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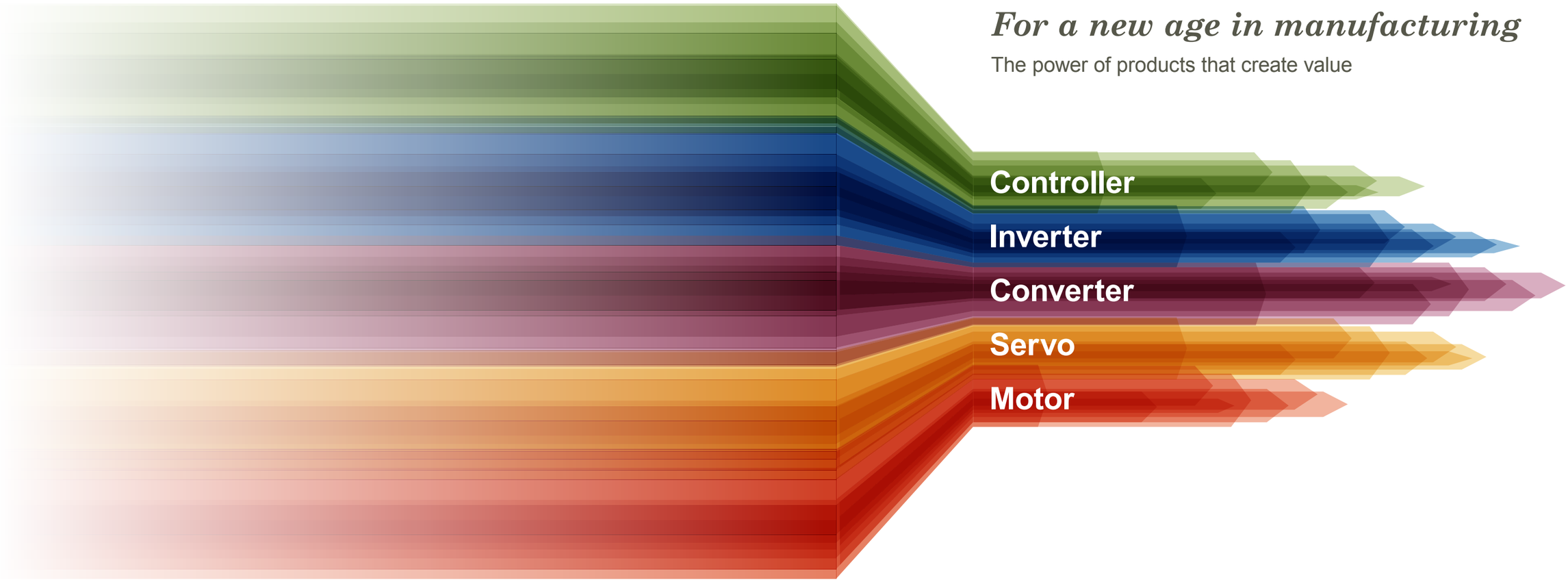
Our Heart and Technology for the Future

TOYODENKI

Industrial System & Electrical Equipment



For a new age in manufacturing

The power of products that create value

IKE073D-A25-08-0AZ

Industrial System & Electrical Equipment

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

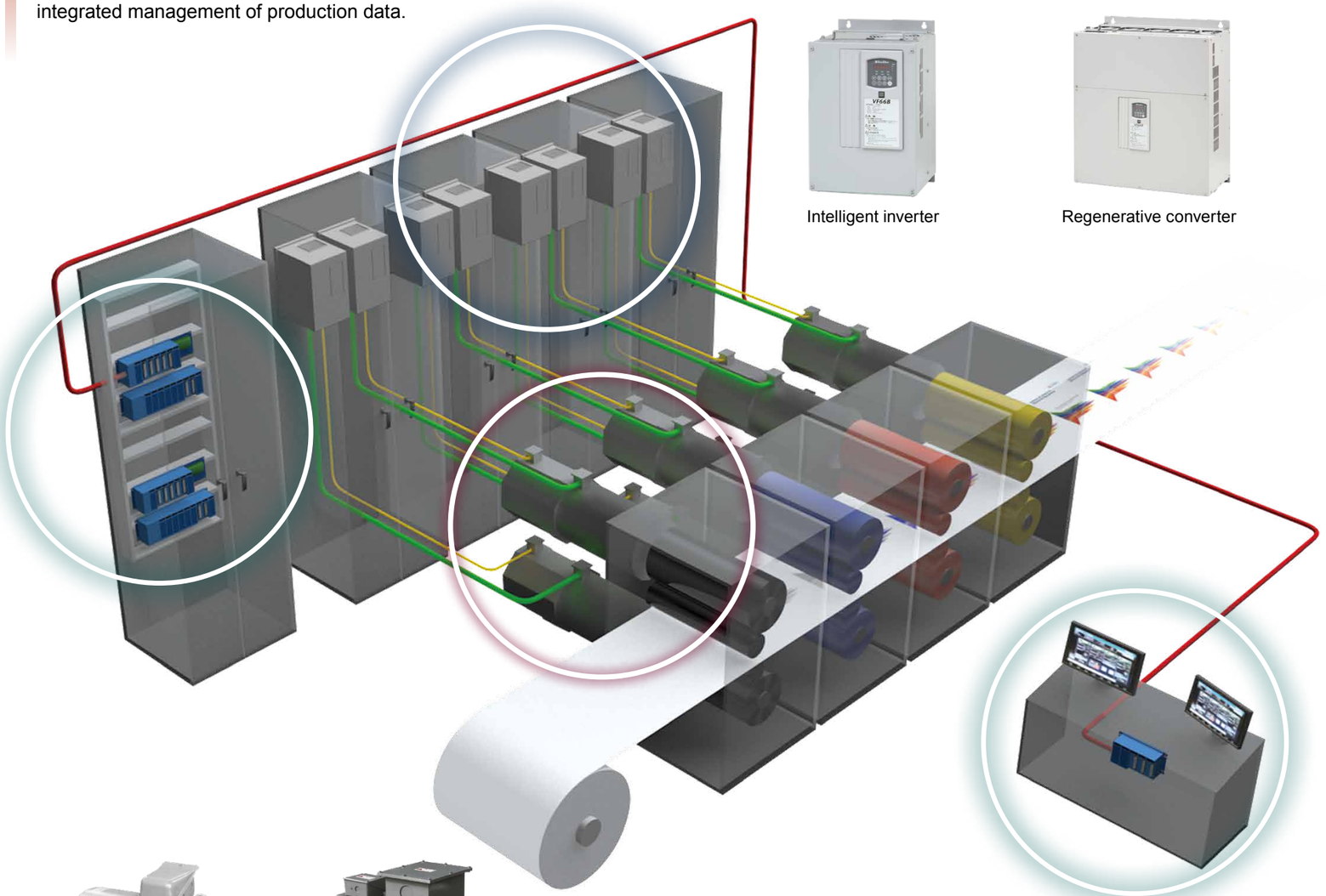
Toyo Denki Seizo serves customers across Japan and around the world through its general industrial machinery and equipment, automobile development testers, and social infrastructure that is essential to daily life. In addition, we offer energy-saving motors and inverters, as well as products based on 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

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.



Intelligent inverter

Regenerative converter

Induction motor for inverter

Permanent magnet synchronous motor

High-speed, advanced-function FA controller

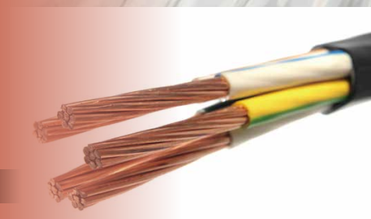
Product examples

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

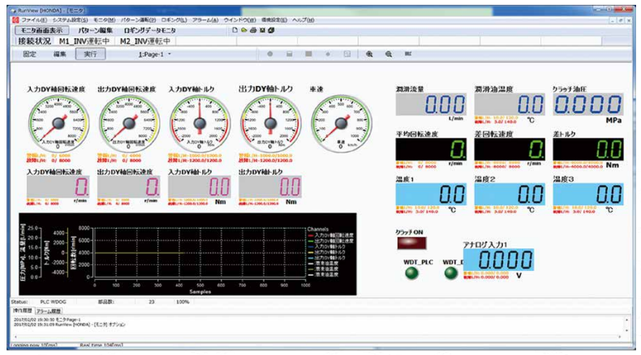
Food
- Sugar centrifuge

Carrier systems
- Ski lifts
- Cableways
- Cable cars

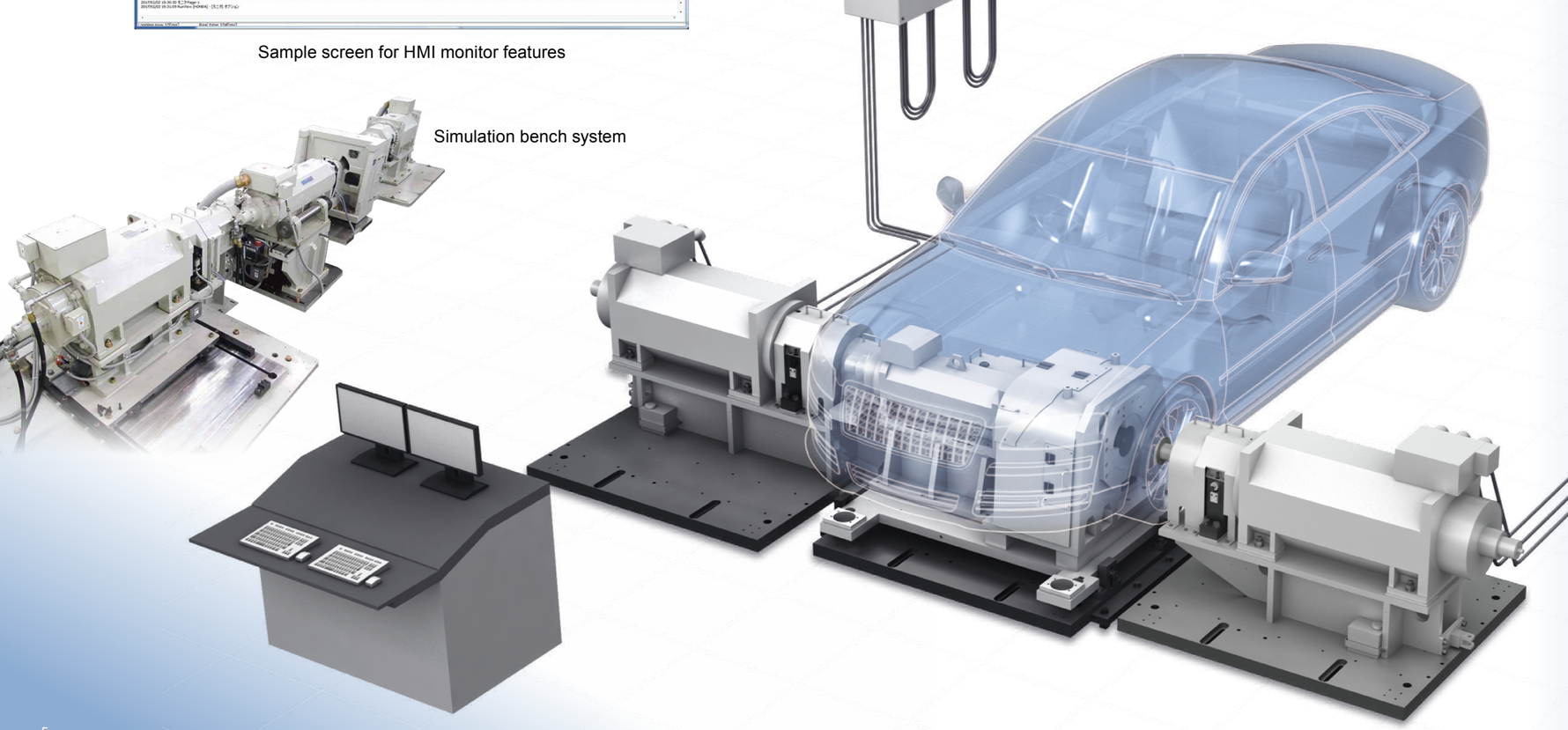
Automotive Testing System

Supporting the development of next-generation automobiles by shortening development time through high precision and high relia bility

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.



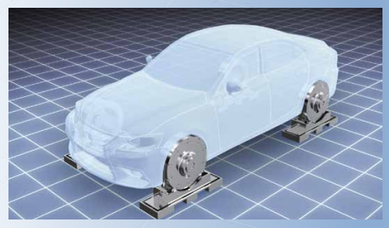
Sample screen for HMI monitor features



Simulation bench system

Run View

Toyo Testing System for Automobiles



In Tyre House Dynamo

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 hydroelectric energy and geothermal.

Product examples

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 water and geothermal.

- 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

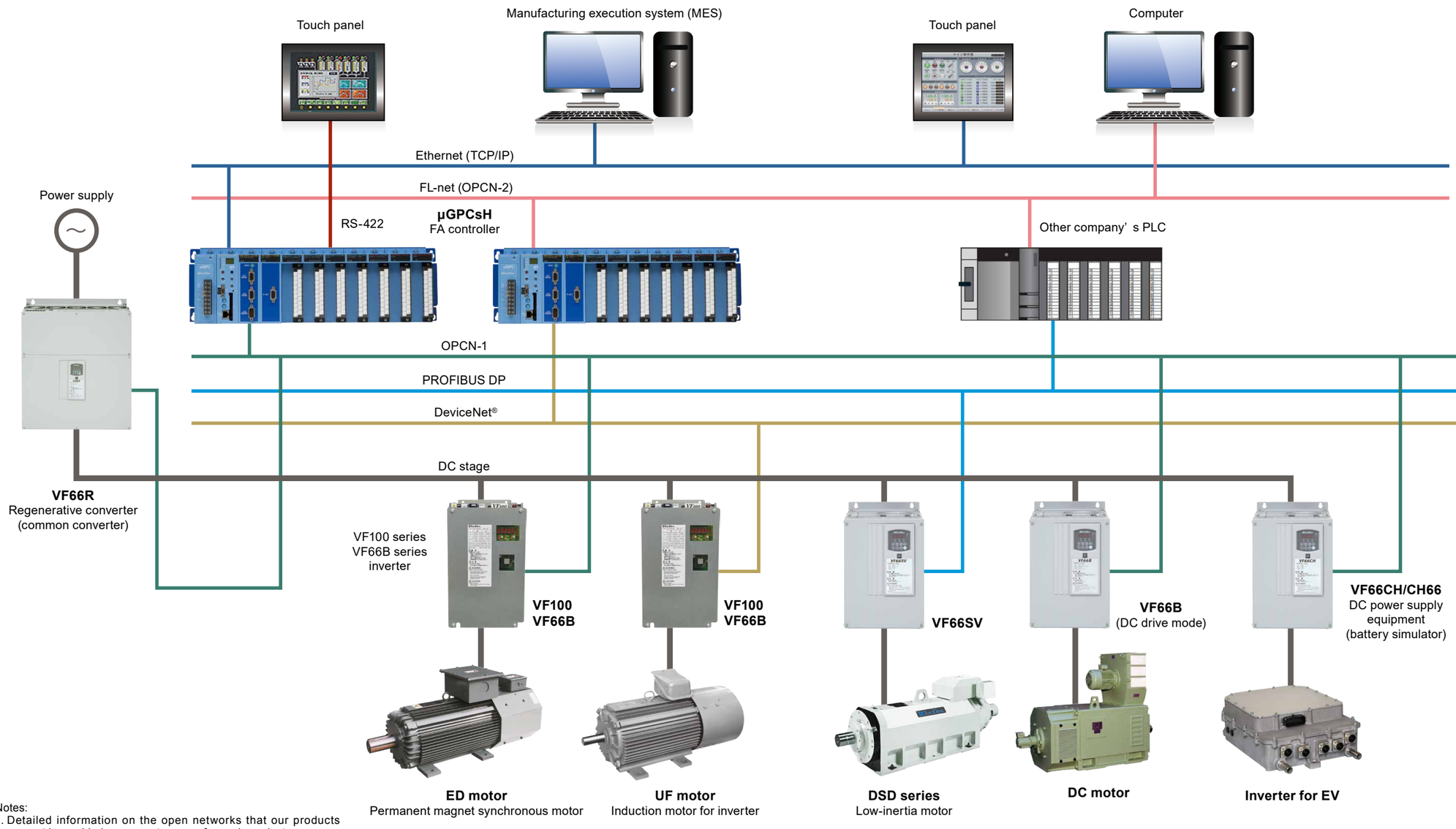
Our equipment stores regenerative power generated by train braking in batteries, and then effectively utilizes it to accelerate the train and stabilize line voltage.

- E³ Solution System

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 (TCP/IP) 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.

High-speed/advanced-function FA controller

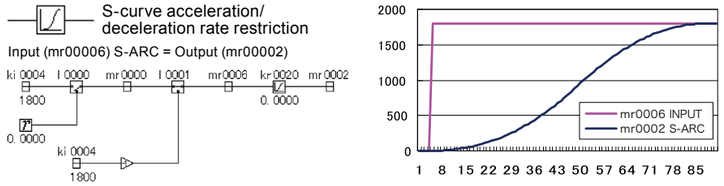
µGPCsH

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 (TCP/IP), FL-net (OPCN-2), OPCN-1, and DeviceNet®, making it easy to build a distributed control system.

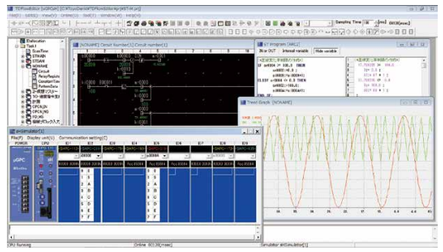


Dataflow and its characteristics

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.



Programming tool screen

Specifications

Application	Small to large-scale system
Number of inputs/outputs	Max. 8,192
Program capacity	640 k words
Processing speed	Logic operations: 0.1 µS (contact instructions), Real number operations: 0.1 µS (addition operations)
Structure	Built-in control panel
Operating ambient temperature	0 to 55 °C
Storage temperature	-20 to 60 °C
Relative humidity	30 to 95 % RH (no condensation allowed)
Operating altitude	2,000 m above sea level or less

Inverter Lineup

Intelligent inverter

VF100

The VF100 inverter inherits the rich application and customization functions of the VF66 series, and contributes for sustainable society.

Inverter with DC motor drive function

VF66B DC drive mode

The DC drive mode of the intelligent inverter VF66B makes it possible to drive a DC motor even though it is an inverter.

Inverter for sync control systems

VF66AD
VF66SDS

A sync control feature has been added to the VF66SV.

High power factor power regenerative PWM converter

VF66R

The successor to VF61R / VF64R for suppression of power supply harmonics and energy saving measures.

Intelligent inverter

VF66B

Mother inverter of the VF66 family. Supports a wide range of applications and customization for your system.

High-capacity AC servo amp

VF66SV

Delivers a speed control range of 1 to 10,000. Offers a high resolution of 25bits thanks to the use of a ABS encoder for position control.

DC power supply

VF66CH
CH66

30 kW or higher models are equipped with a battery simulator mode.

System interconnection inverter

VF66G

Inherited the wealth of applications and customization features of VF66B, to achieve a clean distributed power with high efficiency.

Please contact us for products that are not listed in this catalog.

Intelligent inverter

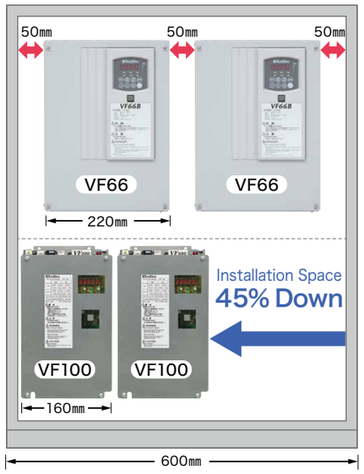
VF100

The VF100 inverter inherits the rich application and customization functions of the VF66 series, and contributes for sustainable society.

Features

Compact equipment and control panel design

By using a structure based on the premise of storage in the control panel, the installation space has been reduced by more than 45% compared to our conventional product (VF66 series). In addition, two ratings (ND: standard load, LD: light load) are available, so it is possible to select an inverter according to the application.



Low maintenance cost

By using long-life components, it is possible to extend the expected life and reduce maintenance cost by extending the maintenance cycle compared to our conventional product (VF66 series).
Operating temperature: 40°C load : 100% (ND), 80% (LD)
24-hour operation
Cooling fan, main circuits capacitor : 10 years,

Improvement of environment resistance

The sheet metal of the inverter body is made of High Corrosion Resistant Plated Steel Sheet (SGMCC : Steel Galvanized Magnesium Cold Commercial), which has excellent corrosion resistance.

Specifications

Control method			5 modes: EDM / IM vector control with speed sensor, EDM / IM vector control without speed sensor, and IM V / f control	
Capacity	Motor type		EDM	IM
	200V	ND	2.2 to 7.5 kW	2.2 to 7.5 kW
		LD	— *1	3.7 to 11 kW
	400V	ND	2.2 to 7.5 kW	2.2 to 7.5 kW
		LD	— *1	3.7 to 11 kW
Rated power			200 to 200 V±10 % 380 to 460 V±10 % 50/60 Hz±5 %	
Output frequency			0.1 to 400.0 Hz	
Overload capacity			ND specification : max150 % (1 minute), max200 % (3 second)	
			LD specification : max110 % (1 minute)	
Network options*2			OPCN-1 PROFIBUS DP DeviceNet® RS422/485 (Modbus RTU) RS232C EtherNet / IP®	
Input signal			Analog 0 to 10 V / ±10 V / 4 to 20 mA (Standard 1CH Optional max 2CH)	
			5 terminals standard, 6 terminals optional	
Output signal			Analog 0 to ±10 V (Standard 1CH Optional 2CH) PWM for 6x output frequency for rotation / frequency measurement	
			2 terminals standard, 2 terminals optional	

*1 EDM cannot rotate in LD mode.
*2 • OPCN-1: conformance class: TUPE-S52I
• Modbus RTU: RS485 compliance
• PROFIBUS DP: PROFIDRIVE-Profile compliance
• DeviceNet®: ODVA conformance test software v.A-14 compliant

Intelligent inverter

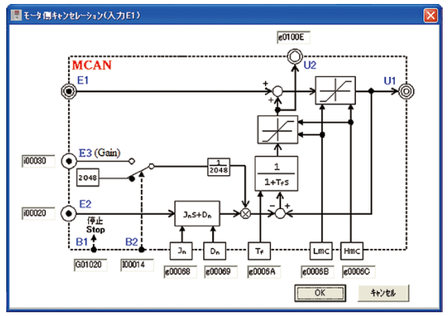
VF66B

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)



Control block diagram

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.

Control mode	Induction motor			ED motor	
	V/f control	Vector control without speed sensor	Vector control with speed sensor	Vector control without speed sensor	Vector control with speed sensor
Speed control range	-	1:150	1:1,000	1:100	1:1,000
Starting torque	-	200 %	200 %	150 %	200 %

5-mode VF66B
Note: See overload capacity in the table below for the starting torque characteristic.

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.

CE	Affixed to inverters that comply with all standards 1 to 3 below 1. RoHS Directive 2011 / 65 / EU and (EU)2015 / 863 2. EMC Directive 2014 / 30/EU 3. Low Voltage Directive 2014 / 35/EU or Machinery Directive 2006 / 42 / EC
TÜV SÜD US	Affixed to inverters that comply with UL508C.

Compliance labels

Specifications

Control method	5 modes: EDM / IM vector control with speed sensor, EDM / IM vector control without speed sensor, and IM V / f control
Capacity	200V class 11 to 180 kW 400V class 11 to 1,000 kW
Rated power	200 to 220 V 380 to 460 V±10 % 50/60 Hz±5 %
Output frequency	0.1 to 400 Hz
Overload capacity	150 % for 1 minute 200 % for 3 seconds (when at low temperature, 75 kW or more is 150 % max)
Network options*	OPCN-1, PROFIBUS DP, DeviceNet®, CC-Link, RS422 / 485 (Modbus RTU), RS232C, Ethernet / IP®
Input signal	Analog 0 to 10 V / ±10 V / 4 to 20 mA (standard 1 CH, optional max 2CH)
	5 terminals standard, 6 terminals optional
Output signal	Analog 0 to ±10 V / 4 to 20 mA (Standard 1CH, Optional max 2CH), PWM for 6x output frequency for rotation/ frequency measurement
	2 terminals standard, 2 terminals optional

* • OPCN-1: conformance class: TUPE-S52I
  • PROFIBUS DP: PROFIDRIVE-Profile compliance
  • DeviceNet®: ODVA conformance test software v.A-14 compliant
  • CC-Link: CC-Link Partner Association certification
  • Modbus RTU: RS485 compliance

Inverter with DC motor drive function

VF66B DC drive mode

The DC drive mode of the intelligent inverter VF66B makes it possible to drive a DC motor even though it is an inverter. It can be converted to AC in stages, shortening the construction period and reducing the investment cost.

Features/functionality

Cost reduction

DC motor can be used as it is and investment cost can be reduced.

Reduction of construction period

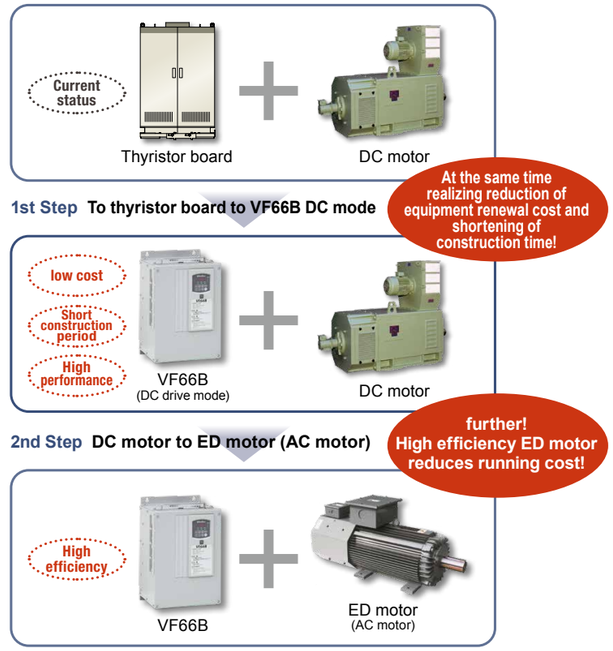
Direct current wiring can be used as it is, shortening the construction term.

Performance up

In addition to digital control, you can build interfaces with the latest various types of networks and PLCs, and you can improve the performance of the equipment.

Easy to AC

Even when updating to an AC motor, you can use it directly as a normal inverter simply by changing the drive mode.



Update step by installing VF66B DC drive mode
* ED motor ... Our permanent magnet type high efficiency motor

Specifications

Control method	Speed control, current control, voltage control
Power rating	200 to 220 V 380 to 460 V ± 10 % 50 / 60 Hz ± 5 %
Maximum output voltage	200 V class DC 220 V 400 V class DC 440 V
Applicable motor capacity*1	200 V class 11 to 90 kW 400 V class 11 to 315 kW
Overload tolerance	150 % 1 minute
Network option*2	OPCN-1, PROFIBUS DP, DeviceNet®, CC-Link, RS422 / 485 (Modbus RTU), RS232C
Input signal	Analog 0 to 10 V / ± 10 V / 4 to 20 mA (1 CH option max. 2 CH)
	Function terminal 5 points (standard) 6 points (option)
Output signal	Analog 0 to ± 10 V / 4 to 20mA (Standard 1 CH option 2 CH) PWM of 6 times the output frequency for the rotation / frequency meter
	Function terminal 2 points (standard) 2 points (option)

* 1: Applicable motor capacity is a guideline. It depends on the rated current value of the DC motor.
* 2: · OPCN-1: conformance class : TUPE-S52I · CC-Link: CC-Link association certification
  · PROFIBUS DP: PROFIDRIVE-Profile compliant · Modbus RTU: RS 485 compliant · DeviceNet®: ODVA Conformance Test Software Ver. A-14 compliant
* 3: As a system product, it will be in the form of being stored in the control panel.

High-capacity AC servo amp

VF66SV

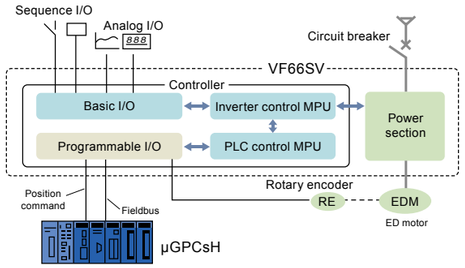
From hydraulic to electric servo–A revolution in the structure of industrial machinery.
Welcome to the world of high-capacity servos.

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 25bits per motor revolution is achieved using a absolute encoder.



VF66SV configuration diagram

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 16,000min^{-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.

S-DSD series motor

Specifications

Control method	Vector control with speed sensor
Capacity	200 V class: 11 to 180 kW 400 V class: 11 to 1,000 kW
Rated power	200 to 220 V 380 to 460 V±10 % 50 / 60 Hz±5 %
Output frequency	0 to 550 Hz (supports up to 1,500 Hz with a special specification product)
Overload capacity	150 % for 1 minute 200 % for 3 seconds (when at low temperature, 75 kW or more is 150 % max)
Network	Conforms with PROFIBUS DP, OPCN-1
Input signal	Analog 0 to 10 V / ±10 V (2CH) 8 multifunction inputs
Output signal	Analog ±10 V (2CH) 3 multifunction outputs

* OPCN-1: conformance class : TUPE-S52I

Inverter for sync control system

VF66AD/VF66SDS

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 25bits SHPC-175-Z is used for the rotation command module and an absolute encoder for the motor.

Absolute rotation command module
SHPC-175-Z
Rotation position commands and rotation speed commands are sent via our proprietary sync communication
For high-precision draw and sync control
Minimizes delay between sections when accelerating/decelerating
RS422

External view of module

VF66SDS: Incremental sync control

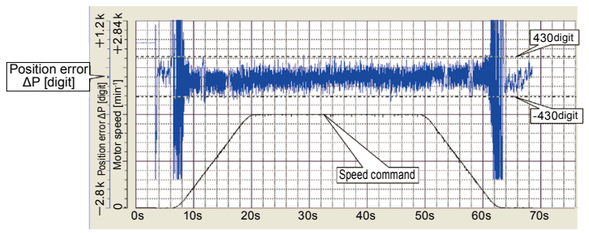
The VF66SDS is the successor to the VF64SDS inverter. It applies incremental sync control to the VF64SDS inverter, and we have already delivered countless numbers to our customers. VF66SDS's sync control uses a PG emulator module that generates A, B, Z phases in commands. It uses SHPC-172-Z as a PG emulator module and an incremental encoder for a motor, thereby achieving 76,800 P/r.

PG emulator module
SHPC-172-Z
Generates and outputs rotation position commands using A, B, Z, and phase signals
For high-precision draw and sync control
Minimal delay between sections when accelerating/decelerating
RS422 or optic fiber

External view of module

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.



Rotation position error in sync control

Specifications

Control method	Vector control with speed sensor
Capacity	200 V class 11 to 180 kW 400 V class 11 to 1,00 0kW
Rated power	200 to 220 V 380 to 460 V±10 % 50 / 60 Hz±5 %
Output frequency	0.1 to 400 Hz
Overload capacity	150 % for 1 minute 200 % for 3 seconds (when at low temperature, 75 kW or more is 150 % max)
Network	OPCN-1
Input signal	Analog 0 to 10 V / ±10 V (2CH) 8 multifunction inputs
Output signal	Analog ±10 V (2CH) 3 multifunction outputs

* OPCN-1: conformance class : TUPE-S52I

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.

VF66CH　　CH66

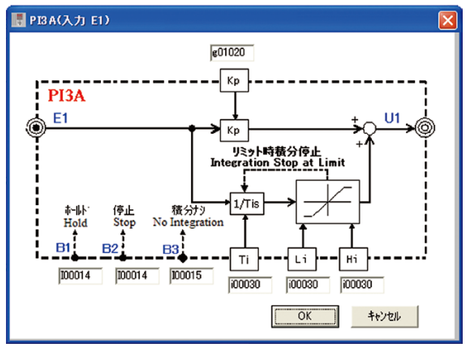
Features/functionality

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

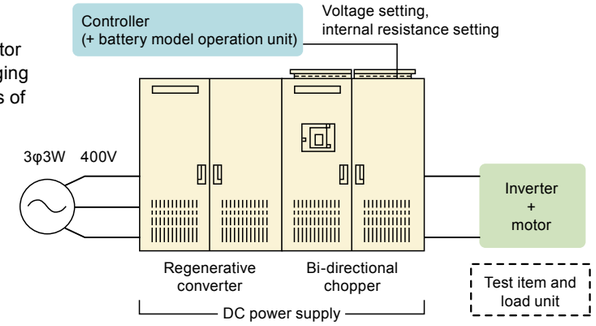
Compatibility with OPCN-1, RS422/485, and RS232C networks allow you to build a variety of systems via data communication with host system(PLC etc.)



Control block diagram

Battery simulator

VF66CH and CH66 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.



Configuration and connections of DC variable power source

Specifications

Product name	VF66CH (Buck Chopper)	VF66CH (Buck Chopper, BTS mode)	CH66 (Buck-Boost Chopper)
Control mode	AVR / ACR	BTS (Battery Simulator mode)	AVR / ACR / BTS
Rated input voltage	DC462 to 716 V AC380 to 460 V ±10 %	DC462 to 716 V AC380 to 460 V ±10 %	DC462 to 716 V
Output voltage range	10 to 90 % of Input DC voltage	10 to 90 % of Input DC voltage	6.7 % of Input DC voltage to 750 V (carrier frequency is 3.0 kHz) 13.3 % of Input DC voltage to 750 V (carrier frequency is 6.0 kHz)
Rated output current	48 to 1200 A	83.3 to 800 A	100 to 500 A
Network	OPCN-1 RS422 / 485 RS232C		
Input signal	Analog 0 to 10 V / ±10V / 4 to 20 mA (standard 1CH, optional 2CH, multifunction input (standard 5CH, optional 6CH))		
Output signal	Analog 0 to ±10 V / 4 to 20 mA (standard 1CH, optional 2CH, multifunction output (standard 2CH, optional 2CH))		

* OPCN-1: conformance class: TUPE-S52I

High Power Factor Power Regenerative PWM Converter

VF66R

The successor to VF61R / VF64R for suppression of power supply harmonics and energy saving measures. The VF66R is based on the intelligent inverter VF66B, enhances the customization function which is the concept of the VF66B series, improves ease of use and environmentally friendly design.

Features/functionality

Significant suppression of power supply harmonics

The power supply harmonics of the inverter is greatly suppressed, and the total power supply distortion ratio is 5% or less.

High power factor

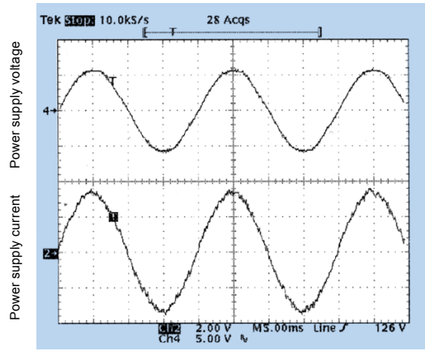
A high power factor of 95% or more can be secured at loading of 99% or more at rated load and 30% or more load, enabling the handling of power supply equipment.

100% continuous power regenerative operation possible

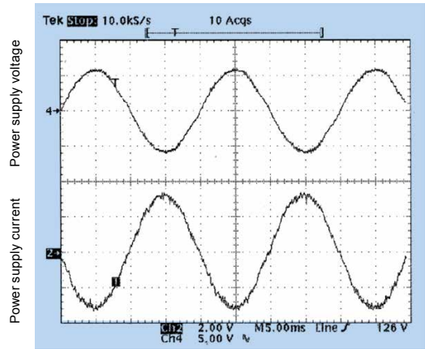
Continuous regenerative operation is possible, it instantaneously follows even sharp load fluctuations, and dramatically improves the braking ability of the system.

120 degree energization mode installed

PWM sine wave converter mode and 120 degree conduction mode can be used. You can choose according to usage and environment.



During power running



During regenerative operation

Power supply waveform at power running regeneration

Specifications

Capacity	200 V class 75 to 180 kW 400 V class 75 to 1,000 kW
Power-supply voltage	Three-phase three-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 %
Input power factor	99 % or more (at 100 % load) 95 % or more (when loaded at 30 % or more)
Harmonic content ratio	5 % or less (at 100% load)
DC output voltage	200 V Class 312 to 358 V 400 V Class 600 to 716 V
Operation mode	PWM sine wave converter mode 120 degree conduction mode
Overload tolerance	150 % 1 minute
Network	OPCN-1 RS 422 / 485 / 232 C CC-Link

*Please inquire for models of 55 kW and lower.

System interconnection inverter

VF66G

Inherited the wealth of applications and customization features of VF66B, to achieve a clean distributed power with high efficiency.

Features/functionality

Harmonic suppression by instantaneous distortion minimization control (Grid-connected mode)

By adopting our proprietary control method, harmonic current is suppressed and the total current distortion ratio is less than 5%.

Independent operation detection (Grid-connected mode)

It is equipped with independent operation detection device.

Suppression of voltage fluctuation by reactive power output control (Grid-connected mode)

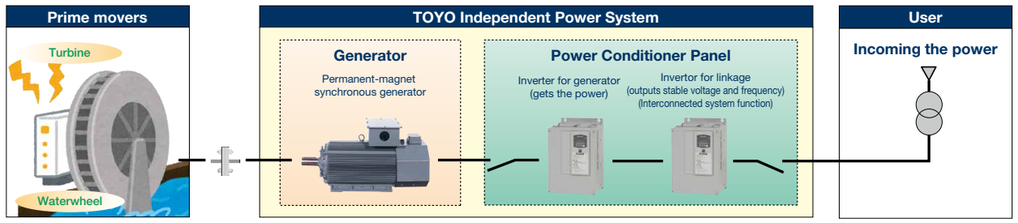
Adjustment within the inverter range enables control of reactive power output by advance / delay command.

Corresponds to grid connection (droop mode) with generator (Governor control mode)

The ship diesel generator operates under governor control, and the governor control mode is installed in VF66G, enabling parallel operation with diesel generator. Governor control mode has frequency and voltage drooping characteristics.

System interconnection mode and autonomous operation mode switching function

It is possible to switch modes smoothly with only the switching signal without changing the setting.



Specifications

Operation mode	Grid-connected mode (*) / Autonomous operation mode	Governor control mode
Unit capacity	200 V Class 75 to 180 kW	400 V Class 75 to 1,000 kW
AC output voltage	200 V class 200 to 220 V 400 V class 400 V to 440 V	200 V class 200 to 220 V 400 V class 440 V to 500 V
DC voltage range	200 V class 300 to 340 V 400 V class 600 V to 680 V	200 V class 350 V 400 V class 700 V
Control method	Instantaneous distortion minimization control method	Triangular wave comparison PWM control method
Output frequency	50 / 60 Hz	60 Hz
Output frequency accuracy	± 3 % or less	± 5 % or less (settling)
Harmonic content percentage	Current distortion (in interconnection operation): 5 % overall, 3 % or less in each order Voltage distortion (in self-sustaining operation): 5 % or less Voltage distortion: 5 % or less	Voltage distortion: 5 % or less Voltage distortion: 5 % or less
Network	OPCN-1 CC-Link	RS485 / 422

(*) VF66G dose not comply with grid-connection less than 50kW.
* OPCN-1: conformance class : TUPE-S52I

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.

In Tyre House Dynamo

By installing it in place of automobile tyre wheels,
it is possible to perform tests that cannot be done with conventional chassis dynamos.

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

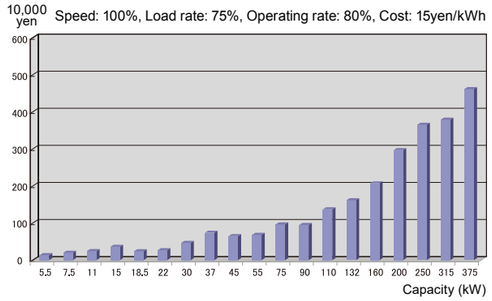
ED Motor (IPM Synchronous Motor)

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

Features/functionality

Delivers energy savings

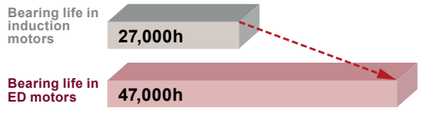
Using our ED motors dramatically reduces CO^2 emissions and saves energy. They deliver about 3% more efficiency than the NEMA standard for high-efficiency motors and 5% more for induction motors for our UF series inverters, thereby helping to lower our customer's costs.



ED motor energy savings
(Compared to an induction motor, over 5 years)

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.



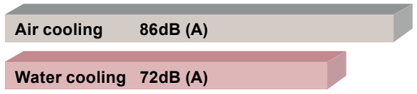
Comparison of bearing life

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.



Comparison of air cooling and water cooling
(Our product 400kW motor)

Customize according to customer's requirements

- The protection class can be changed to IP55(optional).
- The low-speed ED motors (nonstandard) optimize motor specifications by reducing the maximum rated speed to about half (575 min^{-1}) to achieve cost reduction through system optimization.
- Please inquire for more information.

Specifications

Number of poles	6 pole
Output	1.5 to 750 kW (Water cooling is for 18.5kW and up, IP55 is for 30kW and up, Low speed ED motor is for 55kW and up.)
Rotating speed	(Constant power range: 1:1.33 of base speed) Standard specification: 1,200 / 1,500 / 1,800 min^{-1} Low speed specification: 875 / 725 / 575 min^{-1} 900 / 750 / 600 min^{-1}
Rated voltage	190 / 380 V
Protection	IP44 (IP55 option)
Attachment method	Leg-mounted standalone (side) Options: Upright, flange-mounted
Overload capacity	150 % for 1 minute
Attachments	Encoder, cooling fan, and PTC thermistor (Options : reducer, brake, self-ventilated motor)

Induction motor for inverter

UF Motor

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

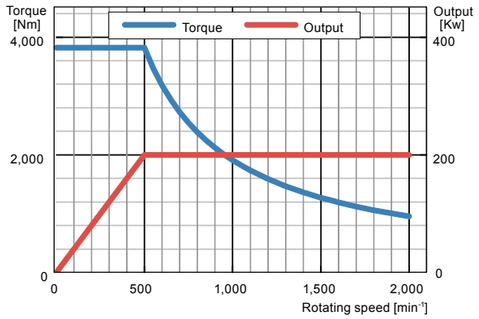
Features/functionality

Wide range of speeds

These motors are capable of continuous operation at a constant output, from 0min^{-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 stalling*1 as well as a wide power constant region*2 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.



200 kW 500/2,000 min^{-1} torque/output characteristic

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.

Process line products

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

Number of poles	4 pole
Output	0.75 to 250 kW
Rotating speed	1,200 / 1,500 / 1,800 min^{-1} (for other speed, please contact us)
Rated voltage	200 / 400 V
Protection	IP44
Attachment method	Leg-mounted standalone (side) Options: Upright, flange-mounted
Overload capacity	150 % for 1 minute
Attachments	Encoder, cooling fan, and PTC thermistor (Options: reducer, brake)

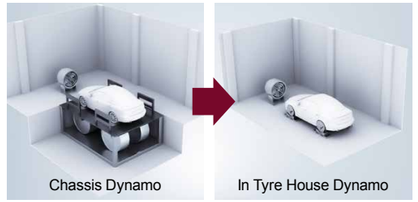
In Tyre House Dynamo

It was developed for the purpose of evaluating autonomous vehicles which are expected to become popular in the future, and replacing chassis dynamos. In addition to enhancing the lineup, we will continue to brush up and evolve it as a new device.

Feature

Space-saving

It does not require large-scale construction work like conventional chassis dynamo, and can be installed anywhere there is space on a flat surface.
It can also be installed in anechoic chambers and anechoic chambers for EMC testing with minimal floor work.



Driving Test Verification

In Tyre House Dynamo can be tested the same way as the chassis dynamometer. In addition, since all four wheels can be controlled individually, it is possible to simulate various driving conditions.

Quietness

The noise level of the dynamo is about 70 dB. You can clearly see the sound of the vehicle even while driving. In addition, since there are no tyres, road noise does not occur, and it is possible to distinguish abnormal noises in the car.

Installation

It can be installed in the same way as replacing a tyre wheel. By using a dedicated adapter, it can be used for various types of vehicles.
The camber angle, caster angle, toe-in, and toe-out are structures that imitate the actual vehicle.

Potential

It can be combined with vehicle cameras, radar, and GPS to evaluate autonomous vehicles. In addition, verification that could only be done on a test course or on an actual road can be safely realized by bench test.

Specifications

Rated capacity	94.2 kW	160 kW
Max rotating speed	2,000 min^{-1}	2,500 min^{-1}
Max torque	1,350 Nm	3,800 Nm
Dimension (diameter)	650 mm	680 mm
Flame dimension	185 mm	340 mm
Compatible brakes (diameter)	425 mm max	460 mm max

Dynamic spin dynamo

Low-Inertia Motor (DSD Series)

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

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.

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

Types	Output	Base rotating speed / Max rotating speed	Inertia (J)
Induction motor	220kW	4,000 min^{-1}	0.73 kg•m^2
		8,000 min^{-1}	
S-DSD	220kW	4,000 min^{-1}	0.073 kg•m^2
		8,000 min^{-1}	

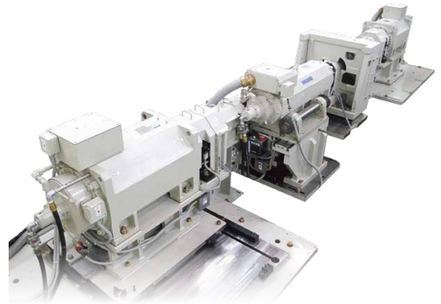
Transient operation on the level of a real vehicle

Combining a low-inertia S-DSD series dynamo with a VF66SV 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 17 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.



FF transmission bench

Specifications

High-speed, low-inertia dynamos (S-DSD,S-DSDi, S-DSD HP, S^2-DSD) High RPM / Super low inertia / Small size/Excitation	
Output	to 505 kW
Rotating speed	to 10,000 min^{-1}
Torque	Up to 1,610 Nm max
Super high speed, low-inertia dynamo (S-DSD HS) Super high rotating speed / Low inertia / Small size	
Output	to 275 kW *Please consult us for outputs exceeding 220 kW.
Rotating speed	to 20,000 min^{-1} *Please consult us for outputs exceeding 16,000 min^{-1}
Torque	Up to 525 Nm* max
High-torque, low-inertia dynamo (H-DSD, W-DSD) High torque / Low inertia / Wide range	
Output	to 535 kW
Rotating speed	to 4,000 min^{-1}
Torque	Up to 5,960 Nm* max

*Please consult us for torques exceeding the indicated values.

Common specifications	
Protection	IP42
Insulation type	H
Attachment method	Leg-mounted standalone (side)
Cooling method	Water cooled
Starting torque	150 %
Overload capacity	150 % for 1 minute
Lubrication method	Grease lubricated / Oil-air lubrication
Attachments	Speed detector PTC thermistor element

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 small-scale hydroelectric power, biomass, and other renewable energies through the use of state-of-the-art equipment.

Features/functionality

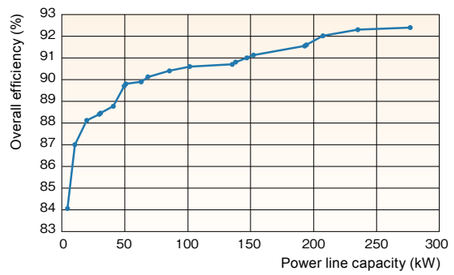
Small-sized permanent magnet synchronous generator Approximately half the weight of an induction generator

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.)

External view of our permanent magnet generator

High efficiency

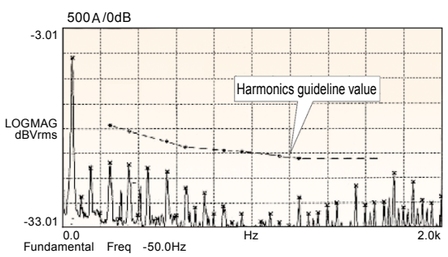
Using our permanent magnet synchronous generators (EDG), along with a converter for high-efficiency control, enables 94% total efficiency from the generator to the end of the power line when using a high-capacity model and 90% efficiency when using a low-capacity model.



Overall efficiency (%)
(From generator axle input to end of power line)

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.



Analysis of current harmonics (at 40 kW)

Specifications

■ Generator

Rated output	Permanent magnet synchronous generator (EDG) 6P 11 to 500 kW 1,200 / 1,500 / 1,800 min^{-1}

■ Power conditioner control panel

Output voltage	200 / 400 V± 10 % 50 / 60 Hz± 5 %
Capacity (power line end)	200V / 50 to 180kW, 400V 50 to 1,000 kW
Rated time	Derating during continuous operation and minus power fluctuation
Overload capacity	150 % for 1 minute
Control method	Generator max efficiency control, Instantaneous distortion minimization control method, Toyo Denki proprietary islanding detection
Use environment	Indoor specs: 0 to +40 °C 85% RH or less 1,000 m elevation or less

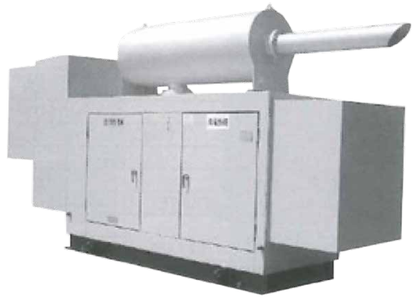
(*) For power conditioner panel of grid-connection less than 50 kW, please contact us.

Separate catalog: Available

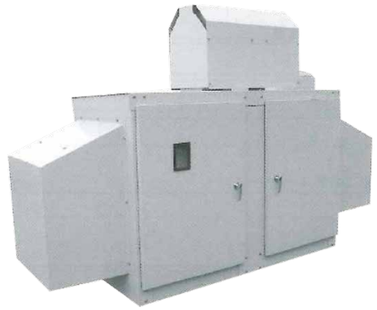
For general emergency and disaster

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.



KT320CK 200/220 V 300/320 kVA



ZT-66CK 200/220 V 50/60 kVA

KT-700CKH 6,600 V 625/700 kVA

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

No.	Number of poles	Voltage (V)	Output (kVA)
1	2	200 / 220	20 / 22.5 to 39 / 43
2	4	200 / 220	50 / 605 to 500 / 570
3	4	400 / 440	600 / 625 to 750 / 875
4	4	6,600	300 / 320 to 1,000 / 1,250

Specifications

Application	Emergency backup power
Standards	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.
Structure	Cubicle (indoor or outdoor)
Environmental conditions	Ambient temperature: -5 to 40 °C, Relative humidity: 85 % or less
	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
Battery	Valve-regulated lead-acid battery (REH)
External coating color	YT-25CK to ZT-115CK: Munsell 5Y7 / 1 semigloss MT-135CK to KT-1250CKH: Munsell 5Y7 / 1
Noise spec*	Standard noise
	Low noise (approx. 85 dB (A) at 1 m level) Super low noise (approx. 75 dB (A) at 1 m level)

*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.

Tandem generating equipment housing

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.

Rated output

Number of poles	Voltage (V)		Output (kVA)	
	Single phase	Three phase	Single phase	Three phase
4	105 / 210	210	40 to 50	10 to 30
4	105 / 210	210	60 to 80	10 to 30

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

Item	Specifications
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

Control panels for high-speed switching equipment

Steam turbine generator

When using a large amount of steam such as a paper mill or a sugar factory, a part of the steam is used for power generation, or municipal waste which was conventionally discarded, wood waste that comes out from sawmill / plywood factory, Many methods are being adopted to power the factory in-house by generating sawdust, rice grains from rice mills, etc. as fuel.
We have delivered a number of private power generation facilities from the production experience of many years of turbine generators, and we are driving strongly.

Specifications

Rated output	300 to 50,000 kVA
Rated voltage	440 V, 3,300 V, 6,600 V, 11,000 V, 13,800 V
Number of poles	4P
Frequency	50 / 60 Hz
Rated power factor	0.8 (delay)
Phase number	3 phases
Excitation method	Brushless
Time rating	Continuous

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.

System capacity

	Line voltage	
	600 / 750 V system	1,500 V system
System capacity	180 kW	360 kW
	360 kW	720 kW
	540 kW	1,080 kW

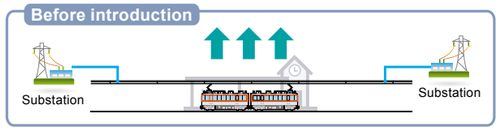
*Please contact us for information on system dimensions, weight, and other specs.
*System capacity is rated at 30 seconds.

Functions

Prevention of regeneration cancellation

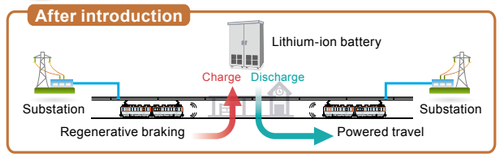
Problem

On train lines where regenerative cars have been introduced, line voltage rises and regenerative 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.



Solution

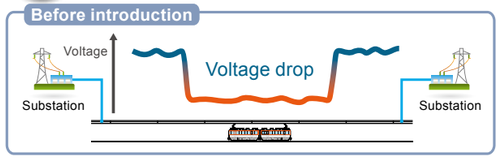
The E³ Solution System effectively stores excess regenerative power and supplies it to other powered cars.



Voltage drop compensation

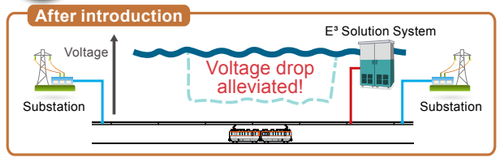
Problem

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.



Solution

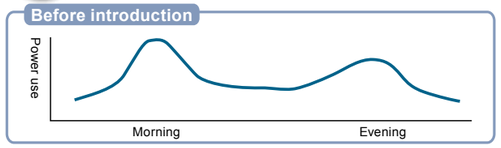
The installation of the E³ Solution System at the problem points limits voltage drop.



Power peak cut

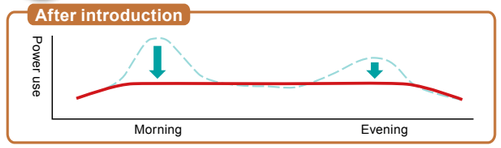
Problem

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.



Solution

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



Separate catalog: Available

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

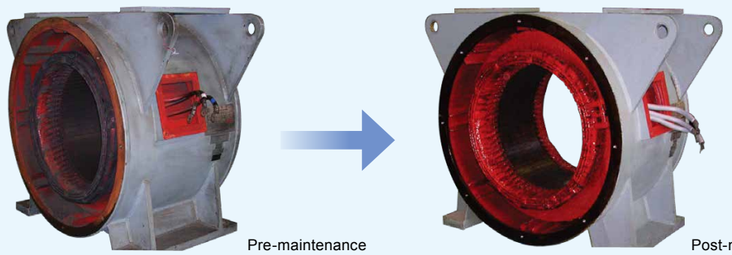
The reliability of electrical equipment parts drops as they degrade and wear out over time. But accidents caused by degraded or worn parts are not limited to the parts themselves. They can also spread to healthy parts as well. Preventative maintenance is essential for preventing problems before they 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.



Pre-maintenance　　Post-maintenance

Reform & Renewal

Renovations for improving productivity and safety updates for life cycles

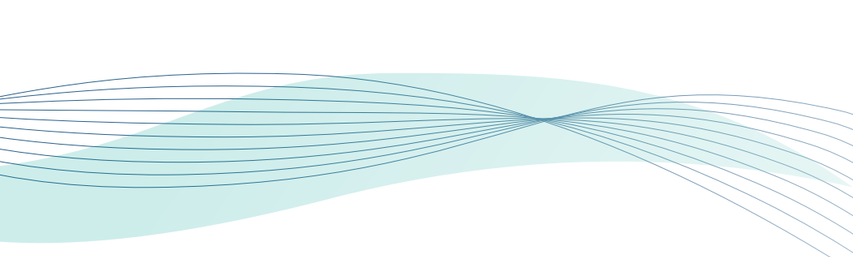
In response to social demands, equipment at various facilities is constantly being renovated and updated to meet needs such as improving productivity, upgrading systems, securing operational safety, reducing production costs by lowering energy expenses, and reducing CO^2 emissions to achieve environmentally 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



Pre-renovation　　Post-renovation

Example of electric part update for an electrical wire processing machine

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

Pre-renovation　　Post-renovation