

# TDK's future: Not simply an extension of the past but creating a new TDK by unleashing the unlimited potential of magnetism



As TDK steadily moves toward becoming a “centennial company,” I will focus the energy of the Group’s approximately 100,000 personnel to achieve further strategic growth firmly rooted in magnetics technology.

MAGNETICS TECHNOLOGIES

Shigenao Ishiguro  
President & Chief Executive Officer

## — Keynote

### Harnessing both “dynamic” and “static” attack strategies

Greetings. I am Shigenao Ishiguro, the appointed president of TDK by approval of the shareholders at the Ordinary General Meeting of Shareholders on June 29, 2016. I intend to work hard and devote all of my abilities toward further development of the company's business, to reward the trust placed in me by the shareholders and all other stakeholders. In this endeavor, I ask for your continued guidance and support.

After joining TDK in 1982, I spent 22 years in the magnetic tapes business, followed by 12 years engaged in the HDD magnetic heads business, so I have always been involved in the field of magnetics. For 17 years, about half of my time with TDK, I worked on overseas assignments. At plants both in Japan and abroad, I was able to gain experience in the areas of production management and corporate planning. While taking the helm of a number of projects including starting new production bases, I learned how important it is to create a tangible framework that motivates staff to work toward the realization of a concept. This is something that I have dedicated myself to ever since. With this in mind, I told all employees that they are the key players in my speech just after taking office as president.

The concept that I now intend to solidify is the TDK growth strategy built around our core competence in magnetics technology. This strategy was put in place by my predecessor, now-Chairman Kamigama, when he threw the TDK rudder around and changed course from a mere strengthening of our existing capabilities to an aggressive policy. I will inherit his dynamic management approach and continue in the offensive. If we define this as a “dynamic” attack strategy, there is also a “static” attack strategy to which I will give weight as well. During the time when TDK created the golden age of the cassette tape, high profits were our hallmark. In the current day, however, our profitability unfortunately is at a lower level than that of competitors in the electronic components sector. I see it as my mission to engage with this fact and to raise the baseline of our profit capability. By harnessing both the “dynamic” and the “static” attack concepts, I intend to create a framework that is easy to grasp and that will strongly motivate all members of our organization as we go about the task of turning strategy into reality.

## — “Dynamic” approach

### Creating TDK's future through nonlinear advancement

Until about the end of the 1980s, TDK was known as the magnetic tapes company. After the start of the new millennium, we led the world in HDD magnetic heads, and in recent years, we have expanded into high-frequency components and rechargeable batteries. Remaining alert to the demands of society and the evolution of technology, TDK has demonstrated the capability to boldly switch to new strategic products before existing ones enter their declining phase.

Ever since TDK was founded in 1935 with the aim of pioneering the industrial application of a new magnetic material called “ferrite,” the DNA of the company has been magnetics technology. While becoming ever more proficient in this field, we have achieved a long series of innovative breakthroughs for 80 years. Magnetism technology doubtlessly is a major underpinning of our competitive advantage. But we have other strengths as well, such as “forming technology” for working materials into complex shapes and “sintering technology” for creating highly precise microstructures.

These are just two examples of the sophisticated “process technology” that TDK has perfected over the years. While having magnetism technology as its core competence, TDK was able to develop many innovative products through repeated applications of process technology. For example, core technology of magnetic tapes has enabled us to create film application products such as rechargeable batteries with superior performance. Thin-film process technology applied to HDD magnetic heads has contributed to an amazing jump in recording density and will also be instrumental in the next-generation of thin-film electronic components. This kind of framework has resulted in what could be termed the non-sequential advancement of TDK, which in turn has supported the company's sustainable development.

TDK has been promoting globalization since the 1950s and has fostered a corporate culture that naturally accepts a wide range of values. This not only means that TDK respects the philosophy of acquired

companies, it has also inspired us to give such companies the leading initiative in areas where they have technological resources that are lacking in TDK. By partnering with companies and people from other nationalities and backgrounds to pursue the realization of shared visions, the strength of diversity has become one of TDK's hallmarks that also acts as a driver of change. For example, the starting point of TDK's expansion into the HDD magnetic heads sector was the acquisition of Hong Kong's SAE Magnetics (H.K.) Ltd. in 1986. In 2005, the acquisition of Amperex Technology Ltd., also based in Hong Kong, contributed greatly to the expansion of our market share in lithium polymer batteries (rechargeable batteries). And in 2008, the acquisition of the major electronic components manufacturer EPCOS Group of Germany had many beneficial effects. Our group gained a leading position as a supplier of high-frequency components

for smart devices. Our business portfolio and customer base for aluminum capacitors, film capacitors, piezoelectric materials, and other products for the automotive and industrial equipment sectors expanded significantly. Synergy was also created in packaging technology and other technical areas. High-frequency components in particular have become a strong driver of profit growth in recent years. Products in our industry do have a "use by" date. Both HDDs and smartphones have reached a phase of maturity and are bound to eventually go on a decline. But technologies such as magnetics technology and process technology will endure indefinitely. And the strength of diversity that comes from a combination of cultures and different backgrounds also has unlimited potential. By harnessing these strengths, TDK will shape its future course and move toward new frontiers in what I consider to be the dynamic attack strategy.

## MAGNETICS TECHNOLOGIES

### — Magnetic sensors: a pillar of change

## Believing in the vast potential of TMR elements

Around 2009 when I was overseeing the domestic operations for HDD magnetic heads, I went together with then-President Kamigama to visit a closed-down site that had previously been a manufacturing base of cassette tapes. As we overlooked the area, Mr. Kamigama sternly said to me: "Have a good look at this desolate place now overgrown with weeds. This is a part of your responsibility! Were you able to take cassette tape technology and make something else of it?" These severe words still remain with me today because they became the basis for my resolve. He continued: "Don't let the same thing happen to HDD magnetic heads. Think of the next step while we still have the advantage!" Above, I mentioned technologies that will endure indefinitely. One of these is the technology that resides in an industrial plant. When the cassette tape factory was closed down, the accumulated technology and know-how indeed could not be passed on sufficiently. This realization prompted me to begin looking for the next thing after HDD magnetic heads. The TMR (Tunnel Magneto Resistance) elements used in the HDD magnetic heads are highly accurate and sensitive sensors that are able to catch minute

magnetic signals. But at the time, there were practically no other applications for them. Although at first it felt like reaching for the clouds, I did form the belief that in the future, magnetic sensors using TMR elements would prove useful to society. With a tiny team of only three people, including veteran engineers, we set out on the path to realize this dream. We pursued the project originally in a quite basic and down-to-earth way. Using rough prototypes and hand-made materials, we persisted in showing TMR element sensors at various trade shows and exhibitions, trying to convince people of their potential. Gradually, we found an increasingly interested audience, and by trying to match the aims of customers with our technology, we became more and more convinced that TMR sensors have enormous merit. Six years later, in 2015, TDK began the mass production of magnetic sensors for automotive applications. We are currently in talks with more than 40 companies, and approval activities are steadily progressing. So it can be said that these sensors, which are expected to become a new pillar in TDK's portfolio, were developed with and by customers.

### — Growth strategy for the age of IoT

## Creating high added value through synergy with partners

The next big technology wave that we will be riding is the IoT (Internet of Things). Sensors, actuators, and communication modules are to be incorporated in all manner of things around us, and mutual interaction will enable data to be created, analyzed, and used for real-world feedback in ways that so far were hardly believed possible. This development has already begun on a society-wide level. A myriad of electronic components will be required, which brings enormous possibilities and expansion opportunities to manufacturers in this field. Within this scenario, TDK has defined magnetics technology and process technology as the cross-points in our matrix of growth areas. We intend to deliver products with high added value that are not within reach of competitors and can only come from TDK. Electronic components are subject to ever more stringent demands with regard to extreme miniaturization, higher integration, higher functionality, and module integration support. In the age of IoT, these technological demands will certainly become even more severe, and meeting these demands will be a key factor in increasing the power of applications. When TDK recognizes the need for resources reinforcement in order to respond to changes at these cross-points, rather than trying to reinforce our own resources through enormous investments, we put the focus on collaboration with suitable external partners. We have already carried out some initiatives in this area in 2015 and 2016, and the new partnerships are expected to create huge synergy effects. In May 2015, we established a joint venture company with Taiwan's Advanced Semiconductor Engineering Inc. (ASE) for the fabrication of semiconductor embedded substrate products. TDK's semiconductor embedded substrate (SESUB) technology was developed by the application of micromachining techniques and materials technology gained while manufacturing inductive devices and HDD magnetic heads. ASE brings sophisticated IC packaging technology and test solution technology to the table. The fusion of these mutual capabilities will enable smaller, thinner, and lighter smart devices and will also result in increased production capacity. At another cross-point, namely automotive applications and magnetic sensors, an initiative that drastically raises added value, is our acquisition of Micronas Semiconductor Holding AG (Micronas) as a subsidiary.

Bringing a leading company in the field of Hall sensors for detecting and measuring position information into the TDK fold sets the stage for developing multifaceted synergy. Micronas has accumulated 30 years of experience and know-how in the magnetic sensor market which will be highly instrumental in expanding the scope of product applications. The company also boasts outstanding circuit design technology which in combination with TMR elements from TDK will make it possible to further raise the accuracy of digital output signals of sensors to an extremely high level. Creating hybrid-type products with greater added value is of special strategic importance, as I will explain in more detail below. Having Micronas as a partner drastically increases the degree of freedom we have in coming up with creative ideas that meet the needs and demands of customers. And we will of course follow Micronas' lead in areas where the company has extensive market experience. TDK has concluded an agreement with Qualcomm Incorporated (Qualcomm), to set up the joint venture RF360 Holdings Singapore PTE, Ltd. for supplying high-frequency components. This joint venture will become a powerful player in the high-frequency solutions market by utilizing the high-frequency component-related technology accumulated by TDK together with advanced wireless technology developed by the Qualcomm subsidiary Qualcomm Technologies, Inc. (QTI). It was also agreed that TDK, Qualcomm, and QTI will deepen their technological cooperation in a wide range of fields, including passive components, batteries, wireless power transfer, sensors, and MEMS for next-generation mobile devices, the IoT, and automotive products. In the world of IoT, sensors to collect data, CPUs for analyzing them, communication chipsets to provide feedback to the real world, as well as actuators, batteries, and power management technology for driving various devices, will be in high demand. Modularization technology for ultracompact devices will also be needed. Qualcomm is a global leader in manufacturing the chipsets that serve as the brain for controlling the communication modules, while actuations and interfaces for the real world are also TDK's strengths. The collaboration between these companies creates an ideal complementary relationship that can satisfy many pressing technology requirements. Our aim is to create synergy effects that will grow and spread beyond a single cross-point to multiple intersecting areas.

### — Monozukuri in the age of IoT

## “TDK Industry 4.5”— Zero defect quality sets us apart

TDK is exploring the possibilities of the impending IoT age also with regard to our *Monozukuri* approach to making things. “Industry 4.0” is an IoT-oriented concept currently being promoted by the German government in cooperation with industry and academia, aimed at achieving autonomous production lines and drastically increasing manufacturing efficiency. TDK is adding quality to the equation with the “TDK Industry 4.5” concept that takes things even further. New production lines that were completed in October 2016 at the Honjo Factory and the Inakura Factory in Akita Prefecture in Japan will use a monitoring network comprising cameras and sensors to

enable the line to autonomously detect any process problems in real time. Big data analysis is then applied to provide feedback and implement upstream control. While being aimed at zero defect quality, this innovative approach also facilitates inventory control and helps to increase energy efficiency. Using the sites in Japan as pilot plants, the approach will eventually be expanded to other plants and bases around the world, with the aim to realize “location free” operation whereby the same quality can be achieved regardless of the actual production location. In this way, we are taking our quality-oriented *Monozukuri* to a whole new level.

### — Profit growth scenario

## Toward resuming profit growth from fiscal 2018

TDK holds an option to sell 49% of the joint venture shares held after 30 months from the contract date to Qualcomm. If this option is exercised, the transfer price is expected to be about US\$3 billion. We are defining our Medium-Term Plan until the fiscal year ending March 2018 on the assumption that the option shall be exercised. The key aspect of this plan is the placement of “sensors and actuators,” “energy units,” and “next-generation electronic components” as strategic growth products, aiming for expansion at the cross-points of these product categories with our three priority markets, namely “automotive,” “ICT,” and “industrial equipment and energy.” We are actively pursuing strategic investments with the aim of increasing sales of strategic growth products by ¥100 billion by fiscal 2018. When releasing our financial results for fiscal 2016, we also announced an increase in capital expenditure from the originally budgeted ¥350–¥400 billion to ¥430–¥480 billion, demonstrating the intent to accelerate our strategy.

In fiscal 2016, the first year of the plan, the drop in demand for personal computers and the shift from HDDs to solid state drives (SSDs) proceeded more quickly than anticipated, causing shipments of HDD magnetic heads to fall below our initially planned numbers. However, the slack was taken up by passive

components and film application products, resulting in record net sales and a year-on-year increase in operating income of 29%. As for the future, due to our policy of focusing on growth investments for the business structure conversion until fiscal 2017, and also taking into account the influence of a stronger yen as compared to the previous fiscal year, we expect sales and net income to decline in the current fiscal year. From fiscal 2018 onwards, investments in strategic growth products are expected to produce results and lead to profit growth, and for fiscal 2019 we are anticipating a scenario of further expansion in strategic growth products. (For details, please see the section on the Medium-Term Plan on page 20.)

HDD magnetic heads, which so far have been a pillar of our revenue, will continue to face a difficult situation. Along with efforts to improve the company’s profitability by right-sizing and consolidating our own production base, we also will be aiming to transcend conventional frameworks and contribute to the right-sizing of the industry at large. Product services powered by advanced technical capabilities as well as controlled investments are further means by which we intend to ensure profits as a remaining player in the industry.

### — Expansion plan for strategic growth products

## The “four-stage rocket” for sensors and actuators

Among the strategic growth products, our policy for sensors and actuators targets non-optical sensors in general, with magnetic sensors at the center, for which we have drawn a growth scenario that can be likened to the launch of a four-stage rocket.

The first stage is angle sensors, pressure sensors, and humidity sensors for automotive applications. In keeping with the trend towards the increasing electrification of automobile, we will be working towards an expansion of applications as well as the customer base.

The second stage relates to expected consumer product demand. Using advantages such as high accuracy and low power consumption as sales points, we will develop applications for TMR sensors also in the huge B2B2C market. Because sensors in this area will be about 10 times smaller than automotive-use sensors, more sensors can be produced per wafer, which should lead to increased business efficiency.

After pursuing expansion in the first and second stages, the third stage will consist in maximizing the synergy effect with Micronas, as mentioned previously. For automotive sensors, redundancy is normally required, because they may be involved in life-threatening situations. Even if two identical sensors are used, there is still a possibility that both may fail at the same time. This risk can be further minimized by combining a TMR sensor and a Hall sensor in a hybrid configuration. By harnessing ASIC and packaging technology from Micronas as well, we intend to significantly enhance the added value of sensor products.

Finally, the fourth stage consists of modular sensor systems. By offering systems that incorporate multiple parts including the sensor and processor, organized

module, transmitter, etc., we will be able to provide customers with even more useful solutions.

In the field of actuators, we are providing optical image stabilizers (OIS) for prevention of camera shake and voice coil motors (VCM) for auto-focusing in camera modules of smartphones. Along with strengthening our sensor offerings, we will harness proprietary and new technologies to develop products with even higher accuracy and lower power consumption.

As the term “energy unit” implies, our policy will be to shift the focus from selling single devices such as lithium polymer batteries (rechargeable batteries) to units that combine hardware and software, offering high added value. By packaging functions such as wireless power transfer, power conversion, energy storage, and energy control together with various sensors, we will aim for expanding the application scope in the area of industrial equipment and automobiles.

Synergy with Qualcomm will be a major driver for growth in next-generation electronic components. Starting with SESUB, IC-embedding technology, thin-film technology, and materials technology will be joining forces to enable a broad portfolio of next-generation electronic components and modules that offer exceptional value. In November 2015, we agreed on the acquisition of the Tsuruoka Factory of Renesas Semiconductor Manufacturing featuring sophisticated clean room facilities to strengthen our production capacity. We intend to position it to play a central role for thin-film products, a product category where demand is expected to grow further.



## — “Static” attack strategy for increased profitability

# Accelerating the cycle of overall corporate activities

In the past, I undertook a project at a factory manufacturing HDD magnetic heads to cut the lead time in half. Thanks to the entire staff of the factory—some 600 people—working together, the goal was achieved in about a year, but there was even an unexpected by product, in so far as the overall business cycle was improved as well. This had wide-ranging effects. First of all, inventory stocking requirements were reduced and production efficiency significantly increased. Samples of new products could also be delivered much quicker. This in turn enabled us to receive customer feedback and requests regarding the sample at an earlier point, so that the development and manufacture of new products overall could move in a faster cycle. By getting cutting-edge products to customers faster, added value was created which eventually resulted in a lower cost rate. This experience is at the root of my current ideas for improving our earnings structure.

The “static” attack concept aimed at improving profitability also involves drastic measures for improving efficiency on the cost side, but only a review of the cost structure will eventually hit a limit, and the organization may become fatigued. On the management level, simply looking at management indexes and waving the flag will not result in thorough structure reform. As I mentioned, my own stance is to involve all production sites and work tenaciously, with both feet on

the ground, toward drastic change of the overall earnings structure of TDK. With this in mind, we need a structure and KPIs that make each and every employee realize that putting things into practice is what enables profitability improvement. Taking the different characteristics of functions such as development, manufacture, marketing, and administration, as well as differences in each business division into consideration, I intend to put in place easy-to-understand and practice-oriented KPIs, for example, for production, design, prototyping, assessment lead time, etc. If every member of our organization fulfills their roles on their own volition, the speed of TDK’s various business activities as well as cash and information flow will increase naturally, which in turn makes it possible to raise the marginal income ratio. This approach to gradually but fundamentally effect change is somewhat similar to Chinese herbal medicine. It will not bring results overnight but strong and determined efforts change things in a positive direction. Current management targets call for an increase in the operating income ratio and ROE by at least 10% each. Through an improvement in earnings structure and expansion of strategic growth products, I intend to bring about a realization of these targets. But with regard to both, 10% of course is not necessarily enough, and I intend to aim toward higher figures.



## — Toward creating a “centennial company”

# Continuing the challenge in the spirit of the company’s founder

TDK’s corporate motto, “Contribute to culture and industry through creativity,” is an expression that fully reflects the strong and determined spirit of Kenzo Saito, the company’s founder. At the time of the company’s founding, the special material ferrite that had been invented in Japan was still a totally unknown quantity, so the decision to try and explore its possibilities for industrial use was by no means an easy one. Mr. Saito was motivated by the spirit of originality, aiming to create something of value that had not existed before, and to do so by starting at the fundamental level of the material. He also had the implications for society in mind, and was confident that “where there’s a will, there’s a way.”

I strongly believe that we need to follow these tenets today and in the future as well, as we move towards the 100th anniversary of the company. In 2015, TDK newly formulated its Corporate Vision and TDK Value in order to properly interpret what our corporate motto means in the current age. I feel it is part of my mission to make sure that the message gets across. We always need to deepen our curiosity and creativity, so that we continue to be a company that contributes through technology to solve the challenges that society is facing. The social aspect is also very important in terms of *Monozukuri*. As an enterprise with 90 percent of net sales derived overseas and bases in some 30 countries around the world, we are conducting business in close contact with many different local communities, both in Japan and abroad. Without proper consideration for these communities, the continuity of our business would not be assured. Furthermore, in manufacturing products we use many natural resources. To ensure a stable supply, it is absolutely essential that our way of making things, i.e., our *Monozukuri* culture, is fully oriented toward protection of the environment. For a business to be truly sustainable, it must respect the interests of all its stakeholders.

The most important issue to be addressed by our company in anticipation of the 100th anniversary in 2035 is the recruitment and training of human resources, i.e., the people to put our strategy and

plans into action. As the age of IoT arrives, opening up vast new opportunities for us to shine, finding and nurturing a greater variety of human resources is essential. Gender, nationality, or creed are irrelevant when looking for talented staff. What we need are people who have potential and who will take up a challenge. In order to bring out the best in them, I also intend to revise our human resource management and compensation schemes.

As an early adopter and proponent of globalization, TDK is also actively engaged in strengthening its governance structure. Since 2002, we have brought in outside directors. The chairman of the Board of Directors as well as the chairs of the Compensation Advisory Committee and the Nomination Advisory Committee are outside directors. We actively recruit foreign corporate officers. Since 2015, we have had an evaluation of the Board of Directors performed by a third party. And this was not simply a pro-forma exercise. We thoroughly discussed all issues that had been identified and applied the results toward strengthening our governance. Following a recommendation made in the third party assessment, a new finance and accounting officer was appointed to the Board of Directors, commencing duties from fiscal 2017.

In order to continue sustainable development, we are implementing corporate governance code principles to build an effective, practice-oriented governance structure.

Firmly adhering to the company’s founding spirit, I intend to continue the challenge to unleash the unlimited potential of TDK in the realm of electronics and magnetism. The continued trust and support of all our stakeholders will enable us to march strongly onwards to become a centennial company.

October 2016

Shigenao Ishiguro  
President & Chief Executive Officer

MAGNETICS TECHNOLOGIES