Industrial System & Electrical Equipment

For a new age in manufacturing
The power of products that create value

Controller
Inverter
Converter
Servo
Motor
Providing customers with technology and inspiration with our high-precision, high-response, high-efficiency power electronics, envisioning the path to an environmentally friendly society

Toyo Denki Seizo serves customers across Japan and around the world through its general industrial machinery and equipment, automobile development testers, and social infrastructure that is essential to daily life. In addition, we offer energy-saving motors and inverters, as well as products based on advanced system architecture technology that makes extensive use of FA controllers and networks. We also ensure that our manufacturing practices contribute to the fight against climate change.
Index

Drive System .......................... 3 - 4
Automotive Testing System ....... 5 - 6
Social Infrastructure System ... 7 - 8
Toyo Network System (TNS) .... 9 - 10
μGPCsH/μGPCdsP ................. 11 - 12

Inverter Lineup ....................... 13
VF66B .................................. 14
VF66C .................................. 15
VF66D .................................. 16
VF66SV ..................................17
VF66AD/VF66PD .........................18
VF66CH/CH66 .......................... 19
VF64 (R) HPW .......................... 20
VF61R .................................. 21
VF64R .................................. 22

Motor Lineup ........................ 23
ED Motor .............................. 24
UF Motor .............................. 25
Direct Drive Motor ................. 26
Low-Inertia Motor ................. 27 - 28
Renewable energy .................. 29
Power Generating Equipment .... 30
Tandem Generating Equipment/ 31
High-Speed Power Switching Equipment ... 31
Energy Storage System for railway 32
Maintenance, Repair & Overhaul . 33
Reform & Renewal ................. 34
Providing manufacturing solutions around the world in response to diverse needs, including needs for high quality and high functionality.

We use our vast, wide-ranging technologies and products to provide our customers with optimal control systems. We harness the power of Toyo Network System (TNS), which uses our VF66B series inverters and the high-speed, advanced-function controller μGPCsH, to deliver high-precision, high-response systems, including those for the integrated management of production data.
diverse needs,

**Product examples**

**Printing**
- Shaftless newspaper rotary press
- Commercial shaftless rotary press
- Sheet-fed printing press
- Pattern perforator

**Metalworking**
- Process lines
- Rolling mills
- Pipe mills
- Slitting lines
- Shearing lines
- Recoiling lines

**Tires**
- Extruders
- Mixers
- Calenders
- Conveyors
- Cutting process
- Molding machines
- Drum testers

**Film/Fiber**
- Extruders
- Biaxial stretching machine
- Fiber lines
- Non-oriented film
- Winders
- Injection molding machine

**Electrical wire**
- Drawing machines
- VCV vulcanizers
- CCV vulcanizers
- Wire coating machines

**Paper manufacturing**
- Paper machines
- Fan pumps
- Coaters
- Yankee paper machine
- Calender lines
- Super calender lines

**Food**
- Sugar centrifuge

**Carrier systems**
- Ski lifts
- Cableways
- Cable cars
Automotive Testing System

Supporting the development of next-generation automobiles by shortening development time through high precision and high reliability.

We developed low-inertia motors equivalent to a car engine that reduced the required motor inertia to one-tenth the previous value. These engine simulators were made possible through a variety of weight-saving technologies. We have also enabled the dynamic testing of automotive parts by combining high-speed torque control, including dead-beat control (electric current control method for implementing a high-speed torque response) with mechanical systems equipped with moving mechanisms to which various test pieces can be easily attached.
Supporting the development of next-generation automobiles by shortening development time through high precision and high reliability.

**Product examples**

*Test equipment for automobiles, motorcycles, and construction equipment*

- Transmission testing equipment
- Transaxle testing equipment
- Differential testing equipment
- CVT belt testing equipment
- Engine testing equipment
- EV/HEV testing equipment
- Other products

**Railway testing equipment**

- Brake testing equipment
- Bearing testing equipment
- Other products
Social Infrastructure System

Contributing to public services that support people’s lives around the world

Electric power is one of the most important types of social infrastructure and crucial to daily life. Our power generation systems for everyday and emergency use supply safe and stable electric power. We propose the best possible solutions to our customers, always taking the environment and energy conservation in consideration. Our power generating equipment, steam turbine generating equipment, cogeneration systems, and other technologies are the key to unlocking natural and sustainable energy, such as wind energy.
Power generating equipment
for distributed power supplies

Our distributed power supply systems provide stable electric power over reliable power grids, even for power generated by natural energy sources, including wind and water.

- Wind power generation
- Hydroelectric power generation
- Wave power generation
- Tidal power generation
- Biomass power generation

Power generation systems

Our power generating equipment is not only for emergency use. It also plays an active role at financial institutions and data centers. And with the application of our electric switchboards, which employ our proprietary high-speed switching technology, we deliver de-facto uninterrupted switching between commercial power supplies and power generators.

- Continuous power generation systems
- Emergency power generation systems
- High-speed power supply switching systems
- Power generating equipment
- Steam turbine power generating equipment
- Diesel generating equipment
- Gas turbine generating equipment
- Gas engine generating equipment

Regenerative energy storage equipment

Our equipment stores regenerative power generated by train braking in batteries, and then effectively utilizes it to accelerate the train and stabilize line voltage.

- E³ Solution System

Water supply and sewerage equipment

We provide the latest solutions, including new equipment and detailed diagnostics for getting the most out of existing equipment.
**Toyo Network System (TNS)**

TNS flexibly builds optimal network systems, according to network level.

The quality of a network environment that links man and machine, information and control is determined by automation ability. TNS maximizes automation ability by combining products according to network level, building rich open networks that include Ethernet and other network technologies.

---

**Notes:**
1. Detailed information on the open networks that our products support is provided on separate pages for each product.
2. For product specifications, please refer to the page for the product in question.
3. The VF61R regenerative converter is not network compatible.
Power generating equipment

- Ethernet
- FL-net (OPCN-2)
- μGPCdsP
- PLC-type DSP controller
- Other company’s PLC
- PROFIBUS DP
- DeviceNet
- DC stage
- VF66B series inverter
- ED motor
- Permanent magnet synchronous motor
- UF motor
- Induction motor for inverter
- VF66R/VF64R
- Regenerative converter (common converter)

Power supply equipment

- Touch panel
- Computer
- μGPCdsP PLC-type DSP controller
- Other company’s PLC
- VF66B
- VF66CH/CH66 DC power supply equipment (battery simulator)

TNS flexibly builds optimal network systems, according to network level.
High-speed/advanced-function FA controller

μGPCsH

This controller has complete program compatibility with the μGPC Series, features improved communication interface speed, and offers exceptional connectivity with host PCs, touch panels, and other equipment.

Features/functionality

Easy-to-understand μGPC language and rich open networks

The μGPC language employs easy-to-understand ladder symbols and dataflow symbols, enabling unrestricted real-number operations. It also supports open networks, including Ethernet, FL-net (OPCN-2), OPCN-1, PROFIBUS DP, and DeviceNet, making it easy to build a distributed control system.

Programming tool providing a convenient design environment

- Simulation functionality: Even digital/analog conditions can be freely set.
- Traceback functionality: Up to 16 digital and 16 analog points. Trigger conditions and sample cycle can also be freely set.
- Log functionality: CPU operation log can be viewed in the order that information was recorded. Up to 1,024 communication log entries can be stored.
- Other functionality: Editing, debugging, and document creation.

Web-based remote monitoring

The controller is equipped with web-based monitoring functionality for the status I/O state of PLC via the Internet, making it possible to monitor faults, operation data, and system operation, as well as conduct maintenance, all with a web-based interface. In addition, event-driven data transmission is possible via email.

Specifications

<table>
<thead>
<tr>
<th>Application</th>
<th>Small to large-scale system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs/outputs</td>
<td>Max. 8,192</td>
</tr>
<tr>
<td>Program capacity</td>
<td>320 k words</td>
</tr>
<tr>
<td>Processing speed</td>
<td>Logic operations: 0.1 μS (contact instructions), Real number operations: 0.15 μS (addition operations)</td>
</tr>
<tr>
<td>IP class/cooling method</td>
<td>Built-in IP30 control panel/Natural cooling</td>
</tr>
<tr>
<td>Operating ambient temperature</td>
<td>0~55 °C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-25~85 °C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>20 to 95% RH (no condensation allowed)</td>
</tr>
<tr>
<td>Operating altitude</td>
<td>2,000 m above sea level or less</td>
</tr>
<tr>
<td>Web-based remote monitoring</td>
<td>Simultaneous connection: 5, HTTP version: 1.0-1.1, Security: BAIC authentication, Number of accounts: 16</td>
</tr>
</tbody>
</table>

Separate catalog: Available
PLC-type DSP controller

μGPCdsP

This high-speed μGPC controller is equipped with digital signal processor. It supports MATLAB/Simulink* for improved productivity on a wide array of systems.

Features/functionality

Support for high-speed, high-precision motor control

μGPCdsP can be applied to a wide variety of systems, including automotive measurement equipment, metal and resin production lines, and injection molding machines. The processor module executes motor feedback operations within 100 μs. An innovative drive system can be built by connecting the controller with the VF66C high-speed, high-response inverter.

Exceptional compatibility with MATLAB/ Simulink*

The processor module dramatically improves productivity by simultaneously executing ladders, dataflow operations, and control blocks designed using MATLAB/Simulink.*

Programless TDdsP Monitor for debugging support

MATLAB/Simulink*: Programless TDdsP Monitor for simplifying debugging and helping to reduce test time.

Specifications

<table>
<thead>
<tr>
<th>Name</th>
<th>SHPC-115-Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs/outputs</td>
<td>8,192 points max.</td>
</tr>
<tr>
<td>Program capacity</td>
<td>1,280 kB (approx. 2,000 pages)</td>
</tr>
<tr>
<td>Instruction execution time</td>
<td>Sequence instruction: 0.1 μs to 0.52 μs, Response instruction: 0.1 μs 20 μs</td>
</tr>
<tr>
<td>IP class/cooling method</td>
<td>Built-in IP30 control panel/Natural cooling</td>
</tr>
<tr>
<td>Operating ambient temperature</td>
<td>0~55 °C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-25~85 °C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>20 to 95% RH (no condensation allowed)</td>
</tr>
<tr>
<td>Operating altitude</td>
<td>2,000 m above sea level or less</td>
</tr>
</tbody>
</table>

*MATLAB and Simulink are registered trademarks of The MathWorks, Inc.

Separate catalog: Available
### Intelligent inverter
**VF66B**
Mother inverter of the VF66 family. Supports a wide range of applications and customization for your system.

### Control-separated inverter
**VF66D**
Separates inverter control from the power unit, while communicating between the two. Equipment can be separated by 100 m, and there can be a maximum of 150 units for a simplified control system.

### Inverter for sync control systems
**VF66AD**
A sync control feature has been added to the VF66SV.

**VF66PD**

### High-capacity, water-cooled inverter/converter
**VF64(R)HPW**
Each unit is 250 kW for up to 1,000 kW when four are used in parallel. A compact size has been enabled by the use of a high-capacity IGBT and water cooling.

### High-speed, high-response, high-frequency inverter
**VF66C**
Delivers a high-torque response of 1,500 Hz, as well as an output frequency of 1,500 Hz. (Special specification-compatible product)

### High-capacity AC servo amp
**VF66SV**
Delivers a speed control range of 1 to 10,000. Offers a high resolution of 33,554,432 p/r thanks to the use of a 25-bit ABS encoder for position control.

### DC power supply
**VF66CH**
**CH66**
30 kW or higher models are equipped with a battery simulator mode.

### Regenerative converter
**VF64R**
Supports a 120-degree electrical connection mode, regeneration-only HC functionality, and open networks, in addition to the functionality of VF61R. (Capacity range: 75 to 1,000 kW)

**VF61R**
Dramatically suppresses harmonics by using our proprietary switching system. Delivers a high 99% power factor at rated load. (Capacity range: 11 to 55 kW)

### Other inverters
We offer inverters that are perfectly customized for our customers’ needs, including newly developed models.
Intelligent inverter
VF66B

The VF66B inverter lets you implement all your ideas, including energy conservation, thanks to its host of applications, customizable functionality, and PC tools that support design and testing.

Features/functionality

Customizable functionality for your system (built-in PLC function)
The built-in PLC function of the VF66B has 18 control blocks, 36 dataflow blocks, and 5 ladder blocks—and with customized combinations, can be configured for any type of control system you want. (Program capacity is 16 kB for about 1,024 steps)

Support for a host of applications
The VF66B inverter, a fusion of our motor drive technologies developed over many years, is a versatile product that delivers induction motor and ED motor drive, and includes five modes in a single unit.

Application to international standards
The VF66B inverter comes in models that comply with European Standards and UL Standards. They are equipped with STO functionality that conforms with PLd and SIL2 to further increase safety. Please contact us for more information.

Specifications

<table>
<thead>
<tr>
<th>Control method</th>
<th>5 modes: EDM/IM vector control with speed sensor, EDM/IM vector control without speed sensor, and IM V/f control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>200 V class: 2.2 to 180 kW 400 V class: 2.2 to 1,000 kW</td>
</tr>
<tr>
<td>Rated power</td>
<td>200<del>220 V 380</del>460 V±10% 50/60 Hz±5%</td>
</tr>
<tr>
<td>Output frequency</td>
<td>0.1~400 Hz</td>
</tr>
<tr>
<td>Overload capacity</td>
<td>150% for 1 minute 200% for 3 seconds (when at low temperature, 75 kW or more is 150% max)</td>
</tr>
<tr>
<td>Network options*</td>
<td>OPCN-1, PROFIBUS DP, DeviceNET, CC-Link, RS422/485 (Motibus RTU), RS232C</td>
</tr>
<tr>
<td>Input signal</td>
<td>Analog 0 to 10 V±10 V/4 to 20 mA (standard 1 CH, optional max 2CH, external 2CH)</td>
</tr>
<tr>
<td>Output signal</td>
<td>5 terminals standard, 6 terminals optional</td>
</tr>
<tr>
<td></td>
<td>Analog 0 to ±10 V (Standard 1CH, Optional max 2CH), PWM for 6x output frequency for rotation/frequency measurement</td>
</tr>
</tbody>
</table>

* • OPCN-1: Japan Electrical Manufacturers’ Association’s OPCN-1 standard spec
* • PROFIBUS DP: PROFIDRIVE-Profile compliance
* • DeviceNET: ODVA conformance test software v.A-14 compliant

Compliance labels

Affixed to inverters that comply with Low Voltage Directive 2006/95/EC and ECM Directive 2004/108/EC.

Affixed to inverters that comply with Machinery Directive 2006/42/EC.

Affixed to inverters that comply with UL508C.
High-speed, high-response, high-frequency inverter
VF66C

An inverter that delivers a torque response frequency of 1,500 Hz by employing high-speed communication and a new electric current control method.

Features/functionality

High-speed torque response

A torque response of 1,500 Hz or more along with high-speed current operation/vector control operation output was achieved by employing a new electric current control method.

Achieves a maximum output frequency of 1,500 Hz (Special specification-compatible product)

Delivers an output frequency of 1,500 Hz as a vector control inverter, and achieves a maximum RPM of 16,000 min\(^{-1}\) when combined with a 6-pole S-DSD series motor.

Adapts to complex control systems

Enables high-speed, high-response digital sync control by performing high-speed communication with a μGPCdsP loaded with control code designed using MATLAB/Simulink.*

Specifications

<table>
<thead>
<tr>
<th>Control method</th>
<th>Vector control with speed sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>200 V class: 30 to 180 kW Max. current: 1,020 A   400 V class: 30 to 1,000 kW Max. current: 1,840 A</td>
</tr>
<tr>
<td>Rated power</td>
<td>200<del>220 V 380</del>460 V±10% 50/60 Hz±5%</td>
</tr>
<tr>
<td>Output frequency</td>
<td>0 to 550 Hz (supports up to 1,500 Hz with a special specification product)</td>
</tr>
<tr>
<td>Overload capacity</td>
<td>150% for 1 minute  200% for 3 seconds (when at low temperature, 75 kW or more is 150% max)</td>
</tr>
<tr>
<td>Network</td>
<td>Ethernet 100 Mbps (Number of units 1:1)</td>
</tr>
<tr>
<td>Input signal</td>
<td>Analog ±10 V/4 to 20 mA (2CH) 12-bit 1CH has a response speed of 83 μsec (6 multifunction inputs)</td>
</tr>
<tr>
<td>Output signal</td>
<td>Analog ±10 V (3CH) signed 12-bit 1CH has a response speed of 83 μsec (4 multifunction inputs)</td>
</tr>
</tbody>
</table>

*MATLAB and Simulink are registered trademarks of The MathWorks, Inc.
Control-separated inverter

VF66D

This control-separated inverter aims for a simplified control system by separating speed/position sensor input and various interfaces from the inverter and concentrating them in a control unit.

Features/functionality

Simplified control system

This control-separated inverter concentrates input, such as speed information/sensors, and various interfaces on the PLC end. Control is performed by the PLC and the inverter is specialized for drive. Communication between the devices ties the whole system together.

Separation between control and inverter: 100 m or less

The power section can be set up near the field, thereby reducing emission noise, and enabling a system of up to 150 units to be configured.

Improved freedom of power section design

Isolating control from the power section made possible a wide variety of combinations, including those with a variety of supply voltages and power sections.

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control method</td>
<td>5 modes: EDM/IM vector control with sensor, EDM/IM vector control without sensor, and IM V/f control</td>
</tr>
<tr>
<td>Capacity</td>
<td>200 V class: 2.2 to 180 kW 400 V class: 2.2 to 1,000 kW</td>
</tr>
<tr>
<td>Rated power</td>
<td>200<del>220 V 380</del>460 V±10% 50/60 Hz±5%</td>
</tr>
<tr>
<td>Output frequency</td>
<td>0.1~330 Hz</td>
</tr>
<tr>
<td>Overload capacity</td>
<td>150% for 1 minute 200% for 3 seconds (when at low temperature, 75 kW or more is 150% max)</td>
</tr>
<tr>
<td>Speed control precision/range</td>
<td>Same as VF66B spec</td>
</tr>
<tr>
<td>I/O signal</td>
<td>Same as μGPCsH spec</td>
</tr>
<tr>
<td>Network</td>
<td>OPCN-1, PROFIBUS DP, DeviceNET, CC-Link, RS422/485, RS232C, Modbus RTU, CAN</td>
</tr>
<tr>
<td>Max number of units</td>
<td>150</td>
</tr>
</tbody>
</table>
High-capacity AC servo amp
VF66SV

From hydraulic to electric servo—A revolution in the structure of industrial machinery.
Welcome to the world of high-capacity servos.

Features/functionality

VF66SV servo amp with built-in high precision positioning function

Speed control range of 1 to 10,000
The combination of a servo motor and high-resolution encoder enables a speed control rate of 1 to 10,000 using real number operations.
25-bit angle/position control
A high-resolution angle control/position control of 33,554,432 p/r is achieved using a 25-bit absolute encoder.

Servo motor with low inertial and a high output of 505 kW
The S-DSD series of high-speed, low-inertia motors has a maximum RPM of 16,000 min⁻¹ and is capable of a torque response frequency of up to 2.4 kHz.*
*Special specification-compatible product
*Detailed specifications are provided on page 27.
*Please contact us for more information.

Direct-drive motor with max torque of about 8,000 Nm
Delivers acceleration performance and high-precision control not possible with conventional deceleration mechanisms.
(Application example)
11 kW 0 to 2 0 min⁻¹ Rated torque: 5,252 Nm Max. torque: 7,878 Nm
55 kW 0 to 300 min⁻¹ Rated torque: 1,751 Nm Max. torque: 2,626 Nm
*Detailed specifications are provided on page 26.

Specifications

<table>
<thead>
<tr>
<th>Control method</th>
<th>Vector control with speed sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>200 V class: 5.5 to 180 kW   400 V class: 2.2 to 1,000 kW</td>
</tr>
<tr>
<td>Rated power</td>
<td>200<del>220 V  380</del>460 V±10%  50/60 Hz±5%</td>
</tr>
<tr>
<td>Output frequency</td>
<td>0 to 550 Hz (supports up to 1,500 Hz with a special specification product)</td>
</tr>
<tr>
<td>Overload capacity</td>
<td>150% for 1 minute  200% for 3 seconds (when at low temperature, 75 kW or more is 150% max)</td>
</tr>
<tr>
<td>Network</td>
<td>Conforms with PROFIBUS DP, CC-Link, OPCN-1 and other fieldbuses</td>
</tr>
<tr>
<td>Input signal</td>
<td>Analog ±10 V (2CH)  8 multifunction inputs</td>
</tr>
<tr>
<td>Output signal</td>
<td>Analog ±10 V (2CH)  3 multifunction outputs</td>
</tr>
</tbody>
</table>
Inverter for sync control system
VF66AD/VF66PD

These are advanced function models equipped with the sync control function and high-precision drawing control function of the continually evolving VF66SV.

Features/functionality
VF66AD: Absolute sync control
We have commercialized absolute sync control and delivered countless commercial rotary press drive systems. Absolute sync performs rotation commands and motor rotation feedback via numeric data. To achieve a resolution of 33,554,432 Digit/r, SHPC-175-Z is used for the rotation command module and an absolute encoder for the motor.

VF66PD: Incremental sync control
The VF66PD is the successor to the VF64SDS inverter. It applies incremental sync control to the VF64SDS inverter, and we have already delivered countless numbers to our customers. VF66PD’s sync control uses a PG emulator module that generates A, B, Z phases in commands. It uses SHPC-172-Z as a PG emulator module and an incremental encoder for a motor, thereby achieving 76,800 P/r.

Example application to sectional drive system
This is an example of applying VF66AD to a shaftless rotary press. It achieves a speed control precision of ±0.001% and delivers sectional drive at a precision never before possible. The bottom step represents the speed command for the motor, and the top waveform represents the changes in rotation position error ΔP.

Specifications
<table>
<thead>
<tr>
<th>Control method</th>
<th>Vector control with speed sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>200 V class: 5.5 to 180 kW 400 V class: 2.2 to 1,000 kW</td>
</tr>
<tr>
<td>Rated power</td>
<td>200<del>220 V 380</del>460 V±10% 50/60 Hz±5%</td>
</tr>
<tr>
<td>Output frequency</td>
<td>0.1~400 Hz</td>
</tr>
<tr>
<td>Overload capacity</td>
<td>150% for 1 minute 200% for 3 seconds (when at low temperature, 75 kW or more is 150% max)</td>
</tr>
<tr>
<td>Network</td>
<td>OPCN-1</td>
</tr>
<tr>
<td>Input signal</td>
<td>Analog ±10 V (2CH) 8 multifunction inputs</td>
</tr>
<tr>
<td>Output signal</td>
<td>Analog ±10 V (2CH) 3 multifunction outputs</td>
</tr>
</tbody>
</table>
DC power supply

VF66CH/CH66

We carry two models of direct power supply units (choppers). The VF66CH step-down chopper and the CH66 step up/down chopper are bi-directional non-isolated DC/DC converters for fulfilling the demands of recent years, including power storage and battery charger/dischargers.

Features/functionality

Customizable functionality for your system (built-in PLC function)

The built-in PLC function has a relay circuit, 18 control block circuits, and 36 dataflow circuits, allowing you to configure any type of control you want within the inverter. (Program capacity is 16 kB for about 1,024 steps.)

Network compatible

Compatibility with OPCN-1, PROFIBUS DP, RS422/485, and RS232C networks allow you to build a variety of systems via data communication with other equipment, including inverters.

Battery simulator

Units rated 30 kW or more are equipped with a battery simulator mode, which allows the simulation of charging/discharging an actual device by setting the electrical characteristics of the battery.

Specifications

<table>
<thead>
<tr>
<th>Product name</th>
<th>VF66CH (step-down chopper)</th>
<th>CH66 (step-up/down chopper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control mode</td>
<td>AVR, ACR, BTS (battery simulator)</td>
<td></td>
</tr>
<tr>
<td>Rated input voltage</td>
<td>DC462<del>716 V/AC200</del>220, 380~460 V±10%</td>
<td>DC462~716 V</td>
</tr>
<tr>
<td>Output voltage range</td>
<td>10% to 90% of input DC voltage</td>
<td>50~750 V</td>
</tr>
<tr>
<td>Rated output current</td>
<td>48~1,200 A</td>
<td>100~500 A</td>
</tr>
<tr>
<td>Network</td>
<td>OPCN-1, RS422/485, RS232C</td>
<td></td>
</tr>
<tr>
<td>Input signal</td>
<td>Analog 0 to 10V/±10V/4~20 mA (standard 1CH, optional 2CH) 5 multifunction inputs</td>
<td>Analog 0 to 10V/±10V/4~20 mA (standard 1CH, optional 2CH) 2 multifunction outputs</td>
</tr>
<tr>
<td>Output signal</td>
<td>Analog 0 to 10V/±10V/4~20 mA (standard 1CH, optional 2CH) 2 multifunction outputs</td>
<td></td>
</tr>
</tbody>
</table>
**Advanced-function, high-capacity, water-cooled inverter/ converter**

**VF64(R)HPW**

This 1,000 kW max inverter/ converter uses a high-capacity IGBT and achieves high capacity in a small space by employing water-cooled design.

### Features/functionality

#### Unit configuration

Each unit is 250 kW for up to 1,000 kW when four are connected in parallel. Performing current balance control between units connected in parallel eliminates the balance reactor, and a compact size has been enabled by the use of a high capacity IGBT and water-cooling.

#### Built-in HC function and sequence function

The HC function implements high-speed operations by combining approximately 30 super blocks that use a high-speed CPU for high-precision, high-response control of motor drive. The sequence function enables the building of approximately 100-step ladder programs within the inverter.

#### Support using PC tools

Monitoring of operation status and data collection are possible by utilizing the traceback/trend function, enabling precise engineering that quickly responds to system construction. Settings can be easily changed, exported, and copied using a PC.

### Specifications

<table>
<thead>
<tr>
<th>Control method</th>
<th>Vector control with a sensor, vector control without a sensor, and Vf control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>400 V class: 750 kW, 1,000 kW, max current 1,840 A (at 1,000 kWh)</td>
</tr>
<tr>
<td>Rated power</td>
<td>380~460 V±10%, 50/60Hz±5%</td>
</tr>
<tr>
<td>Output frequency</td>
<td>0~245 Hz</td>
</tr>
<tr>
<td>Overload capacity</td>
<td>150% for 1 minute</td>
</tr>
<tr>
<td>Network</td>
<td>OPCN-1, PROFIBUS DP, DeviceNET, RS422/485, RS232C</td>
</tr>
<tr>
<td>Input signal</td>
<td>Analog 0 to ±10 V/±10 V/±20 mA (Standard 1CH, Optional max 2CH, External 2CH) 6 multifunction inputs</td>
</tr>
<tr>
<td>Output signal</td>
<td>Analog 0 to ±10 V (Standard 1CH, Optional max 2CH), PWM for 6x output frequency for rotation/frequency 4 multifunction outputs</td>
</tr>
</tbody>
</table>
Regenerative converter
VF61R

This regenerative converter is capable of continuous operation and a power supply rate of nearly 1.0, while suppressing current distortion factor using our proprietary switching method and being less susceptible to the effects of supply voltage distortion. This meets the demand for clean power supplies.

**Features/functionality**

**Dramatic suppression of power harmonics by means of our proprietary control method (instantaneous distortion minimization control)**

Contributes to clean power sources by suppressing overall current distortion at the rated load to 5% or less and conforming to guidelines for harmonic suppression measures.

**High power factor**

The value of the operation power factor is 99% or more at the rated load and 95% or more at 30% or more of the rated load. This enables the equipment to be built smaller than before.

**100% continuous power regeneration operation**

Delivers the capabilities of a regenerative converter for AC drive, whether used alone or with multiple units. The operation of multiple units is particularly advantageous because power regeneration has the added effect of power cancelation and high AC drive efficiency, and combining these with a high power rate results in a further reduction in equipment load.

**Specifications**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>11~55 kW</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>3-phase 3-wire 200 V class: 200 to 230 V ±10% 50/60 Hz ±5% 400 V class: 380 to 460 V ±10% 50/60 Hz ±5%</td>
</tr>
<tr>
<td>Input power rate</td>
<td>99% or more (at 100% load) 95% or more (at 30% load or more)</td>
</tr>
<tr>
<td>High frequency percentage</td>
<td>5% or less (at 100% load)</td>
</tr>
<tr>
<td>DC output voltage</td>
<td>200 V class: 320 to 358 V 400 V class: 640 to 716 V</td>
</tr>
<tr>
<td>Overload capacity</td>
<td>150% for 1 minute</td>
</tr>
</tbody>
</table>

Separate catalog: Available
Regenerative converter
VF64R

The VF64R regenerative converter further advances the VF61R, with consideration for the power supply environment, options for system upgrades, and open network support.

Features/functionality

Control modes: PWM sine wave converter mode and 120-degree electric current mode
Customers can choose either PWM sine wave converter mode or 120-degree electric current mode (regeneration function only), whichever is best suited to the installation environment.

Multiple options for system upgrades
The HC function implements high-speed operations by combining approximately 30 super blocks that use a high-speed CPU for high-precision, high-response control of motor drive. The sequence function enables the building of approximately 100-step ladder programs within the inverter. Design/adjustment using PC tools is also supported.

Open network support
A variety of open networks are supported by using optional cards, allowing the construction of networks with a variety of devices, including those that output commands to converters and those that monitor converter status.
* See page 9 (Toyo Network System)

Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>200 V class: 75 to 180 kW</th>
<th>400 V class: 75 to 1,000 kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>75 to 100 kW</td>
<td>75 to 1,000 kW</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>3-phase 3-wire 200 V class: 200 to 230 V ±10% 50/60 Hz ±5%</td>
<td>400 V class: 380 to 460 V ±10% 50/60 Hz ±5%</td>
</tr>
<tr>
<td>Input power rate</td>
<td>99% or more (at 100% load)</td>
<td>95% or more (at 30% load or more)</td>
</tr>
<tr>
<td>High frequency percentage</td>
<td>5% or less (at 100% load)</td>
<td></td>
</tr>
<tr>
<td>DC output voltage</td>
<td>200 V class: 312 to 58 V  400 V class: 600 to 716 V</td>
<td></td>
</tr>
<tr>
<td>Overload capacity</td>
<td>150% for 1 minute</td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>OPCN-1,RS422 / 485,RS232C</td>
<td></td>
</tr>
</tbody>
</table>
**Motor Lineup**

**Permanent magnet synchronous motor**

**ED Motor (IPM Synchronous Motor)**

Small, lightweight motor with approximately two times the bearing life, delivering dramatic energy savings.

**Induction motor for inverter**

**UF Motor**

A small, sturdy, highly versatile induction motor with wide range of speeds and a low-noise design.

**Direct Drive Motor**

Delivers high torque at super low speeds. We have a variety of motors that have the torque and rotating speeds you need.

**Dynamic Spin Dynamo**

**Low-Inertia Motor (DSD series)**

Boasts super low inertia, can be used for servo applications, and achieves transient characteristics on the same level as an actual vehicle in automotive tests. Also capable of being attached under the same conditions as an actual vehicle.

**Other motors**

We offer motors that are perfectly customized for our customers’ needs, including newly developed models.
Permanent magnet synchronous motor

**ED Motor**
(IPM Synchronous Motor)

Our Eco-Drive (ED) motors deliver super high efficiency in a small size, making them both economical and ecological.

### Features/functionality

**Delivers energy savings**

Using our ED motors dramatically reduces CO₂ emissions and saves energy. They deliver about 3% more efficiency than the NEMA standard for high-efficiency motors and 5% more for induction motors for our UF series inverters, thereby helping to lower our customer’s costs.

**Long bearing life decreases maintenance costs**

Rotor loss is extremely low, which keeps bearing temperature low and extends their life by about a factor of two over induction motors. And since bearings do not have to be replaced very often, maintenance costs can be kept down.

**Small size and light weight enable wide-ranging applications**

Both weight and size have been reduced by 50% compared to a conventional induction motor (110 kW, 1,800 min⁻¹ model). The use of an ED motor gives you freedom of design for a wide range of machinery.

### Further noise reduction through water cooling

Water cooling (optional) dramatically cuts noise, just one more way this motor is environmentally friendly.

The water jacket section is plated, allowing the use of factory coolants as is.

### Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of poles</td>
<td>6 pole</td>
</tr>
<tr>
<td>Output</td>
<td>1.5 to 750 kW (Water cooling is for 45 kW and up)</td>
</tr>
<tr>
<td>Rotating speed</td>
<td>1,200/1,500/1,800 min⁻¹ (Constant power range: 1:1.33 of base speed)</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>190/380 V</td>
</tr>
<tr>
<td>Protection</td>
<td>IP44</td>
</tr>
<tr>
<td>Attachment method</td>
<td>Leg-mounted standalone (side) Options: Upright, flange-mounted</td>
</tr>
<tr>
<td>Overload capacity</td>
<td>150% for 1 minute</td>
</tr>
<tr>
<td>Attachments</td>
<td>Optocoder, cooling fan, and PTC thermistor element</td>
</tr>
</tbody>
</table>

**ED motor energy savings of Energy savings over 5 years** (Compared to an induction motor)

**Bearing life in induction motors**

27,000h

**Bearing life in ED motors**

47,000h

**Comparison of bearing life**

**Capacity (kW)**

<table>
<thead>
<tr>
<th>Output</th>
<th>185kW</th>
<th>250kW</th>
<th>375kW</th>
<th>450kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotating speed</td>
<td>1,200min⁻¹</td>
<td>1,200min⁻¹</td>
<td>1,200min⁻¹</td>
<td>1,200min⁻¹</td>
</tr>
<tr>
<td>Noise value of air-cooled models</td>
<td>50Hz</td>
<td>79.8dB(A)</td>
<td>79.8dB(A)</td>
<td>85.7dB(A)</td>
</tr>
<tr>
<td>Noise value of water-cooled models</td>
<td>60Hz</td>
<td>83.8dB(A)</td>
<td>83.8dB(A)</td>
<td>88.4dB(A)</td>
</tr>
<tr>
<td>Noise value of water-cooled models</td>
<td>50/60Hz</td>
<td>75 dB (A) or less</td>
<td>75 dB (A) or less</td>
<td>75 dB (A) or less</td>
</tr>
</tbody>
</table>

**Noise value of water-cooled motor**

**Separate catalog: Available**

---

*Note: Additional data and information may be available in the separate catalog.*
Induction motor for inverter

UF Motor

Low-noise, environmentally friendly motors for driving a variety of machinery.

Features/functionality

Wide range of speeds
These motors are capable of continuous operation at a constant output, from 0 min⁻¹ to base speed, and from constant torque and base speed to maximum speed. A value of 0 min⁻¹ means that the motors support stalling¹ as well as a wide power constant region² of 1:4 or more. This makes them a powerful solution for driving all manner of process lines.
¹ Stall time is determined by the motor’s stall time characteristic.
² The power constant range is determined by the motor’s design.

High response
Rotor inertia is low, which enables extremely fast speed control response. When used in combination with a VF66B series inverter, wide ranging speed control and high speed precision are added to the mix, making it possible to provide systems with the differential speed performance required by process lines.

Low-noise design
A special design enables a low noise level of 75 to 84 dB (A) for a single motor during inverter operation.
112, 132, 160L, 180L ........... 75 dB (A)
200L ................................ 78 dB (A)
250S, 250M ....................... 82 dB (A)
315S, 315M ..................... 84 dB (A)

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of poles</td>
<td>4 pole</td>
</tr>
<tr>
<td>Output</td>
<td>0.75~250 kW</td>
</tr>
<tr>
<td>Rotating speed</td>
<td>1,200/1,800 min⁻¹</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>200/400 V</td>
</tr>
<tr>
<td>Protection</td>
<td>IP44</td>
</tr>
<tr>
<td>Attachment method</td>
<td>Leg-mounted standalone (side) Options: Upright, flange-mounted</td>
</tr>
<tr>
<td>Overload capacity</td>
<td>150% for 1 minute</td>
</tr>
<tr>
<td>Attachments</td>
<td>Optocoder, cooling fan, and PTC thermistor element</td>
</tr>
</tbody>
</table>

Separate catalog: Available
Direct Drive Motor

Our direct drive motors deliver high torque as well as acceleration performance and high-precision control that are not possible with conventional speed reduction mechanisms. This makes them optimal for the manufacture of high-grade film.

Features/functionality

Customizable high-torque, super low-speed motors
These motors deliver a high torque/super low speed of about 8,000 Nm/20 min⁻¹. We offer motors with the torque and rotating speeds that meet our customers’ demands.

Low noise, low maintenance thanks to gearless design
The use of a direct drive motor frees you from troublesome gear maintenance and contributes to low-noise systems that last longer.

Optimal for high-grade film manufacturing
These motors employ a 25-bit high-resolution encoder. Combine them with a VF66SV servo amp to enable super high-precision speed and drawing control. Furthermore, there is no gear backlash, making them optimal for high-grade film manufacturing.

*Detailed specifications are provided on page 17.*

Specifications (sample)

<table>
<thead>
<tr>
<th>For driving casting rolls</th>
<th>For driving tenters/extruders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>Output</td>
</tr>
<tr>
<td>11 kW</td>
<td>55 kW</td>
</tr>
<tr>
<td>Rotating speed</td>
<td>Rotating speed</td>
</tr>
<tr>
<td>0~20 min⁻¹</td>
<td>0~300 min⁻¹</td>
</tr>
<tr>
<td>Rated torque</td>
<td>Rated torque</td>
</tr>
<tr>
<td>5,252 Nm</td>
<td>1,751 Nm</td>
</tr>
<tr>
<td>Max torque</td>
<td>Max torque</td>
</tr>
<tr>
<td>7,878 Nm</td>
<td>2,626 Nm</td>
</tr>
</tbody>
</table>

Customizable according to customer requirements

<table>
<thead>
<tr>
<th>Common specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting torque</td>
</tr>
<tr>
<td>Overload capacity</td>
</tr>
<tr>
<td>Protection</td>
</tr>
<tr>
<td>Cooling method</td>
</tr>
<tr>
<td>Insulation type</td>
</tr>
<tr>
<td>Temperature rise</td>
</tr>
<tr>
<td>Lubrication method</td>
</tr>
<tr>
<td>Sensor</td>
</tr>
</tbody>
</table>

Use environment

<table>
<thead>
<tr>
<th>Ambient temperature</th>
<th>Relative humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10~40 °C</td>
<td>95% RH or less</td>
</tr>
<tr>
<td>Elevation</td>
<td>1,000 m or less</td>
</tr>
<tr>
<td>Use location</td>
<td>Indoors</td>
</tr>
</tbody>
</table>
Dynamic spin dynamo

Low-Inertia Motor (DSD Series)

These motors boast super low inertia and are optimal for servo applications and automotive testing.

**S-DSD**

Slender Dynamic Spin Dynamo

- Use high-speed, low-inertia motor to enable transient operation simulating a real vehicle.
- Drive motor height adjustment mechanism enables simulation of drive characteristics using same engine mounting as real vehicle.
- Differential rotating speed and differential torque control simulates driving characteristics of a real vehicle.
- High output dynamo reproduces acceleration test driving.

**H-DSD**

Heavy Duty Dynamic Spin Dynamo

- Reproduce drive characteristics of a real vehicle through virtual control of engine load (engine virtual and real simulator, or VRS).
- Offers virtual engine model control and virtual vehicle model control to simulate real vehicle drive characteristics from a bench testing machine.

Sample configuration of dynamo equipment for automotive testing

These dynamos enable you to build test systems that shorten development schedules and improve performance in the development of next-generation automobiles. We support systems with all sorts of configurations based on our customers’ requirements. Please contact us for more information.

Separate catalog: Available

---

Note: Can be customized to customer specification.
Features/functionality

Lowest inertia in the industry
To reproduce the responsiveness of an engine, we pursued low inertia even further based on a low-inertia permanent magnet sync motor (ED motor). The inertia moment (J) of our S-DSD series motors is one-tenth that of other motors with the same output.

Transient operation on the level of a real vehicle
Combining a low-inertia S-DSD series dynamo with a VF66C high-response inverter enables a torque frequency response of 2.4 kHz. This makes it possible to better reproduce behaviors that approach actual automobile engines.
*See page 15 for more in depth specifications.

Capable of being attached under the same conditions as an actual vehicle
Size and weight have been dramatically reduced compared to ordinary ED and UF motors. Configurations that approximate an actual vehicle, which has been impossible in the past, such as FF transaxel testers, are now possible. And when combined with a drive mechanism that moves up, down, and side to side, tests under the same conditions as an actual vehicle are now possible.

Specifications

<table>
<thead>
<tr>
<th>Types</th>
<th>Output</th>
<th>Base rotating speed</th>
<th>Max rotating speed</th>
<th>Inertia (J)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Induction motor</td>
<td>220kW</td>
<td>~505 kW</td>
<td>~505 kW</td>
<td>0.73 kg•m²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4,000 min⁻¹</td>
<td>8,000 min⁻¹</td>
<td></td>
</tr>
<tr>
<td>S-DSD</td>
<td>220kW</td>
<td>~275 kW</td>
<td>~275 kW</td>
<td>0.073 kg•m²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4,000 min⁻¹</td>
<td>8,000 min⁻¹</td>
<td></td>
</tr>
</tbody>
</table>

Comparison of inertia values between an induction motor and S-DSD

<table>
<thead>
<tr>
<th>Types</th>
<th>Output</th>
<th>Base rotating speed</th>
<th>Max rotating speed</th>
<th>Inertia (J)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Induction motor</td>
<td>220kW</td>
<td>~505 kW</td>
<td>~505 kW</td>
<td>0.73 kg•m²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4,000 min⁻¹</td>
<td>8,000 min⁻¹</td>
<td></td>
</tr>
<tr>
<td>S-DSD</td>
<td>220kW</td>
<td>~275 kW</td>
<td>~275 kW</td>
<td>0.073 kg•m²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4,000 min⁻¹</td>
<td>8,000 min⁻¹</td>
<td></td>
</tr>
</tbody>
</table>

Common specifications

<table>
<thead>
<tr>
<th>Protection</th>
<th>IP42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation type</td>
<td>H</td>
</tr>
<tr>
<td>Attachment method</td>
<td>Leg-mounted standalone (side)</td>
</tr>
<tr>
<td>Cooling method</td>
<td>Water cooled</td>
</tr>
<tr>
<td>Starting torque</td>
<td>150%</td>
</tr>
<tr>
<td>Overload capacity</td>
<td>150% for 1 minute</td>
</tr>
<tr>
<td>Lubrication method</td>
<td>Grease lubricated/ Oil-air lubrication</td>
</tr>
<tr>
<td>Attachments</td>
<td>Speed detector PTC thermistor element</td>
</tr>
</tbody>
</table>

*Please consult us for torques exceeding the indicated values.
Power generation system using clean, renewable energies

Renewable energy

Our power generation equipment for distributed generation have undergone system upgrades that enable them to easily and efficiently configure clean power generation systems that use wind power, small-scale hydroelectric power, biomass, and other renewable energies through the use of state-of-the-art equipment.

Features/functionality

Small-sized permanent magnet synchronous generator Approximately half the weight of an induction generator

Compared to the average induction generator, our equipment delivers the same output with a lower center height and a dramatically lighter motor weight.

(About 32% to 57% lighter than the average induction generator.)

High efficiency

Using our permanent magnet synchronous generators (EDG), along with a converter for high-efficiency control, enables 94% total efficiency from the generator to the end of the power line when using a high-capacity model and 90% efficiency when using a low-capacity model.

Clean power

Stable voltage and frequency is delivered at the point of grid connection, even when the generator (drive unit) changes rotating speed, and the sine wave output current contains almost no harmonics.

Specifications

<table>
<thead>
<tr>
<th>Category</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generator</strong></td>
<td>Permanent magnet synchronous generator (EDG) 6P  11 to 500 kW 1,200 /1,500/1,800 min⁻¹</td>
</tr>
<tr>
<td><strong>Power conditioner control panel</strong></td>
<td>Output voltage 200/400 V±10%  50/60 Hz±5%</td>
</tr>
<tr>
<td></td>
<td>Capacity (power line end) 10~500 kW</td>
</tr>
<tr>
<td></td>
<td>Rated time Derating during continuous operation and minus power fluctuation</td>
</tr>
<tr>
<td></td>
<td>Overload capacity 150% for 1 minute</td>
</tr>
<tr>
<td></td>
<td>Control method Generator max efficiency control, distortion minimization phase shift PWM, Toyo Denki proprietary islanding detection</td>
</tr>
<tr>
<td></td>
<td>Use environment Indoor specs: 0 to +40 °C  85% RH or less  1,000 m elevation or less</td>
</tr>
</tbody>
</table>

Separate catalog: Available
For general emergency and disaster

**Power Generating Equipment**

Our cubicle-type power generating equipment for general emergencies and disasters complies with the cubicle-type independent power generation standard of Japan’s Fire Service Act. It does not require a dedicated generator room, allowing for easy installation when it is not possible to provide a fireproof room in existing or newly constructed buildings.

**Features/functionality**

**Small and lightweight**

Since all the equipment necessary for generator operation is housed in the cubicle, there is no need for troublesome wiring, pipework, and special foundation work, and installation is possible with an extremely small footprint.

**No dedicated generator room required**

There is no need to provide a generator room because this cubicle-type independent power producing equipment complies with the Fire Service Act. It can be easily installed in the corner of a utility room, on a rooftop, or in other suitable locations.

**Featuring speedy start-up and fully automatic operation**

Optimization of the engine and generator enables swift start up within 10 seconds, or within 40 seconds after a commercial power outage. In addition, microcomputer control delivers reliable startup and stable operation, and enables fully automatic operation with high reliability and operability.

**Output capacity range**

For general emergency and disaster use 3-phase diesel independent power producing equipment

<table>
<thead>
<tr>
<th>No.</th>
<th>Number of poles</th>
<th>Voltage (V)</th>
<th>Output (kVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>200 / 220</td>
<td>20 / 22.5 ~ 39 / 43</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>200 / 220</td>
<td>50 / 605 ~ 500 / 570</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>400 / 440</td>
<td>600 / 625 ~ 750 / 875</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>6,600</td>
<td>300 / 320 ~ 1,000 / 1,250</td>
</tr>
</tbody>
</table>

**Specifications**

<table>
<thead>
<tr>
<th>Application</th>
<th>Emergency backup power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standards</td>
<td>This product is compatible with the Fire Service Act of Japan and certified by electrical equipment technical standards by the JIS/JEC/EM and Nippon Engine Generator Association.</td>
</tr>
<tr>
<td>Structure</td>
<td>Cubicle (indoor or outdoor)</td>
</tr>
<tr>
<td>Environmental conditions</td>
<td>Ambient temperature: -5 to 40 °C, Relative humidity: 85% or less</td>
</tr>
<tr>
<td></td>
<td>Elevations: YT-25CK to YT-47CK: 150 m above sea level or less, ZT-66CK to KT-1250CKH: 300 m above sea level or less</td>
</tr>
<tr>
<td>Battery</td>
<td>Valve-regulated lead-acid battery (REH)</td>
</tr>
<tr>
<td>External coating color</td>
<td>YT-25CK to ZT-115CK: Munsell 5Y7/1 semigloss MT-135CK to KT-1250CKH: Munsell 5Y7/1</td>
</tr>
<tr>
<td>Noise spec*</td>
<td>Standard noise</td>
</tr>
<tr>
<td></td>
<td>Low noise (approx. 85 dB (A) at 1 m level) Super low noise (approx. 75 dB (A) at 1 m level)</td>
</tr>
</tbody>
</table>

*Noise values are averages for energy in four directions (in a semi-free sound field).*
Hybrid output

Tandem Generating Equipment

This rated-voltage, rated frequency, low-waveform-distortion generating equipment offers optimal power supply performance for backup power that can be used for computers, online devices, ATMs, precision equipment, and other equipment.

Features/functionality

Single-phase and three-phase power output with a single generator

This equipment is comprised of a single-phase/three-phase generator and a diesel engine with an electronic governor. It uses the electronic governor to minimize frequency variation in response to load fluctuation, thereby enabling single-phase or three-phase power output in a single unit.

<table>
<thead>
<tr>
<th>Number of poles</th>
<th>Voltage (V)</th>
<th>Output (kVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single phase</td>
<td>Three phase</td>
</tr>
<tr>
<td>4</td>
<td>105 / 210</td>
<td>210</td>
</tr>
<tr>
<td>4</td>
<td>105 / 210</td>
<td>210</td>
</tr>
</tbody>
</table>

Power switching between commercial power/generator power

High-speed Power Switching Equipment

This equipment instantly switches from commercial power to generator power and vice versa when there is a power outage, whether planned or otherwise. We deliver some thirty of these units to customers, including banks, each year.

Features/functionality

High-speed switching between commercial power/generator power

This equipment can switch the supply load between commercial power and generator power in 8 msec, which is instantaneous for all intents and purposes, thereby eliminating the need to shut down other equipment. And when combined with other generating equipment offered by our company, switching time can be accelerated even more.

Main circuit specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
</table>
| Switch | Single phase: High-speed switching of 1 or 2 circuits, 400 A or less  
Three phase: Normal switching of 1 circuit, 100 A or less  
Switches within 8 msec of sync point detection |
E³ Solution System

Energy Storage System for railway

Energy storage equipment recaptures and stores regenerative energy produced when trains brake, and then outputs that stored energy when trains accelerate, enabling the effective use of energy, and supporting line voltage stabilization.

Features

Energy
Energy-saving measures are being carried out in all manner of areas to use energy resources more effectively. The E³ Solution System contributes to energy-saving measures by effectively using electric power.

Ecology
The use of an exceptionally efficient lithium-ion battery contributes to effective power utilization by solving the problem of energy lost as heat.

Economy
Costs are lowered because there is no need for building new transformers to deal with voltage drop, insufficient power, increasing contracted power, or raising the capacity of power receiving equipment.

Functions

Prevention of regeneration cancellation
On train lines where regenerative cars have been introduced, line voltage rises and regeneration cancellation occurs when there are no other powered cars. This phenomenon is more pronounced the more regenerative cars there are on the train line, resulting in the wasting of regenerative power.

The E³ Solution System effectively stores excess regenerative power and supplies it to other powered cars.

Voltage drop compensation
When there is a large distance between the train and the power substation, line voltage drops, and during peak times when there are a lot of trains, voltage drops even further.

The installation of the E³ Solution System at the problem points limits voltage drop.

Power peak cut
High peak demand during morning and evening rush hours increases power costs. And as power demand grows each year, more power substations must be built.

The E³ Solution System cuts the use of contracted power by limiting power consumption at peak hours.

System capacity

<table>
<thead>
<tr>
<th>Line voltage</th>
<th>System capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>600/750 V</td>
<td>180kW 360kW</td>
</tr>
<tr>
<td>1,500 V</td>
<td>360kW 720kW</td>
</tr>
<tr>
<td>System</td>
<td>540kW 1,080kW</td>
</tr>
</tbody>
</table>

*Please contact us for information on system dimensions, weight, and other specs.

*System capacity is rated at 30 seconds.
**Total Support**

Total support available from Toyo Denki Group

---

**Maintenance**

Maintenance and consumable parts to keep equipment running optimally

It is extremely important to conduct diagnostics and maintenance on a regular basis to keep your electric equipment running optimally at all times. And having this job done by technicians well versed in advanced function/advanced performance products and who use their experienced eyes to spot problems keeps it all running in peak condition.

Legally mandated maintenance on emergency generators and other equipment that complies with the Fire Service Act is carried out by a variety of licensed technicians. There are different kinds of maintenance, including spot maintenance and routine maintenance, but we recommend an annual maintenance contract so that you know how your equipment is holding up over time and can keep operational costs under control. Let us assist you in purchasing the consumable parts and maintenance parts to keep your industrial equipment operating optimally.

Products subject to maintenance
- All industrial electric equipment (including DC control equipment)
- Electrical components for generators, engines, and auxiliary equipment
- Electrical components for water supply equipment, pumps, and auxiliary equipment

---

**Repair & Overhaul**

Preventative maintenance for preventing problems before they occur

The reliability of electrical equipment parts drops as they degrade and wear out over time. But accidents caused by degraded or worn parts are not limited to the parts themselves. They can also spread to healthy parts as well. Preventative maintenance is essential for preventing problems before they occur and keeping equipment running in a stable manner because it allows you to systematically repair and overhaul equipment based on operation time and visible signs gleaned from inspection results.

Products subject to maintenance
- Rotary machine equipment: DC motors and DC generators
- AC motors and AC generators
- Repair of control equipment and industrial control equipment
- Overhauls of generator electrical parts and engines
- Overhaul of water supply equipment parts and pumps

---

Example of motor disassembly/repair

Preventive maintenance is performed by disassembling motors, cleaning and drying rotors, stators, and other parts, and then impregnating insulation material and replacing bearings and other components.
In response to social demands, equipment at various facilities is constantly being renovated and updated to meet needs such as improving productivity, upgrading systems, securing operational safety, reducing production costs by lowering energy expenses, and reducing CO₂ emissions to achieve environmentally friendly operations. We take the customer’s perspective on these needs and meet them by combining our latest technologies with our field know-how. We then propose the most rational renovations and updates based on the unique lifecycle of each customer’s equipment and facilities.

Examples of renovations and updates
- Conversion from DC to AC motors (inverter drive)
- Conversion of AC commutator motors to inverter drives
- Updating of electrical parts that are no longer made
- Updating of worn controllers, including PLC
- Conversion of fixed-speed drive equipment to variable speed
- Conversion of mechanical transmission to electric transmission
- Updating of electrical equipment that has reached its maximum service life

**Example of water supply equipment update**

Updating the control panel and the motor to the latest inverter drive creates a system that saves energy and has low pressure variability.

**Example of electric part update for an electrical wire processing machine**

Updating the DC motor to ED motor drive saves energy and reduce maintenance.