

1 SCENARIA (left) and simple dose report screen (right)

1 64/128 Slice CT System SCENARIA

64/128 slice CT System SCENARIA*, released in 2012, realizes 0.35 s/rot scans not only for cardiac scanning but also for whole body scanning with a high-speed data sampling technique and CORE method (3D reconstruction algorithm) which enables high pitch scans. Furthermore, the image noise reduction technique applied by the iterative reconstruction technology was integrated as a standard function.

Recently, there is increased concern regarding medical irradiation all over the world due to the Japanese nuclear power plant disaster in 2011, and a research paper about the possible increase of cancer risk from pediatric computed tomography (CT) scans published in *Lancet*, the British medical journal in 2012.

Therefore, Hitachi Medical Corporation released a new version of its software and applied it to SCENARIA, which realizes not only the improvement of performance and diagnosability for high

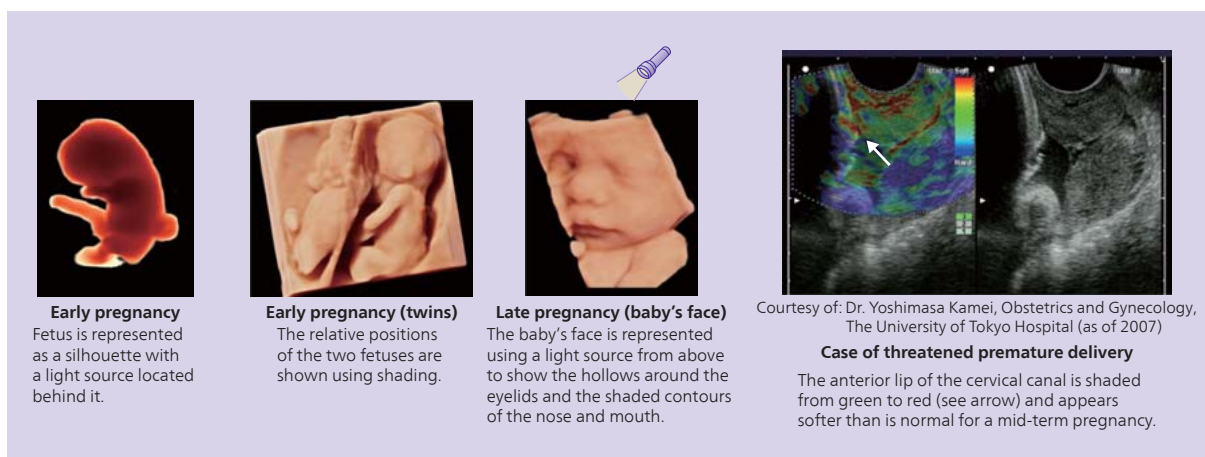
speed scan and cardiac examination, but also the optimization of image quality and dose amounts, and controlling the dose information of each patient. In this new version of the software, a simple dose report function is integrated for transferring the dose information as a secondary capture to a picture archiving and communication system (PACS) after CT scan. By the use of an image viewer, it enables the requesting doctor to check the clinical images with dose information easily.

(Hitachi Medical Corporation)

* SCENARIA is a trademark of Hitachi Medical Corporation.

2 Development Technology for Diagnostic Ultrasound Systems Used to Manage Health of Mother and Fetus

Advances in the technology for diagnostic ultrasound systems used for perinatal care are creating applications that have the potential to obtain new knowledge by expanding the uses for these systems.



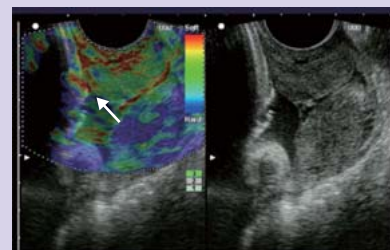
Early pregnancy
Fetus is represented as a silhouette with a light source located behind it.



Early pregnancy (twins)
The relative positions of the two fetuses are shown using shading.



Late pregnancy (baby's face)
The baby's face is represented using a light source from above to show the hollows around the eyelids and the shaded contours of the nose and mouth.



Courtesy of: Dr. Yoshimasa Kamei, Obstetrics and Gynecology, The University of Tokyo Hospital (as of 2007)

Case of threatened premature delivery

The anterior lip of the cervical canal is shaded from green to red (see arrow) and appears softer than is normal for a mid-term pregnancy.

2 4D fetus (left) and elastography (right)

4D fetus enhances brightness and shading using a rendering technique with a virtual light source, producing realistic representations of the fetus's face, expression, and skin texture. Fetal images that replicate a naked-eye view through an endoscope can promote a mother's sense of attachment to her child and help foster maternal feelings.

Hitachi Medical Corporation led the world in announcing elastography, a technology for generating realtime images of the elasticity of tissue. The technology has potential as a technique for detecting and predicting premature delivery and other fetal conditions by viewing the hardness of the fetus's lungs, kidneys, and other organs, and of the mother's cervix.

Hitachi believes that it can provide a high level of reassurance to expectant mothers and other patients by contributing to clinical advances in perinatal care through technologies that support maternal risk management and the diagnosis of fetal disease.

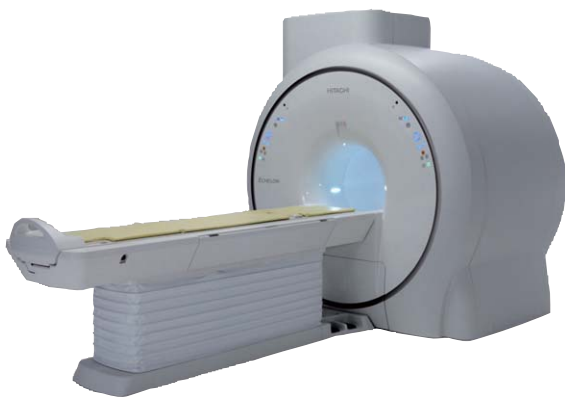
(Hitachi Aloka Medical, Ltd.)

3 Four New Applications Added to Hitachi 1.5T Superconducting MRI System

Hitachi has enhanced the Hitachi superconducting magnetic resonance imaging (MRI) system, creating new system software including four additional Hitachi's original applications designed to deliver new clinical benefits.

The first application is intended to make it easier to see changes in hemodynamics (blood circulation), which are caused by stenosis or other factors. Hemodynamics is determined by selectively suppressing the blood flow signal, using the application combined with time-of-flight (TOF) imaging of a pencil beam pre-saturation pulse that uses regional excitation. By performing imaging with the pencil beam pre-saturation pulse set on a specific blood vessel, the blood flow signal from the blood vessel can be suppressed, and then the hemodynamics of the specific area can be described. This can be done using a technique similar to magnetic resonance digital subtraction angiography where the difference between images with and without a pencil beam saturation pulse is taken and visualized in black and white inverted display.

The second application is Veins and Arteries sans Contrast – Fast Spin Echo (VASC-FSE), one of the non-contrast magnetic



3 Four New Applications Added to Hitachi 1.5T Superconducting MRI System

resonance angiography (MRA) methods for the lower limbs, which is created based on the difference of blood flow speed between systole and diastole phases.

The third application is a fat/water separation application which applies the Dixon method of fat suppression based on the difference in frequency between water and fat.

The fourth application is T2 map which improves the ability to identify tissue degeneration by using a color map to display changes in the T2 value.

In the future, Hitachi intends to continue using Hitachi's own technologies to develop MRI systems in pursuit of enhanced clinical benefits.

(Hitachi Medical Corporation)

4 Mobile X-ray System with Wireless FPD

As X-ray systems increasingly shift toward digital technology, mobile X-ray systems are also adopting digital radiography (DR) using flat panel detectors (FPDs) in place of computed radiography (CR) using an imaging plate (IP).

DR is able to provide on-the-spot images without the need to swap cassettes in order to take additional images or multiple images, and can achieve higher throughput when fitted with a wireless FPD. This not only makes it easier to take X-rays of patients in the ward, it also expands the scope of uses to encompass situations such as emergency first aid, disasters, operating theatres, or the response to an infectious outbreak.

The increasing number of female technologists in recent years has also created a need for light and compact systems that are easy to operate. To meet this need, Hitachi has developed the system, which includes all of the features of the series of mobile X-ray systems, including Hitachi's proprietary pantographic arm technology and "mono-tank" X-ray generator, and also has a wireless FPD for faster throughput and the ability to display images within 3 seconds of exposure.

(Hitachi Medical Corporation)



4 Mobile X-ray system (left), wireless FPDs (top right), and 15-inch monitor (bottom right)

Measurement/Analysis Equipment

1 SU5000 FE-SEM

Field emission-scanning electron microscopes (FE-SEMs) are used in a wide range of research and development and industrial applications. While there has been steady improvement in the performance and functionality of these systems in recent times, the wider range of users has also created a demand for systems that can acquire data at a level that reflects this performance, regardless of the user's skill.

The newly developed SU5000 features a new user interface that can acquire images that suit the intended purpose regardless of the user's skill level. Instead of having users determine the measurement conditions themselves, images with high resolution and contrast can be obtained without the need for complicated system operation by having the user specify the purpose (such as surface information or material distribution), and then automatically applying the settings needed to achieve this. For experienced operators, on the other hand, the interface still allows the system settings to be specified directly.

To suit a wide range of observation and analysis applications, the system can deliver a high level of maximum current (200 nA). Hitachi intends to contribute to leading-edge materials development and research by satisfying requirements for materials observation and analysis that will become increasingly diverse in the future, such as its newly developed backscattered electron detector and secondary electron detector in low vacuum conditions. (Hitachi High-Technologies Corporation)



1 SU5000 FE-SEM



2 TM3030Plus tabletop microscope

2 TM3030Plus Tabletop Microscope

Hitachi's series of tabletop microscopes use low-vacuum observation that provides higher magnification than optical microscopes and can be used for energy dispersive X-ray spectrometry (EDX) analysis (available as an option) to view insulators or other samples that contain moisture or oils without the need for special preparation. With automatic functions and a design that pays careful attention to simple operation, the series of microscopes are suitable for people who have never used an electron microscope before.

While the main role of these tabletop microscopes in the past has been to provide an easy way to make observations at a higher magnification than is possible with an optical microscope, electron microscopes have in recent years also come to be used for screening purposes.

To satisfy these increasingly diverse needs, a secondary electron detector has been added to the newly developed TM3030Plus. While past models have used backscattered electron imaging to view the sample's structure or contours, the highly sensitive secondary electron detector for use in low vacuum conditions that is included in high-end models, allows the use of secondary electron imaging to view microscopic features on the sample surface.

Hitachi is contributing to fields such as research and development and quality assurance by satisfying the increasingly diverse needs of the growing market for tabletop microscopes. (Hitachi High-Technologies Corporation)



3 Chromaster 5610 MS detector for high-speed liquid chromatographs (left) and interior view (atmospheric-pressure ion filter) (right)

3 Chromaster 5610 MS Detector for High-speed Liquid Chromatographs

Mass spectrometers are an important form of detector used to obtain information about material mass (mass spectrum) primarily in research and development in the pharmaceutical, chemical, and food industries. Large mass spectrometers suffer from a number of issues, including uncertainty about how to operate and maintain them, with special requirements as to where they can be installed.

Designed to be lighter, more accurate, and compact, the new Chromaster* 5610 mass spectrometry (MS) detector is intended for high-performance liquid chromatograph (HPLC) users and features a quadrupole mass spectrometer that, by obtaining mass information, can deliver significant improvements in the reliability of qualitative analysis. It provides greater flexibility in terms of where it can be installed, the same installation footprint as the Chromaster high-speed liquid chromatograph, the ability to operate on a 100-V alternating current (AC) mains power supply, and reduced use of nitrogen gas. With the significant improvement of maintenance through the inclusion of a newly developed atmospheric-pressure ion filter, the Chromaster 5610 MS detector is helping to satisfy new analytical requirements by avoiding the problems of large mass spectrometers and overcoming their installation difficulties.

(Hitachi High-Tech Science Corporation)

* Chromaster is a trademark of Hitachi High-Technologies Corporation.

4 STA7200RV Simultaneous Thermogravimetric Analyzer

Thermal analyzers measure the thermal properties of materials. They are widely used in applications such as materials research and development, quality assurance to perform analyses such as differential thermal analysis (DTA) (which measures the heating and cooling of a material), differential scanning calorimetry (DSC), thermogravimetry (TG), thermo-mechanical analysis

(TMA), and dynamic mechanical analysis (DMA).

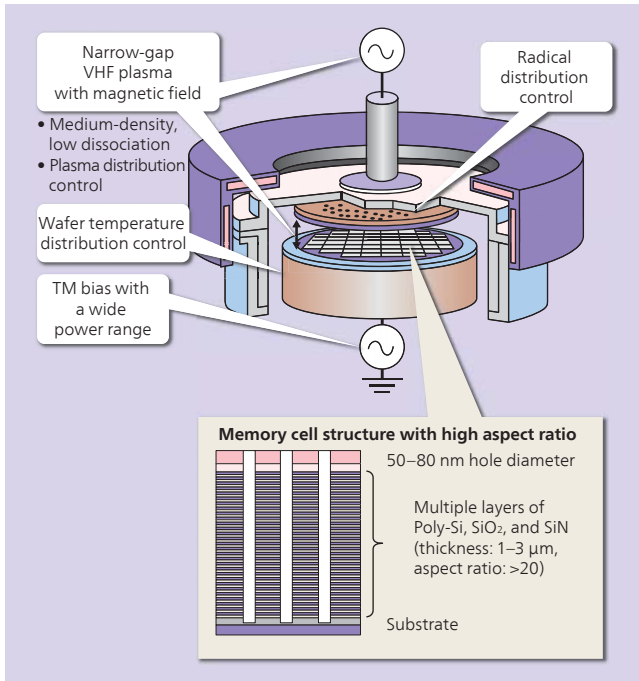
The STA7200RV simultaneous thermogravimetric analyzer includes a “sample observation option” that uses a charge-coupled device (CCD) camera to observe visible changes in the sample while it is also undergoing TG and DTA measurements. This means that visible changes in the sample that occur during heating, and that are not evident during conventional thermal analysis, can be observed and assessed along with the measurement results. Also, a new heating furnace design with a sample observation window (view port) makes it possible to measure and observe samples at temperatures up to 1,000°C, allowing the visual observation of such processes as the decomposition of organic polymers or the melting or transition to glass of inorganic materials.

(Hitachi High-Tech Science Corporation)



4 STA7200RV simultaneous thermogravimetric analyzer fitted with sample observation option (top) and heating furnace design with view port (bottom)

Semiconductor Manufacturing and Inspection Equipment



1 Plasma etching technology for multiple layers with high aspect ratio

1 Plasma Etching Technology for Multiple Layers with High Aspect Ratio

Non-volatile memory has underpinned the spread of such technologies as smartphones, tablets, and cloud computing. Now, three-dimensional memory, in which memory cells are layered vertically, has reached the stage of commercialization for this application. In addition to working with high aspect ratios, the etching process for layered memory cells also requires a technology that can simultaneously perform high-speed vertical processing of the layers of different materials, including polycrystalline silicon (poly-Si), silicon dioxide (SiO₂), and silicon nitride (SiN).

To achieve this, Hitachi has developed an etching technology that uses a very high frequency (VHF) plasma with magnetic field to process multiple layers with a high aspect ratio. The technology is able to perform high-speed vertical processing of high-aspect ratio structures using a medium-density plasma in which low dissociation is generated by a parallel plate reactor with a narrow gap, and time modulation (TM) bias with a wide power range for ion energy control. By using technologies such as magnetic field control of the plasma distribution, radical distribution control, and wafer temperature distribution control, the technology also achieves high productivity by improving the uniformity of the etching speed, shape formation and other processes on the wafer surface.

(Hitachi High-Technologies Corporation)

2 Next-generation LS9300 Wafer Surface Inspection System

The ongoing shrink in design over recent years of the memory, processors, and other semiconductor devices used in smartphones, tablets, and personal computers has further increased the importance of reducing wafer defects and contamination in the semiconductor manufacturing process.

The LS9300 wafer surface inspection system can detect defects on unpatterned wafers with a mirror-finished surface. Applied technology of throughput laser scattering achieves high sensitivity and high detection of small contaminants and various types of defects on wafer surfaces prior to patterning. Defects such as discontinuity or shallow scratch flatness defects, water marks, epi stacking faults, protrusions by the polishing process, and flatness defects caused during deposition cause problems in next-generation processes. The LS9300 achieves high sensitivity by detecting the light scattered from defects while suppressing background noise from the wafer surface. It is widely adopted to control contamination in the manufacturing of semiconductors on the 10-nm scale, and for delivery and incoming wafer quality control.

The main features of the LS9300 wafer surface inspection system are as follows.

- (1) Short-wavelength laser and a new highly efficient design of optical detector achieve 24-nm*¹ sensitivity
- (2) High productivity with a throughput of up to 80 wafers per hour*²

(Hitachi High-Technologies Corporation)

*1 Sensitivity varies depending on the nature of the wafer surface. Quoted sensitivity is for standard polystyrene latex particles on a bare Si wafer.

*2 In high-speed mode with 32-nm sensitivity at 300-mm wafers



2 Next-generation LS9300 wafer surface inspection system

Electronic Equipment and Power Tools



1 SK-UHD4000 4K broadcast camera

1 4K Broadcast Camera for the Next Generation of Broadcasting

Test transmissions have commenced using the new 4K broadcast standard with four times the resolution of high definition (HD).

Hitachi has developed the SK-UHD4000, a 4K broadcast camera that provides the same ease of operation and maintenance as HD and allows broadcasters to continue using their HD lenses even when operating at 4K resolution. By resolving the problems associated with 4K broadcasting, such as reduced sensitivity, this groundbreaking 4K broadcast camera facilitates program production, especially live sports coverage.

The main features of the SK-UHD4000 are as follows.

- (1) The camera can use existing HD lenses without the need for an adaptor or the special lenses previously required for shooting in 4K, thereby allowing broadcasters to continue using their valuable stock of HD lenses.
- (2) Uses a 2/3-inch metal oxide semiconductor (MOS) sensor with high sensitivity and low noise and a precise technique for optics alignment to achieve 4K resolution, realistic color reproduction, and the same high sensitivity and wide dynamic range as an HD camera.
- (3) Camera unit uses proprietary digital image signal processing, optical transmission, and a highly efficient power supply to achieve low power consumption similar to that of Hitachi's HD cameras.

(Hitachi Kokusai Electric Inc.)

2 Highly Practical Nailer and Durable, Heavy Duty Air Compressor with High Operating Pressure

Pneumatic nailers that operate on compressed air are widely used in housing construction. In Japan, the construction quality requirements related to earthquake and fire safety have been strengthened since the Great Hanshin Earthquake, including the use of more fastening nails to improve seismic strength and the

use of hard materials to improve fire safety. Accordingly, nailers must be capable of continuous reliable operation.

In response, Hitachi has fitted its nailers with an industry-first^{*1} three-level pressure setting that reduces air consumption by allowing the user to change the nailing force as they work to suit the size of nail being used. Hitachi has also improved the basic performance of the high-pressure air compressor by providing it with a class-leading^{*2} tank capacity to ensure a reliable supply of compressed air, and a new compressor unit that features excellent durability. Because of problems with theft due to the compressor being located away from the user, it is also fitted with an anti-theft function.

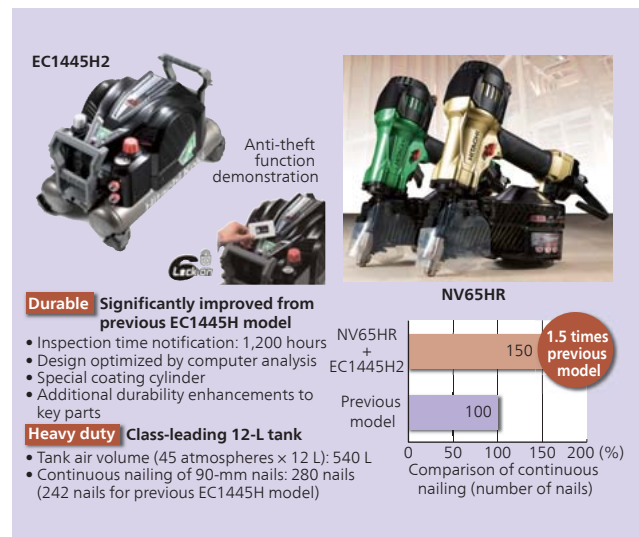
The main features of the NV65HR nailer and EC1445H2 high-pressure air compressor are as follows.

- (1) The NV65HR nailer has an industry-first three-level pressure setting to eliminate wasteful air use by allowing the user to select an appropriate nailing force as they work (30% reduction in air consumption).
- (2) EC1445H2 high-pressure air compressor has a class-leading tank capacity (540 L) to deliver reliable pressure, and improved durability due to use of a new compressor unit (2.4 times more durable than previous models). It is also fitted with an anti-theft function based on near field communication (NFC).
- (3) Used together, the NV65HR and EC1445H2 provide a significant improvement in capacity for continuous nailing (1.5 times previous models).

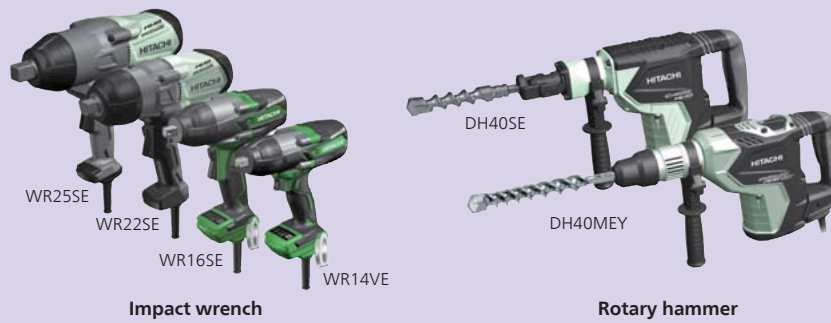
(Hitachi Koki Co., Ltd.)

*1 As of September 2014, among Japanese pneumatic tool manufacturers (researched by Hitachi Koki Co., Ltd.)

*2 As of February 2014, for 16-kg-class high-pressure air compressors made by Japanese power tool manufacturers (researched by Hitachi Koki Co., Ltd.)



2 Highly practical nailer and durable, heavy duty air compressor with high operating pressure



3 Impact wrench (left) and rotary hammer (right) with AC brushless motors and double-insulated aluminum housings

3 Impact Wrench and Rotary Hammer with AC Brushless Motors and Double-insulated Aluminum Housings

Impact wrenches are used for tightening bolts in the construction of buildings and other infrastructure, and rotary hammers are used for concrete drilling and chipping. In addition to being small, lightweight, and durable with a long life, these tools require better performance in situations with poor power supply quality and the ability to operate from an engine-powered generator.

New models from Hitachi feature a highly efficient industry-first*¹ alternating current (AC) brushless motor and double-insulated aluminum housings (a die-cast aluminum body and inner plastic sleeve*²) for small size, light weight, durability, and long life, along with Hitachi's proprietary electronic control technology to ensure reliable operation when using an extension cord or engine-powered generator.

The main features of these power tools are as follows.

- (1) Highly efficient industry-first AC brushless motor and double-insulated aluminum housing for small size and light weight (motor is 20% smaller) together with durability.
- (2) Proprietary electronic control technology detects voltage and adjusts output to compensate for voltage drops. Capable of operating from an engine-powered generator.
- (3) Maintenance-free, with durable long-life motor that does not require replacement of carbon brushes.

(Hitachi Koki Co., Ltd.)

*1 As of November 2014, among power tool manufacturers (researched by Hitachi Koki Co., Ltd.)

*2 Excluding WR14VE and WR16SE

4 Portable Cordless High-pressure Washers

The household use of high-pressure washers has grown in recent years, with further demand growth anticipated from leisure, agricultural, and other cleaning applications where no power supply is available, and from cleaning services as the numbers of the very elderly and households in which both partners work continue to grow. In response, Hitachi has developed industry-first*¹ portable cordless high-pressure washers that use lithium-ion batteries

designed for power tools.

The high-pressure washers have a maximum discharge pressure of 2.0 MPa (roughly seven times mains water pressure) and excellent water conservation performance, and are capable of operating using only one-sixteenth as much water as washing with mains water. The new models are intended not only for household use, but also for the commercial cleaning market, with a variable pressure setting that makes the units suitable for a wide range of applications, and a highly efficient brushless motor that ensures durability and a long battery life.

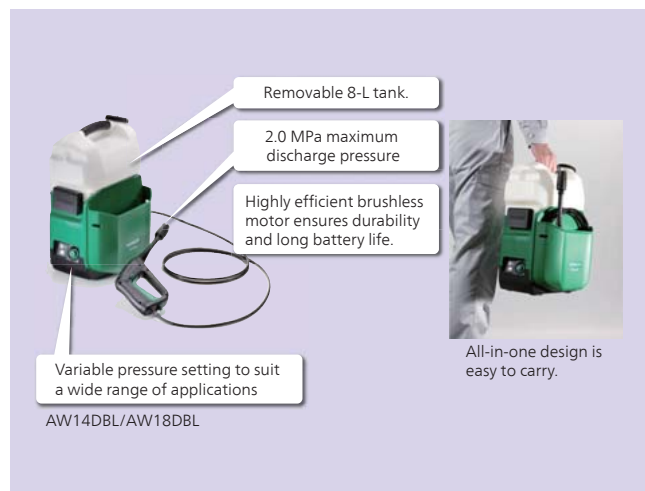
The main features of the high-pressure washers are as follows.

- (1) Very portable, with a compact, lightweight, all-in-one design that does not require a nearby power or mains water supply.
- (2) Powerful cleaning performance with a maximum discharge pressure of 2.0 MPa during cordless operation, and a variable pressure setting to suit a wide range of applications.
- (3) Highly efficient brushless motor ensures durability and long battery life*².
- (4) Continuous operation using either the mains water supply or its own removable 8-L tank.

(Hitachi Koki Co., Ltd.)

*1 As of November 2014, among Japanese power tool manufacturers (researched by Hitachi Koki Co., Ltd.)

*2 Operating time per battery charge is approximately 30 minutes for the AW14DBL and 35 minutes for the AW18DBL.



4 Portable cordless high-pressure washers