall automatically be granted on the date of each annual meeting of stockholders of the Company (commencing with the annual meeting to be held in 1997) to each non-employee director of the Company, PROVIDED that he was elected to serve as a director of the Company at least six months prior to the date of such meeting.

(b) OPTION EXERCISE PRICE. The option exercise price per share for each option granted under the Plan shall equal (i) the last reported sales price per share of the Company's Common Stock on the Nasdaq National Market (or, if the Common Stock is traded on a national securities exchange on the date of grant, the reported closing sales price per share of the Common Stock on such exchange) on the date of grant (or if no such price is reported on such date such price as reported on the nearest preceding day) or (ii) if the Common Stock is not traded on the Nasdaq National Market or a national securities exchange, the fair market value per share on the date of grant as determined by the Board of Directors on such date. If at any time, in the good faith judgment of the Board of Directors, the Board of Directors

determines that the fair market value of the shares of the Company's Common Stock is less than the exercise price of any options granted under the Plan, it may change the exercise price of such options to the fair market value of the Common Stock on the date of such determination; provided that, similar exercise price adjustments (or replacement options are issued) with respect to options issued pursuant to the Company's other option plans.

(c) OPTIONS NON-TRANSFERABLE. Each option granted under the Plan by its terms shall not be transferable by the optionee otherwise than by will, or by the laws of descent and distribution, and shall be exercised during the lifetime of the optionee only by him. No option or interest therein may be transferred, assigned, pledged or hypothecated by the optionee during his lifetime, whether by operation of law or otherwise, or be made subject to execution, attachment or similar process.

(d) EXERCISE PERIOD. Each option granted pursuant to paragraphs (a)(i) and (ii) of this Section 5 shall become exercisable in twelve (12) equal quarterly installments following the date of grant. Each option granted pursuant to paragraph (a)(iii) of this Section 5 shall become fully exercisable on the day prior to the first annual meeting of stockholders of the Company following the date of grant (or if no such meeting is held within thirteen (13) months after the date of grant, on the thirteen-month anniversary of the date of grant).

(e) TERMINATION. Upon termination of an optionee's service as a director of the Company, each option held by him may be exercised during the three month period following such termination of service, as to the exercisable portion of such option as of the date of termination, PROVIDED that (i) no option may be exercised more than ten (10) years after the date of grant, and (ii) in the event an optionee ceases to serve as a director due to his death or disability (within the meaning of Section 22(e)(3) of the Code or any successor provision), each option may be exercised, within the period of 180 days following the date the optionee ceases to serve as a director, by the optionee or by the person to whom the option is transferred by will, by the laws of descent and distribution, or by written notice, as to the portion of the option that is exercisable on the date of death or disability and as to the additional portion that would have become exercisable on the next anniversary date of the date of grant of such option.

(f) EXERCISE PROCEDURE. Options may be exercised only by written notice to the Company at its principal office accompanied by (i) payment in cash of the full consideration for the shares as to which they are exercised or (ii) an irrevocable undertaking, in form and substance satisfactory to the Company, by a broker to deliver promptly to the Company sufficient funds to pay the exercise price or delivery of irrevocable instructions, in form and substance satisfactory to the Company, to a broker to deliver promptly to the Company cash or a check sufficient to pay the exercise price.

(g) EXERCISE BY REPRESENTATIVE FOLLOWING DEATH OF DIRECTOR. An optionee, by written notice to the Company, may designate one or more persons (and from time to time change such designation), including his or her legal representative, who, by reason of the director's death, shall acquire the right to exercise all or a portion of the option. If the person or persons so designated wish to exercise any portion of the option, they must do so within the term of the option as provided herein. Any exercise by a representative shall be subject to the provisions of the Plan.

#### 6. ASSIGNMENTS

The rights and benefits of participants under the Plan may not be assigned, whether voluntarily or by operation of law, except as provided in Section 5(g).

#### 7. EFFECTIVE DATE

The Plan shall become effective immediately upon its adoption by the Board of Directors, but all grants of options shall be conditional upon the approval of the Plan by the stockholders of the Company within 12 months after adoption of the Plan by the Board of Directors.

#### 8. LIMITATION OF RIGHTS

(a) NO RIGHT TO CONTINUE AS A DIRECTOR. Neither the Plan, nor the granting of an option nor any other action taken pursuant to the Plan, shall constitute or be evidence of any agreement or understanding, express or implied, that the Company will retain the optionee as a director for any period of time.

(b) NO STOCKHOLDERS' RIGHTS FOR OPTIONS. An optionee shall have no rights as a stockholder with respect to the shares covered by his options until the date of the issuance to him of a stock certificate therefor, and no adjustment will be made for dividends or other rights (except as provided in Section 9) for which the record date is prior to the date such certificate is issued.

#### 9. CHANGES IN COMMON STOCK

(a) If the outstanding shares of Common Stock are increased, decreased or exchanged for a different number or kind of shares or other securities, or if additional shares or new or different shares or other securities are distributed with respect to such shares of Common Stock or other securities, through merger, consolidation, sale of all or substantially all of the assets of the Company, reorganization, recapitalization, reclassification, stock dividend, stock split, reverse stock split or other distribution with respect to such shares of Common Stock, or

other securities, an appropriate and proportionate adjustment will be made in (i) the maximum number and kind of shares reserved for issuance under the Plan, (ii) the number and kind of shares or other securities subject to then outstanding options under the Plan and (iii) the price for each share subject to any then outstanding options under the Plan, without changing the aggregate purchase price as to which such options remain exercisable. No fractional shares will be issued under the Plan on account of any such adjustments.

(b) In the event of (i) a consolidation, merger or other reorganization in which all of the outstanding shares of Common Stock are exchanged for securities, cash or other property of any other corporation or business entity or (ii) any sale of all or substantially all of the Company's assets (in either event, an "Acquisition"), all options outstanding under the Plan immediately prior to the effective date of such Acquisition shall become automatically exercisable in full upon the effective date of such Acquisition.

#### 10. AMENDMENT OF THE PLAN

The Board of Directors may suspend or discontinue the Plan or revise or amend it in any respect whatsoever; provided, however, that without approval of the stockholders of the Company no revision or amendment shall change the number of shares subject to the Plan (except as provided in Section 9).

#### 11. NOTICE

Any written notice to the Company required by any of the provisions of the Plan shall be addressed to the Treasurer of the Company and shall become effective when it is received.

#### 12. GOVERNING LAW

The Plan and all determinations made and actions taken pursuant hereto shall be governed by the laws of The Commonwealth of Massachusetts.

Adopted by the Board of Directors  
and Stockholders on May 17, 1996

Approved as Amended and Restated by the  
Board of Directors on December 31, 1997

Approved as Amended and Restated by the  
Stockholders on January 9, 1998

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1. Share amounts set forth herein do not reflect the 2,110-for-1 stock split approved by the Board of Directors of the Company on December 31, 1997 (the "Split"), therefore, amounts reflected herein should be appropriately adjusted in accordance with Section 9 to reflect the Split.

## MKS INSTRUMENTS, INC.

## 1997 DIRECTOR STOCK OPTION PLAN

## 1. PURPOSE

The purpose of this 1997 Director Stock Option Plan (the "Plan") of MKS Instruments, Inc., a Massachusetts corporation (the "Company"), is to encourage ownership in the Company by non-employee directors of the Company whose continued services are considered essential to the Company's future progress and to provide them with a further incentive to remain as directors of the Company.

## 2. ADMINISTRATION

The Board of Directors shall supervise and administer the Plan. Grants of stock options under the Plan and the amount and nature of the awards to be granted shall be automatic in accordance with Section 5. However, all questions of interpretation of the Plan or of any options issued under it shall be determined by the Board of Directors and such determination shall be final and binding upon all persons having an interest in the Plan.

## 3. PARTICIPATION IN THE PLAN

Directors of the Company who are not employees of the Company or any subsidiary of the Company shall be eligible to participate in the Plan.

## 4. STOCK SUBJECT TO THE PLAN

(a) DEFINITION OF COMMON STOCK. "Common Stock" means (i) prior to the closing of the Company's initial public offering of common stock pursuant to an effective registration statement under the Securities Act of 1933 ("IPO"), the Class B Common Stock, no par value per share, of the Company, and (ii) from and after the closing of the IPO, the Common Stock, no par value per share, of the Company.

(b) The maximum number of shares of the Company's Common Stock which may be issued under the Plan shall be 200,000 shares, subject to adjustment as provided in Section 7. All share amounts set forth in this Plan reflect the 2,110-for-1 stock split approved by the Board of Directors of the Company on December 31, 1997 (the "1997 Stock Split").

(c) If any outstanding option under the Plan for any reason expires or is terminated without having been exercised in full, the shares allocable to the unexercised portion of such option shall again become available for grant pursuant to the Plan.

(d) All options granted under the Plan shall be nonstatutory options not entitled to special tax treatment under Section 422 of the Internal Revenue Code of 1986, as amended to date and as it may be amended from time to time (the "Code").

#### 5. TERMS, CONDITIONS AND FORM OF OPTIONS

Each option granted under the Plan shall be evidenced by a written agreement in such form as the Board of Directors shall from time to time approve, which agreements shall comply with and be subject to the following terms and conditions:

(a) **OPTION GRANT DATES.** Options shall automatically be granted to all eligible outside directors as follows:

(i) each person who is an eligible outside director on the date upon which the Company enters into an underwriting agreement for its first underwritten public offering of Common Stock (the "Public Offering Price") pursuant to an effective registration statement under the Securities Act of 1933, as amended, (the "Pricing Date"), shall be granted an option to purchase 7,000 shares of Common Stock at an exercise price equal to the Public Offering Price;

(ii) each person who first becomes an eligible outside director after the Pricing Date shall be granted an option to purchase 7,500 shares of Common Stock on the date of his or her initial election to the Board of Directors; and

(iii) each eligible outside director then in office on the date of each annual meeting of stockholders of the Company shall be granted an additional option to purchase 4,000 shares of Common Stock on the date of each such annual meeting of stockholders, PROVIDED that he was elected to serve as a director of the Company at least six months prior to the date of such meeting.

(b) **OPTION EXERCISE PRICE.** The option exercise price per share for each option granted under the Plan shall equal (i) the last reported sales price per share of the Company's Common Stock on the Nasdaq National Market (or, if the Common Stock is traded on a national securities exchange on the date of grant, the reported closing sales price per share of the Common Stock on such exchange) on the date of grant (or if no such price is reported on such date such price as reported on the nearest preceding day), (ii) if the Common Stock is not traded on the Nasdaq

National Market or a national securities exchange, the fair market value per share on the date of grant as determined by the Board of Directors or (iii) the average of the closing bid and asked prices in the over-the-counter market.

(c) TRANSFERABILITY OF OPTIONS. Except as the Board of Directors of the Company may otherwise determine or provide in a written agreement entered into in connection with the grant of an option under the Plan, options shall not be sold, assigned, transferred, pledged or otherwise encumbered by the Optionee, either voluntarily or by operation of law except by will or the laws of descent and distribution, and during the life of the optionee and shall be exercisable only by him. Reference to an optionee, to the extent relevant in the context, shall include references to authorized transferees.

(d) EXERCISE PERIOD. Except as the Board may otherwise determine or provide in a written agreement entered into in connection with the grant of an option under the Plan, each option granted pursuant to paragraphs (a)(i) and (ii) of this Section 5 shall become exercisable in twelve (12) equal quarterly installments following the date of grant. Each option granted pursuant to paragraph (a)(iii) of this Section 5 shall become fully exercisable on the day prior to the first annual meeting of stockholders of the Company following the date of grant (or if no such meeting is held within thirteen (13) months after the date of grant, on the thirteen-month anniversary of the date of grant).

(e) TERMINATION. Upon termination of an optionee's service as a director of the Company, each option held by him may be exercised during the three month period following such termination of service, as to the exercisable portion of such option as of the date of termination, PROVIDED that (i) no option may be exercised more than ten (10) years after the date of grant and (ii) in the event an optionee ceases to serve as a director due to his death or disability (within the meaning of Section 22(e)(3) of the Code or any successor provision), each option may be exercised, within the period of 180 days following the date the optionee ceases to serve as a director, by the optionee or by the person to whom the option is transferred by will, by the laws of descent and distribution, or by written notice, as to the portion of the option that is exercisable on the date of death or disability and as to the additional portion that would have become exercisable on the next anniversary date of the date of grant of such option.

(f) EXERCISE PROCEDURE. Options may be exercised only by written notice to the Company at its principal office accompanied by (i) payment in cash of the full consideration for the shares as to which they are exercised or (ii) an irrevocable undertaking, in form and substance satisfactory to the Company, by a broker to deliver promptly to the Company sufficient funds to pay the exercise price or delivery of irrevocable instructions, in form and substance satisfactory to the

Company, to a broker to deliver promptly to the Company cash or a check sufficient to pay the exercise price.

(g) EXERCISE BY REPRESENTATIVE FOLLOWING DEATH OF DIRECTOR. An optionee, by written notice to the Company, may designate one or more persons (and from time to time change such designation), including his or her legal representative, who, by reason of the director's death, shall acquire the right to exercise all or a portion of the option. If the person or persons so designated wish to exercise any portion of the option, they must do so within the term of the option as provided herein. Any exercise by a representative shall be subject to the provisions of the Plan.

6. LIMITATION OF RIGHTS

(a) NO RIGHT TO CONTINUE AS A DIRECTOR. Neither the Plan, nor the granting of an option nor any other action taken pursuant to the Plan, shall constitute or be evidence of any agreement or understanding, express or implied, that the Company will retain the optionee as a director for any period of time.

(b) NO STOCKHOLDERS' RIGHTS FOR OPTIONS. An optionee shall have no rights as a stockholder with respect to the shares covered by his options until the date of the issuance to him of a stock certificate therefor, and no adjustment will be made for dividends or other rights (except as provided in Section 7) for which the record date is prior to the date such certificate is issued.

7. CHANGES IN COMMON STOCK

(a) If, at any time after the 1997 Stock Split, the outstanding shares of Common Stock are increased, decreased or exchanged for a different number or kind of shares or other securities, or if additional shares or new or different shares or other securities are distributed with respect to such shares of Common Stock or other securities, through merger, consolidation, sale of all or substantially all of the assets of the Company, reorganization, recapitalization, reclassification, stock dividend, stock split, reverse stock split or other distribution with respect to such shares of Common Stock, or other securities, an appropriate and proportionate adjustment will be made in (i) the maximum number and kind of shares reserved for issuance under the Plan, (ii) the number and kind of shares or other securities subject to then outstanding options under the Plan and (iii) the price for each share subject to any then outstanding options under the Plan, without changing the aggregate purchase price as to which such options remain exercisable. No fractional shares will be issued under the Plan on account of any such adjustments.

(b) In the event of (i) a consolidation, merger or other reorganization in which all of the outstanding shares of Common Stock are exchanged for securities, cash or other property of any other corporation or business entity or (ii) any sale of all or substantially all of the Company's assets (in either event, an "Acquisition"), all options outstanding under the Plan immediately prior to the effective date of such Acquisition shall become automatically exercisable in full upon the effective date of such Acquisition.

8. AMENDMENT OF THE PLAN

The Board of Directors may suspend or discontinue the Plan or revise or amend it in any respect whatsoever; provided, however, that without approval of the stockholders of the Company no revision or amendment shall change the number of shares subject to the Plan (except as provided in Section 7).

9. NOTICE

Any written notice to the Company required by any of the provisions of the Plan shall be addressed to the Chief Financial Officer of the Company and shall become effective when it is received.

10. GOVERNING LAW

The Plan and all determinations made and actions taken pursuant hereto shall be governed by the laws of The Commonwealth of Massachusetts.

Adopted by the Board of Directors  
on December 31, 1997

Approved by the Stockholders  
on January 9, 1998

## MKS INSTRUMENTS, INC.

## 1997 EMPLOYEE STOCK PURCHASE PLAN

The purpose of this Plan is to provide eligible employees of MKS Instruments, Inc. (the "Company") and certain of its subsidiaries with opportunities to purchase shares of the Company's Common Stock, no par value per share (the "Common Stock"), commencing on June 1, 1998; provided, that at such time the Company's Common Stock shall be listed for trading on the Nasdaq National Market or a national securities exchange. Three hundred thousand (300,000) shares of Common Stock in the aggregate have been approved for this purpose. All share amounts set forth in this Plan reflect the 2,110-for-1 stock split approved by the Board of Directors of the Company on December 31, 1997 (the "1997 Stock Split").

1. ADMINISTRATION. The Plan will be administered by the Company's Board of Directors (the "Board") or by a Committee appointed by the Board (the "Committee"). The Board or the Committee has authority to make rules and regulations for the administration of the Plan and its interpretation and decisions with regard thereto shall be final and conclusive.

2. ELIGIBILITY. Participation in the Plan will neither be permitted nor denied contrary to the requirements of Section 423 of the Internal Revenue Code of 1986, as amended (the "Code"), and regulations promulgated thereunder. All employees of the Company, including Directors who are employees, and all employees of any subsidiary of the Company (as defined in Section 424(f) of the Code) designated by the Board or the Committee from time to time (a "Designated Subsidiary"), are eligible to participate in any one or more of the offerings of Options (as defined in Section 9) to purchase Common Stock under the Plan provided that:

(a) they are customarily employed by the Company or a Designated Subsidiary for more than 20 hours a week and for more than six months in a calendar year; and

(b) they have been employed by the Company or a Designated Subsidiary for at least six months prior to enrolling in the Plan; and

(c) they are employees of the Company or a Designated Subsidiary on the first day of the applicable Plan Period (as defined below).

No employee may be granted an option hereunder if such employee, immediately after the option is granted, owns 5% or more of the total combined voting power or value of the stock of the Company or any subsidiary. For purposes of the preceding sentence, the attribution rules of Section 424(d) of the Code shall apply in determining the stock ownership of an employee, and all stock which the employee has a contractual right to purchase shall be treated as stock owned by the employee.

3. OFFERINGS. The Company will make one or more offerings ("Offerings") to employees to purchase stock under this Plan. Offerings will begin each June 1 and December 1, or the first business day thereafter (the "Offering Commencement Dates"). Each Offering Commencement Date will begin a six (6) month period (a "Plan Period") during which payroll deductions will be made and held for the purchase of Common Stock at the end of the Plan Period. The Board or the Committee may, at its discretion, choose a different Plan Period of twelve (12) months or less for subsequent Offerings.

4. PARTICIPATION. An employee eligible on the Offering Commencement Date of any Offering may participate in such Offering by completing and forwarding a payroll deduction authorization form to the employee's appropriate payroll office at least 30 days prior to the applicable Offering Commencement Date. The form will authorize a regular payroll deduction from the Compensation, as defined below, received by the employee during the Plan Period. Unless an employee files a new form or withdraws from the Plan, his deductions and purchases will continue at the same rate for future Offerings under the Plan as long as the Plan remains in effect. The term "Compensation" means the amount of money reportable on the employee's Federal Income Tax Withholding Statement, including overtime, shift premium, incentives, bonus awards and commissions, and excluding reimbursements for expenses such as relocation allowances for travel expenses, income or gains on the exercise of Company stock options or stock appreciation rights, and similar items, whether or not shown on the employee's Federal Income Tax Withholding Statement, but including, in the case of salespersons, sales commissions to the extent determined by the Board or the Committee.

5. DEDUCTIONS. The Company will maintain payroll deduction accounts for all participating employees. With respect to any Offering made under this Plan, an employee may authorize a payroll deduction in any whole percent amount up to a maximum of 10% (or such lower percentage as may be established by the Board or the Committee) of the Compensation he or she receives during the Plan Period or such shorter period during which deductions from payroll are made. The minimum payroll deduction is such percentage of compensation as may be established from time to time by the Board or the Committee.

No employee may be granted an Option (as defined in Section 9) which permits his rights to purchase Common Stock under this Plan and any other employee stock purchase plan (as defined in Section 423(b) of the Code) of the Company and its subsidiaries, to accrue at a rate which exceeds \$25,000 of the fair market value of such Common Stock (determined at the Offering Commencement Date of the Plan Period) for each calendar year in which the Option is outstanding at any time.

6. DEDUCTION CHANGES. An employee may decrease, subject to section 5 hereof or discontinue his payroll deduction once during any Plan Period, by filing a new payroll deduction authorization form. However, an employee may not elect to increase his payroll deduction during a Plan Period. If an employee elects to discontinue his payroll deductions during a Plan Period, but does not elect to withdraw his funds pursuant to Section 8 hereof, funds deducted prior to his election to discontinue will be applied to the purchase of Common Stock on the Exercise Date (as defined below).

7. INTEREST. Interest will not be paid on employee accounts.

8. WITHDRAWAL OF FUNDS. An employee may at any time prior to the close of business on the last business day in a Plan Period and for any reason permanently draw out the balance accumulated in the employee's account and thereby withdraw from participation in an Offering. Partial withdrawals are not permitted. The employee may not begin participation again during the remainder of the Plan Period. The employee may participate in any subsequent Offering in accordance with terms and conditions established by the Board or the Committee.

9. PURCHASE OF SHARES. On the Offering Commencement Date of each Plan Period, the Company will grant to each eligible employee who is then a participant in the Plan an option ("Option") to purchase on the last business day of such Plan Period (the "Exercise Date"), at the Option Price hereinafter provided for, the largest number of whole shares of Common Stock of the Company as does not exceed the number of shares determined by dividing \$12,500 by the closing price (as defined below) on the Offering Commencement Date of such Plan Period.

The purchase price for each share purchased will be 85% of the closing price of the Common Stock on (i) the first business day of such Plan Period or (ii) the Exercise Date, whichever closing price shall be less. Such closing price shall be (a) the closing price on any national securities exchange on which the Common Stock is listed, (b) the closing price of the Common Stock on the Nasdaq National Market or (c) the average of the closing bid and asked prices in the over-the-counter-market, whichever is applicable, as published in THE WALL STREET JOURNAL. If no sales of Common Stock were made on such a day, the price of the Common Stock for

purposes of clauses (a) and (b) above shall be the reported price for the next preceding day on which sales were made.

Each employee who continues to be a participant in the Plan on the Exercise Date shall be deemed to have exercised his Option at the Option Price on such date and shall be deemed to have purchased from the Company the number of full shares of Common Stock reserved for the purpose of the Plan that his accumulated payroll deductions on such date will pay for, but not in excess of the maximum number determined in the manner set forth above.

Any balance remaining in an employee's payroll deduction account at the end of a Plan Period will be automatically refunded to the employee, except that any balance which is less than the purchase price of one share of Common Stock will be carried forward into the employee's payroll deduction account for the following Offering, unless the employee elects not to participate in the following Offering under the Plan, in which case the balance in the employee's account shall be refunded

10. ISSUANCE OF CERTIFICATES. Certificates representing shares of Common Stock purchased under the Plan may be issued only in the name of the employee, in the name of the employee and another person of legal age as joint tenants with rights of survivorship, or (in the Company's sole discretion) in the name of a brokerage firm, bank or other nominee holder designated by the employee. The Company may, in its sole discretion and in compliance with applicable laws, authorize the use of book entry registration of shares in lieu of issuing stock certificates.

11. RIGHTS ON RETIREMENT, DEATH OR TERMINATION OF EMPLOYMENT. In the event of a participating employee's termination of employment prior to the last business day of a Plan Period, no payroll deduction shall be taken from any pay due and owing to an employee and the balance in the employee's account shall be paid to the employee or, in the event of the employee's death, (a) to a beneficiary previously designated in a revocable notice signed by the employee (with any spousal consent required under state law) or (b) in the absence of such a designated beneficiary, to the executor or administrator of the employee's estate or (c) if no such executor or administrator has been appointed to the knowledge of the Company, to such other person(s) as the Company may, in its discretion, designate. If, prior to the last business day of the Plan Period, the Designated Subsidiary by which an employee is employed shall cease to be a subsidiary of the Company, or if the employee is transferred to a subsidiary of the Company that is not a Designated Subsidiary, the employee shall be deemed to have terminated employment for the purposes of this Plan.

12. OPTIONEES NOT STOCKHOLDERS. Neither the granting of an Option to an employee nor the deductions from his pay shall constitute such employee a

stockholder of the shares of Common Stock covered by an Option under this Plan until such shares have been purchased by and issued to him.

13. RIGHTS NOT TRANSFERABLE. Rights under this Plan are not transferable by a participating employee other than by will or the laws of descent and distribution, and are exercisable during the employee's lifetime only by the employee.

14. Application of Funds. All funds received or held by the Company under this Plan may be combined with other corporate funds and may be used for any corporate purpose.

15. ADJUSTMENT IN CASE OF CHANGES AFFECTING COMMON STOCK. In the event, at any time after the 1997 Stock Split, of a subdivision of outstanding shares of Common Stock, or the payment of a dividend in Common Stock, the number of shares approved for this Plan, and the share limitation set forth in Section 9, shall be increased proportionately, and such other adjustment shall be made as may be deemed equitable by the Board or the Committee. In the event of any other change affecting the Common Stock, such adjustment shall be made as may be deemed equitable by the Board or the Committee to give proper effect to such event.

16. MERGER. If the Company shall at any time merge or consolidate with another corporation and the holders of the capital stock of the Company immediately prior to such merger or consolidation continue to hold at least 80% by voting power of the capital stock of the surviving corporation ("Continuity of Control"), the holder of each Option then outstanding will thereafter be entitled to receive at the next Exercise Date upon the exercise of such Option for each share as to which such Option shall be exercised the securities or property which a holder of one share of the Common Stock was entitled to upon and at the time of such merger or consolidation, and the Board or the Committee shall take such steps in connection with such merger or consolidation as the Board or the Committee shall deem necessary to assure that the provisions of Section 15 shall thereafter be applicable, as nearly as reasonably may be, in relation to the said securities or property as to which such holder of such Option might thereafter be entitled to receive thereunder.

In the event of a merger or consolidation of the Company with or into another corporation which does not involve Continuity of Control, or of a sale of all or substantially all of the assets of the Company while unexercised Options remain outstanding under the Plan, (a) subject to the provisions of clauses (b) and (c), after the effective date of such transaction, each holder of an outstanding Option shall be entitled, upon exercise of such Option, to receive in lieu of shares of Common Stock, shares of such stock or other securities as the holders of shares of Common Stock received pursuant to the terms of such transaction; or (b) all outstanding Options may be cancelled by the Board or the Committee as of a date prior to the effective date of any such transaction and all payroll deductions shall be paid out to the

participating employees; or (c) all outstanding Options may be cancelled by the Board or the Committee as of the effective date of any such transaction, provided that notice of such cancellation shall be given to each holder of an Option, and each holder of an Option shall have the right to exercise such Option in full based on payroll deductions then credited to his account as of a date determined by the Board or the Committee, which date shall not be less than ten (10) days preceding the effective date of such transaction.

17. AMENDMENT OF THE PLAN. The Board may at any time, and from time to time, amend this Plan in any respect, except that (a) if the approval of any such amendment by the shareholders of the Company is required by Section 423 of the Code, such amendment shall not be effected without such approval, and (b) in no event may any amendment be made which would cause the Plan to fail to comply with Section 423 of the Code.

18. INSUFFICIENT SHARES. In the event that the total number of shares of Common Stock specified in elections to be purchased under any Offering plus the number of shares purchased under previous Offerings under this Plan exceeds the maximum number of shares issuable under this Plan, the Board or the Committee will allot the shares then available on a pro rata basis.

19. TERMINATION OF THE PLAN. This Plan may be terminated at any time by the Board. Upon termination of this Plan all amounts in the accounts of participating employees shall be promptly refunded.

20. GOVERNMENTAL REGULATIONS. The Company's obligation to sell and deliver Common Stock under this Plan is subject to listing on a national stock exchange or quotation on the Nasdaq National Market and the approval of all governmental authorities required in connection with the authorization, issuance or sale of such stock.

21. GOVERNING LAW. The Plan shall be governed by Massachusetts law except to the extent that such law is preempted by federal law.

22. ISSUANCE OF SHARES. Shares may be issued upon exercise of an Option from authorized but unissued Common Stock, from shares held in the treasury of the Company, or from any other proper source.

23. NOTIFICATION UPON SALE OF SHARES. Each employee agrees, by entering the Plan, to promptly give the Company notice of any disposition of shares purchased under the Plan where such disposition occurs within two years after the date of grant of the Option pursuant to which such shares were purchased.

24. EFFECTIVE DATE AND APPROVAL OF SHAREHOLDERS. The Plan shall take effect on June 1, 1998 if at such time the Common Stock is listed for trading on the Nasdaq National Market or a national securities exchange.

Adopted by the Board of Directors  
on December 31, 1997  
Approved by the Stockholders  
on January 9, 1998

TAX INDEMNIFICATION AND S CORPORATION DISTRIBUTION  
AGREEMENT

This TAX INDEMNIFICATION AND S CORPORATION DISTRIBUTION AGREEMENT (the "Agreement") is entered into as of February \_\_, 1998 between MKS INSTRUMENTS, INC., a Massachusetts corporation (the "Company"), and the persons listed on Schedule A attached hereto (individually a "Stockholder" and collectively the "Stockholders"). Capitalized terms not otherwise defined have the meanings ascribed to them in Section 1.1.

WHEREAS, the Company and the Stockholders have entered into this Agreement as a condition to the Public Offering;

WHEREAS, the Company has been an "S corporation" (as defined in Section 1361(a)(1) of the Code) for federal tax purposes since July 1, 1987;

WHEREAS, the Company and the Stockholders understand that the Company's S corporation status will terminate upon the date of the Public Offering (the "Termination Date"), and, as a result, the Company will be a "C corporation" (as defined in Section 1361(a)(2) of the Code) beginning on the Termination Date;

WHEREAS, the Company will declare the AAA Dividend which will be payable on the Closing Date;

WHEREAS, the Company and the Stockholders wish to provide for certain tax related payments in connection with the Company's status as an S corporation and for the adjustment of the amount of the AAA Dividend in certain events;

WHEREAS, the Company and the Stockholders wish to terminate this Agreement such that it has no effect should the Public Offering not occur;

NOW, THEREFORE, the parties agree as follows:

ARTICLE I

DEFINITIONS

1.1 DEFINITIONS. The following terms, as used herein, have the following meanings:

"AA Account" means the Company's "accumulated adjustments account," as defined in Section 1368(e)(1) of the Code, as of the close of business on the day before the Termination Date.

"AAA Dividend" means the dividend to be declared by the Company prior to the Closing Date which shall be payable to the stockholders of record on the day immediately prior to the Closing Date in an amount equal to [\$ ].

"AAA Settlement Date" means the later of (i) March 15, 1999 or (ii) the last day of the "post-termination transition period," as defined in Section 1377(b) of the Code, of the Company.

"Adjustment Amount" means the net increase in taxable income of one or more of the Stockholders or the Company based on a Final Determination and which gives rise to a payment pursuant to Section 3.3 or Section 3.4 hereof.

"Affected Stockholder" means a Stockholder whose tax returns are adjusted in a manner which gives rise to an obligation of the Company pursuant to Section 3.3 hereof.

"Blended Rate" means a percentage which equals the sum of the maximum marginal federal and state individual income tax rates for an individual residing in Massachusetts (after giving effect to the full deductibility of state income taxes for federal income tax purposes) in effect for the year of the adjustment to a tax return of the Company or such Stockholder that gives rise to a correlative adjustment to a tax return of such Stockholder or the Company, respectively. For example, if an adjustment that results in an amount due from the Stockholders hereunder, the year of the Company's return that was adjusted shall determine the Blended Rate to be used in computing the amount due.

"Closing Date" means the date on which the Public Offering closes.

"Code" means the Internal Revenue Code of 1986, as amended.

"C Short Year" means that portion of the S Termination Year of the Company beginning on the Termination Date and ending on the last day of the S Termination Year.

"C Taxable Year" means any taxable year (or portion thereof) of the Company, including the C Short Year, during which it is subject to taxation as a C corporation as defined in Section 1361(a)(2) of the Code.

"Final Determination" means the first to occur of

(i) the expiration of 30 days after IRS acceptance of a Waiver of Restrictions on Assessment and Collection of Deficiency of Tax and Acceptance of Overassessment on IRS Form 870 or 870-AD;

(ii) a decision, judgment, decree, or other order by a court of competent jurisdiction that is not subject to further judicial review and has become final;

(iii) the execution of a closing agreement under Section 7121 of the Code or the acceptance by the IRS of an offer in compromise under Section 7122 of the Code, or comparable agreements under the laws of other jurisdictions;

(iv) the expiration of the time for filing a claim for refund or for instituting suit in respect for a claim for refund disallowed in whole or in part by the IRS or other relevant tax authority;

(v) any other final disposition of the tax liability for such period by reason of the expiration of the applicable statute of limitations; or

(vi) any other event that the parties agree is final and irrevocable determination of the liability at issue.

"Public Offering" means the public offering of the Company's Common Stock pursuant to the Registration Statement on Form S-1 originally filed by the Company with the Securities and Exchange Commission on November 14, 1997.

"Record Date" means the day immediately preceding the Closing Date.

"S Short Year" means that portion of the S Termination Year beginning on the first day of such taxable year and ending on the day immediately preceding the Termination Date.

"S Taxable Year" means any taxable year (or portion thereof) of the Company, including the S Short Year, during which it is subject to taxation as an S corporation as defined in Section 1361(a)(1) of the Code.

"S Termination Year" shall mean the fiscal year of the Company that includes the Termination Date.

"Taxing Authority" means the United States Internal Revenue Service and any comparable state or foreign taxing authority.

"Termination Date" means the date on which the S corporation status of the Company will terminate pursuant to Section 1362(d) of the Code, which is expected to be the Closing Date.

## ARTICLE II

TERMINATION OF S CORPORATION STATUS, ALLOCATION OF INCOME,  
DECLARATION OF AAA DIVIDEND AND ADJUSTMENT OF AAA DIVIDEND

2.1 TERMINATION OF S CORPORATION STATUS. The Company and the Stockholders understand that the Company's S corporation status will terminate upon the consummation of the Public Offering.

2.2 PRO RATA ALLOCATION OF TAX ITEMS. The Company shall be required to allocate the tax items described in Section 1362(e)(2)(A) of the Code between the S Short Year and the C Short Year pursuant to the pro rata allocation rules set forth in Section 1362(e)(2)(B) of the Code.

2.3 DECLARATION OF AAA DIVIDEND. Prior to the Closing Date, the Company declared that the AAA Dividend would be payable on the Closing Date, subject to the closing of the Public Offering, to the stockholders of record on the Record Date.

## 2.4 ADJUSTMENT TO AAA DIVIDEND.

(a) The parties acknowledge that the amount of the AAA Dividend will be based on good faith determinations by the Company of the amount of AA Account as of the Closing Date.

(b) The parties agree that if the Company determines after the Termination Date and on or before the AAA Settlement Date that the amount of the AA Account as of the Termination Date does not equal the amount of the AAA Dividend, then:

(i) if the amount of the AAA Dividend exceeds the amount of AA Account as of the Termination Date, the Stockholders who received the AAA Dividend shall immediately thereafter remit to the Company their pro-rata share of such excess; and

(ii) if the amount of the AA Account as of Termination Date exceeds the amount of the AAA Dividend, the Company shall immediately thereafter distribute to the Stockholders their pro-rata shares of such excess.

(c) The Company shall notify the Stockholders no later than five (5) days prior to the AAA Settlement Date in the event the Stockholders are required to remit any amount to the Company pursuant to this Section 2.4. Payments pursuant to this Section 2.4 shall be made no later than thirty (30) days following the AAA Settlement Date.

(d) No payment shall be due, and no party shall have a claim against the other party, under this Agreement if the relevant determination of the amount of the AA Account occurs after the applicable AAA Settlement Date.

(e) Any payment due under this section shall be increased by interest on the amount of such payment computed from the date of the payment of the AAA Dividend until the date of payment pursuant to this section. The interest rate shall be the Prime Rate of BankBoston as of the AAA Settlement Date.

### ARTICLE III

#### TAX PAYMENTS AND INDEMNIFICATION OBLIGATIONS

3.1 **LIABILITY FOR TAXES INCURRED DURING S SHORT YEAR.** Each Stockholder covenants and agrees that: (i) the Stockholder will duly include, in his own federal and state income tax returns, all items of income, gain, loss, deduction, or credit attributable to the S Short Year in a manner consistent with the Form 1120S and the schedules thereto (and the corresponding state income tax forms and schedules) to be filed by the Company with respect to such period; (ii) such returns shall be filed no later than the due date (including extensions, if any) for filing such returns; and (iii) each Stockholder shall pay any and all taxes required to be paid for its taxable year that includes the S Short Year.

3.2 **LIABILITY FOR TAXES INCURRED DURING S SHORT YEAR AND C SHORT YEAR.** The Company covenants and agrees that: (i) the Company shall be responsible for and shall effect the filing of all federal and state income tax returns for the Company with respect to the S Short year and the C Short Year; (ii) such Company returns shall be accurately prepared and timely filed; and (iii) the Company shall pay any and all taxes required to be paid by the Company for the periods covered by such returns as required by applicable law.

3.3 **COMPANY'S INDEMNIFICATION OF STOCKHOLDERS FOR TAX LIABILITIES.** In the event of an adjustment to one or more tax returns of the Company for an S Taxable Year based on a Final Determination which results in a net increase in taxable income of a Stockholder and a corresponding adjustment to one or more tax returns of the Company for a C Taxable year based on a Final Determination which results in a net decrease in taxable income of the Company, the Company shall pay to any Affected Stockholder an amount equal to the Adjustment Amount multiplied by the Blended Rate. In addition, provided the Affected Stockholder originally reported its distributive share of income and other items of the Company from an S Taxable Year consistently with the Schedule K-1 provided to him by the Company, the Company shall pay to the Affected Stockholder any penalties or interest actually paid by the

Affected Stockholder as a result of the adjustment to such items giving rise to the Company's liability hereunder. The Company shall pay the amount due to the Affected Stockholder within thirty (30) business days after the receipt of notice from the Affected Stockholder that a payment is due by such party to the appropriate Taxing Authority.

The Company acknowledges that it shall be solely responsible for any federal, state, and local taxes (including interest and penalties) relating to built in gains tax imposed by Section 1374 of the Code and any tax on excess passive income imposed by Section 1375 of the Code.

#### 3.4 STOCKHOLDERS INDEMNIFICATION OF COMPANY FOR TAX LIABILITIES.

(a) ADJUSTMENTS TO COMPANY'S TAXABLE INCOME. In the event of an adjustment of one or more tax returns of the Company for a C Taxable Year based on a Final Determination which results in a net increase in taxable income of the Company for a C Taxable Year and a corresponding adjustment to one or more tax returns of the Company for an S Taxable Year based on a Final Determination which results in a net decrease in taxable income of the Company for the S Taxable Year, the Stockholders, severally (according to the percentage of the outstanding shares of the Company's stock owned by each Stockholder for the years of adjustment) and not jointly, agree to contribute to the capital of the Company an amount equal to the Adjustment Amount multiplied by the Blended Rate. In addition, the Stockholders shall contribute to the capital of the Company an amount equal to any penalties and interest to be paid by the Company to any Taxing Authority as a result of such determination.

(b) ADJUSTMENTS ATTRIBUTABLE TO COMPANY'S S STATUS. If, based on a Final Determination, the Company is deemed to have been a C corporation for federal, state or local income tax purposes during any period in which it reported (or intends to report) its taxable income as an S corporation, the Stockholders agree to contribute to the capital of the Company, subject to the limitations contained in the last sentence of this Section 3.4(b) and in Section 3.4(c), an amount equal to the Adjustment Amount with respect to such year multiplied by the Blended Rate. Each Stockholder's obligation under this Section 3.4(b) shall be several and not joint and shall be limited to that percentage of the tax and interest due and payable by the Company equal to the fraction, expressed as a percentage, the numerator of which is the total distributions to such Stockholder made by the Company from July 1, 1987 through and including the Termination Date, plus the AAA Dividend and any adjustment thereto pursuant to this Agreement, and the denominator of which is the total distributions made by the Company to all Stockholders from July 1, 1987 through and including the Termination Date, plus the AAA Dividend and any adjustment thereto pursuant to this Agreement.

(c) LIMIT ON INDEMNIFICATION AMOUNT. Any payment by any Affected Stockholder to the Company pursuant to this Section 3.4 shall not exceed the lesser of (A) the amount of the refund from any Taxing Authority attributable to the reduction in such Affected Stockholder's tax liability attributable to adjustments established pursuant to the Final Determination and (B) the amount of the total distributions to such Stockholder as determined under Section 3.4(b). For purposes of this Section 3.4(c), the amount of the refund shall include refunds or abatements of taxes, interest on such refunds or abatements, and any other amount actually received by the Affected Stockholder from the Taxing Authority with respect to such determination.

(d) TIME OF INDEMNIFICATION PAYMENT. The Stockholders shall contribute to the capital of the Company amounts set forth in this Section 3.4 within thirty (30) business days after the later of (a) the receipt of the refund from the Taxing Authority attributable to such adjustment or (b) notice from the Company that a payment is due by the Company to the appropriate Taxing Authority.

### 3.5 CONTESTS/COOPERATION.

(a) CONTESTS. Each of the Company and the Stockholders agree that (i) in the event that any of them receives notice, whether orally or in writing, of any federal, state, local or foreign tax examinations, claims, settlements, proposed adjustments or related matters that may affect in any way the liability of a party under this Agreement, it shall within ten days notify the other parties in writing thereof (provided that any failure to give such notice shall not reduce a party's right to indemnification under this Agreement except to the extent of actual damage incurred by the other parties as a result of such failure), and (ii) the party or parties (the "Indemnifying Party") who would be required to indemnify the other party or parties (the "Indemnified Party") shall be entitled at its reasonable discretion and sole expense to handle, control and compromise or settle the defense of any matter which may give rise to a liability under this Agreement, provided that the Indemnifying Party from time to time provides assurances reasonably satisfactory to the Indemnified Party that (1) the Indemnifying Party is financially capable of pursuing such defense to its conclusion, and (2) such defense is actually being pursued in a reasonable manner.

(b) COOPERATION. The parties will make available to one another, as reasonably requested, and to any Taxing Authority, all information, records or documents relating to the liability for taxes covered by this Agreement and will preserve such information, records or documents until the expiration of any applicable statute of limitations or extensions thereof. The party requesting such information shall reimburse the other party for all reasonable out-of-pocket costs incurred in producing such information.

(c) CLAIMS FOR REFUND. Each party hereto agrees to file a properly completed claim with the appropriate Taxing Authority for a refund or an abatement of taxes paid with respect to any matter which may give rise to a liability under Sections 3.3 or 3.4 of this Agreement.

3.6 COSTS. Except to the extent otherwise provided herein, each party shall bear its own costs in administering this Agreement.

3.7 CORRECTION OF A FINAL DETERMINATION. In the event a party makes a payment pursuant to this Agreement based on the expected outcome of a Final Determination which subsequently is determined to have been incorrect, the parties shall adjust the payments hereunder in order to reflect the subsequent determination as if it was the Final Determination upon which the original payment was based.

#### ARTICLE IV

##### MISCELLANEOUS

4.1 COUNTERPARTS. This Agreement may be executed in several counterparts, each of which shall be deemed an original, but all of which counterparts collectively shall constitute an instrument representing the Agreement between the parties hereto.

4.2 CONSTRUCTION OF TERMS. Nothing herein expressed or implied is intended, or shall be construed, to confer upon or give any person, firm or corporation, other than the parties hereto or their respective successors and assigns, any rights or remedies under or by reason of this Agreement.

4.3 GOVERNING LAW. This Agreement and the legal relations between the parties hereto shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts without regard to Massachusetts choice of law rules.

4.4 AMENDMENT AND MODIFICATION. This Agreement may be amended, modified or supplemented only by a written agreement executed by the parties.

4.5 ASSIGNMENT. This Agreement and all of the provisions hereof shall be binding upon and inure to the benefit of the parties hereto and their respective successors and permitted assigns, but neither this Agreement nor any of the rights, interests or obligations hereunder shall be assigned by any of the parties hereto without the prior written consent of the other parties, nor is this Agreement intended to confer upon any other person except the parties any rights or remedies hereunder.

4.6 INTERPRETATION. The title, article and section headings contained in this Agreement are solely for the purpose of reference, are not part of the agreement of the parties and shall not in any way affect the meaning or interpretation of this Agreement.

4.7 SEVERABILITY. In the event that any one or more of the provisions of this Agreement shall be held to be illegal, invalid or unenforceable in any respect, the same shall not in any respect affect the validity, legality or enforceability of the remainder of this Agreement, and the parties shall use their best efforts to replace such illegal, invalid or unenforceable provisions with an enforceable provision approximating, to the extent possible, the original intent of the parties.

4.8 ENTIRE AGREEMENT. This Agreement embodies the entire agreement and understanding of the parties hereto in respect to the subject matter contained herein. There are no representations, promises, warranties, covenants, or undertakings, other than those expressly set forth or referred to herein. This Agreement supersedes all prior agreements and the understandings between the parties with respect to such subject matter.

4.9 FEES. In any action or proceeding brought to enforce or interpret any provision of this Agreement, the successful party shall be entitled to reasonable fees of attorneys, accountants and other professionals as well as other costs incurred in connection with such action or proceeding.

4.10 INTEREST ON OVERDUE PAYMENTS. Any payment pursuant to this Agreement not made when due under this Agreement shall bear interest at the rate of 10% per annum until paid.

4.11 NOTICES. All notices provided for in this Agreement shall be validly given if in writing and delivered personally or sent by registered mail, postage prepaid

if to the Company, to:

General Counsel  
MKS Instruments, Inc.  
6 Shattuck Road  
Andover, MA 01810

copy to:  
[Company Counsel]  
[Address]

if to any Stockholder, to:

Name of Stockholder  
c/o John R. Bertucci  
President  
MKS Instruments, Inc.  
6 Shattuck Road  
Andover, MA 01810

4.12 TERMINATION OF AGREEMENT. This Agreement shall terminate and be void, as if it never had been executed, if the Closing Date shall occur after December 31, 1998.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

MKS INSTRUMENTS, INC.

By: \_\_\_\_\_  
Chief Financial Officer

STOCKHOLDERS

\_\_\_\_\_  
John R. Bertucci

\_\_\_\_\_  
Claire R. Bertucci

Claire R. Bertucci Second Family Trust  
of December 15, 1986 FBO Carol B. Bertucci

By: \_\_\_\_\_  
Trustee

Claire R. Bertucci Second Family Trust  
of December 15, 1986 FBO Janet C. Bertucci

By: \_\_\_\_\_  
Trustee

John R. Bertucci Second Family Trust  
of December 15, 1986 FBO Carol B. Bertucci

By: \_\_\_\_\_  
Trustee

John R. Bertucci Second Family Trust  
of December 15, 1986 FBO Janet C. Bertucci

By: \_\_\_\_\_  
Trustee

Claire R.. Bertucci CBS Retained  
Annuity Trust of 1997

By: \_\_\_\_\_  
Trustee

Claire R. Bertucci JCB Retained  
Annuity Trust of 1997

By: \_\_\_\_\_  
Trustee

John R. Bertucci CBS Retained Annuity Trust of 1997

By: \_\_\_\_\_  
Trustee

John R. Bertucci Family Retained Annuity Trust of 1997

By: \_\_\_\_\_  
Trustee

John R. Bertucci JCB Retained Annuity Trust of 1997

By: \_\_\_\_\_  
Trustee

\_\_\_\_\_  
John J. Sullivan

John J. Sullivan Retained Annuity Trust of 1997

By: \_\_\_\_\_  
Trustee

\_\_\_\_\_  
Cheryl A. Sweeting

\_\_\_\_\_  
John F. Sullivan

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Kathleen M. Davis

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Thomas J. Sullivan

SCHEDULE A  
List of Stockholders

John R. Bertucci

Claire R. Bertucci

Claire R. Bertucci Second Family Trust of December 15, 1986 FBO Carol B. Bertucci

Claire R. Bertucci Second Family Trust of December 15, 1986 FBO Janet C. Bertucci

John R. Bertucci Second Family Trust of December 15, 1986 FBO Carol B. Bertucci

John R. Bertucci Second Family Trust of December 15, 1986 FBO Janet C. Bertucci

Claire R.. Bertucci CBS Retained Annuity Trust of 1997

Claire R. Bertucci JCB Retained Annuity Trust of 1997

John R. Bertucci CBS Retained Annuity Trust of 1997

John R. Bertucci Family Retained Annuity Trust of 1997

John R. Bertucci JCB Retained Annuity Trust of 1997

John J. Sullivan

John J. Sullivan Retained Annuity Trust of 1997

Cheryl A. Sweeting

John F. Sullivan

Kathleen M. Davis

Thomas J. Sullivan