Our Heart and Technology for the Future



Industrial System & Electrical Equipment

For a new age in manufacturing

The power of products that create value



Industrial System & Electrical

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.





System

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
VF66B DC drive mode	15
VF66C	16
VF66SV	17
VF66AD/VF66PD	18
VF66CH/CH66	19
VF66R	20
vF66G	21

Motor Lineup23
ED Motor24
UF Motor25
Direct Drive Motor26
Low-Inertia Motor27
Renewable energy28
Power Generating Equipment29
Tandem Generating Equipment/
High-Speed Power Switching Equipment 30
Steam turbine generator 31
Energy Storage System for railway 32
Total Support 33-34

Drive System

Providing manufacturing solutions around the world in response to 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 μ GPCsH, to deliver high-precision, high-response systems, including those for the integrated management of production data.



Induction motor for inverter

Permanent magnet synchronous motor



Intelligent inverter

High-speed, advanced-function FA controller

diverse needs,



Regenerative converter





PLC-type DSP 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

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.



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



bility







Social Infrastructure System

Contributing to public services that support people's lives around the

Bank

Data center

Factorv

Drinking water treatment plant

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 and hydroelectric energy.

Hospital

E³ Solution System

STATION

City hall

Product examples

world

Wind power generation

School

Hydroelectric power generation



Outlying island

Tidal power generation

Wave power generation

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.

Permanent magnet synchronous motor

UF motor Induction motor for inverter



High-speed/advanced-function FA controller

µGPCsH

This controller has complete program compatibility with the μ GPC 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 easyto-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.





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.

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.

Plant equipment, etc. PLC data PLC data Analog data, bit data, temperature, and status, etc Inverter/motor data Web browser

Network diagram

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

Separate catalog: Available

Specifications

......

Programming tool screen

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, highprecision motor control

 μ GPCdsP 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 μ s. An innovative drive system can be built by connecting the controller with the VF66C high-speed, high-response inverter.



H-DSD nign-torque, low-inertia motor

Example of an automotive measurement system using $\mu GPCdsP$

Programless TDdsP Monitor for debugging support

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

Exceptional compatibility with MATLAB/ Simulink*

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







DSP software environment

-				
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-				

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

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





Intelligent inverter

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



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)



Inverter for sync control systems VF66AD VF66PD

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.



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.



High-capacity AC servo amp

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.



System interconnection inverter **VF66G**

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

Intelligent inverter

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

Control method	5 modes: EDM/IM vector control with speed sensor, EDM/IM vector control without speed sensor, and IM V/f control
Capacity	200 V class: 2.2 to 180 kW 400 V class: 2.2 to 1,000 kW
Rated power	200~220 V 380~460 V±10% 50/60 Hz±5%
Output frequency	0.1~400 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
Innut signal	Analog 0 to 10 V/±10 V/4 to 20 mA (standard 1 CH, optional max 2CH, external 2CH)
input signal	5 terminals standard, 6 terminals optional
Output signal	Analog 0 to ±10 V (Standard 1CH, Optional max 2CH), PWM for 6x output frequency for rotation/frequency measurement
	2 terminals standard, 2 terminals optional

* • 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

Control block diagram

		Induction m	notor	ED motor	
Control mode	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%

STATISTICS, STATIS

5-mode VF66B

Note: See overload capacity in the table below for the starting torque characteristic.



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

#0006D

OK I

41286

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

Affixed to inverters that comply with UL508C.

Compliance labels

CC-Link: CC-Link Partner Association certification
 Modbus RTU: ASYC66-Z 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 1.5 to 110 kW 400 V class 1.5 to 315 kW
Overload tolerance	150% 1 minute
Network option ^{*2}	OPCN-1 PROFIBUS DP DeviceNET CC-Link RS422 / 485 (Modbus RTU) RS232C
Input oignal	Analog 0 to 10 V / ± 10 V / 4 to 20 mA (1 CH option max. 2 CH external 2 CH)
input signal	Function terminal 5 points (standard) 6 points (option)
	Analog 0 to ± 10 V (Standard 1 CH option 2 CH) PWM of 6 times the output frequency for the rotation / frequency meter
Output signal	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.

· CC-Link: CC-Link association certification

OPCN-1: Japan Electrical Manufacturers Association OPCN-1 Standard Specification CC-Link: PROFIBUS DP: PROFIDRIVE-Profile compliant Modbus RTU: ASYC 66-Z 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-speed, high-response, high-frequency inverter

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 highspeed 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 μ GPCdsP loaded with control code designed using MATLAB/Simulink.*





Torque command current response waveform



S-DSD series motor



µGPCdsP

Specifications

Control method	Vector control with speed sensor
Capacity	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
Rated power	200~220 V 380~460 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	Ethernet 100 Mbps (Number of units 1:1)
Input signal	Analog ± 10 V/4 to 20 mA (2CH) 12-bit 1CH has a response speed of 83 μ sec (6 multifunction inputs)
Output signal	Analog ± 10 V (3CH) signed 12-bit 1CH has a response speed of 83 μ sec (4 multifunction inputs)

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

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.



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.

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 specification	ons are provided on page 20	6.



Direct-drive motor

Control method	Vector control with speed sensor
Capacity	200 V class: 5.5 to 180 kW 400 V class: 2.2 to 1,000 kW
Rated power	200~220 V 380~460 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, CC-Link, OPCN-1 and other fieldbuses
Input signal	Analog ±10 V (2CH) 8 multifunction inputs
Output signal	Analog ±10 V (2CH) 3 multifunction outputs

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.



External view of module

External view of module

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 $\pm 0.001\%$ 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 .



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

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

Rotation position error in sync control

Control method	Vector control with speed sensor
Capacity	200 V class: 5.5 to 180 kW 400 V class: 2.2 to 1,000 kW
Rated power	200~220 V 380~460 V±10% 50/60 Hz±5%
Output frequency	0.1~400 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 ±10 V (2CH) 8 multifunction inputs
Output signal	Analog ±10 V (2CH) 3 multifunction outputs

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.



Control block diagram

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.



Configuration and connections of DC variable power source

Product name	VF66CH (step-down chopper)	CH66 (step-up/down chopper)	
Control mode	AVR, ACR, BTS (battery simulator)		
Rated input voltage	DC462~716 V/AC200~220, 380~460 V±10%	DC462~716 V	
Output voltage range	10% to 90% of input DC voltage	50~750 V	
Rated output current	48~1,200 A	100~500 A	
Network	OPCN-1, RS422/485, RS232C		
Input signal	Analog 0 to 10V/ ±10 V/4~20 mA (standard 1CH, optional 2CH) 5 multifunction inputs		
Output signal	Analog 0 to 10V/ ±10 V/4~20 mA (standard 1CH, optional 2CH) 2 multifunction outputs		

High Power Factor Power Regenerative PWM Converter

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 regenerative operation Power supply waveform at power running regeneration

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 \pm 10% 400 V Class 380 to 460 V \pm 10% 50/60 Hz \pm 5%
Input power factor	99% or more (at 100% load) 95% or more (when loaded a
Harmonic content ratio	5% or less (at 100% load)
DC output voltage	200 V Class 312 ~ 358 V 400 V Class 600 ~ 716 V
Operation mode	PWM sine wave converter mode 120 degree conduction n
Overload tolerance	150% 1 minute
Network	OPCN-1 RS 422/485/232 C CC-Link

Specifications

*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

By adopting our proprietary control method (instantaneous distortion minimized PWM modulation method), harmonic current is suppressed and the total current distortion ratio is less than 5%.

Independent operation detection device · FRT requirements compliant

We have a new active method independent operation detection device compatible with FRT requirement (operation continuation requirement at accident).

Suppression of voltage fluctuation by reactive power output control

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

Corresponds to grid connection (droop mode) with generator

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.



Operation mode	System linkage mode / Autonomous operation mode	Governor control mode
Capacity	200 V Class 11 to 180 kW	400 V Class 11 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 Minimum PWM method	Triangular wave comparison PWM method
Output frequency	50/60Hz	60Hz
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

Controller	
5	
verter	

Motor Lineup



Permanent magnet synchronous motor

ED Motor (IPM Synchronous Motor)

uunn su

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



Induction motor for inverter

JF 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.

Output		185kW	250kW	375kW	450kW
Rotating speed		1,200min ⁻¹	1,200min ⁻¹	1,200min ⁻¹	1,200min ⁻¹
Noise value	50Hz	79.8dB(A)	79.8dB(A)	85.7dB(A)	85.7dB(A)
models	60Hz	83.8dB(A)	83.8dB(A)	88.4dB(A)	88.4dB(A)
Noise value of water-cooled models	50/60Hz	75 dB (A) or less			

Noise value of water-cooled motor

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

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.

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)



Process line products

Specifications

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

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.



External view of a direct drive motor

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.

Diagram of application to a film manufacturing system

Optimal for high-grade film manufacturing

These motors employ a 25-bit highresolution 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 highgrade film manufacturing.

*Detailed specifications are provided on page 17.



VF66SV servo amp



Specifications (sample)

Customizable according to customer requirements

For driving casting rolls			
Output	11 kW		
Rotating speed	0~20 min ⁻¹		
Rated torque	5,252 Nm		
Max torque	7,878 Nm		

For driving tenters/extruders		
Output	55 kW	
Rotating speed	0~300 min ⁻¹	
Rated torque	1,751 Nm	
Max torque	2,626 Nm	

	Common spe	cifications
Starting	torque	150%
Overload	capacity	150% for 1 minute
Protection		IP42 (fully enclosed splash-proof design)
Cooling method		Stator water cooling
Insulation type		F
Temperature rise		F rise
Lubrication method		Grease lubricated
Sensor		25-bit high-resolution encoder
Use environment	Ambient temperature	-10~40 °C
	Relative humidity	95% RH or less
	Elevation	1,000 m or less
	Use location	Indoors

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.

Transient operation on the level of a real vehicle

Combining a low-inertia S-DSD series dynamo with a VF66C highresponse 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 16 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. Comparison of inertia values between an induction motor and S-DSD

Types	Turner	Quitaut	Base rotating speed	In ortic (I)	
	Output	Max rotating speed	inertia (J)		
	Induction	2201444	4,000min ⁻¹	0.701.00.002	
motor	ZZUKVV	8,000min ⁻¹	0.73kg•m		
	0.000	220kW	4,000min ⁻¹	0.0701	
	5-DSD		8,000min ⁻¹	0.073Kg+m	



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	~505 kW		
Rotating speed	~ 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	~275 kW *Please consult us for outputs exceeding 220 kW.		
Rotating speed	~20,000 min ⁻¹ *Please consult us for outputs exceeding 16,000min ⁻¹ .		
Torque Up to 525 Nm* max			
High-torque, low-inertia dynamo (H-DSD, W-DSD) High torque/Low inertia/Wide range			
Output	~535 kW		
Rotating speed	~4,000 min ⁻¹		
Torque	Up to 5,960 Nm* max		

Common specifications			
Protection	IP42		
Insulation type	н		
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		

*Please consult us for torques exceeding the indicated values.

(Separate catalog: Available)

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.









External view of our permanent magnet generator

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)

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	out voltage 200/400 V±10% 50/60 Hz±5%			
Capacity (power line end) 10~500 kW				
Rated time	Derating during continuous operation and minus power fluctuation			
Overload capacity	150% for 1 minute			
Control method	Generator max efficiency control, distortion minimization phase shift PWM, Toyo Denki proprietary islanding detection			
Use environment	Indoor specs: 0 to +40 °C 85% RH or less 1,000 m elevation or less			

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 cubicletype 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.



KT320CK 200/220 V 300/320 kVA



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



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

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 ~ 39 / 43
2	4	200 / 220	50 / 605 ~ 500 / 570
3	4	400 / 440	600 / 625 ~ 750 / 875
4	4	6,600	300 / 320 ~ 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)		
	Ambient temperature: -5 to 40 °C, Relative humidity: 85% or less		
Environmental conditions	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		
Noine apoet	Standard noise		
Noise spec	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).

Controller

Hybrid output

Tandem Generating Equipment

This rated-voltage, rated frequency, low-waveformdistortion 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	Voltage (V)		Output (kVA)	
poles	Single phase	Three phase	Single phase	Three phase
4	105 / 210	210	40 ~ 50	10 ~ 30
4	105 / 210	210	60 ~ 80	10 ~ 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	50/60Hz	
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.

Substation

Functions

Prevention of regeneration cancellation



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.



Voltage drop compensation



Power peak cut



System capacity

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

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

specs. *System capacity is rated at 30 seconds.



The E³ Solution System effectively stores excess





Solution	The E ^a Solution Sys power by limiting pov	tem cuts the use of contracted ver consumption at peak hours.
After Power use	introduction	
	Morning	Evening

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.



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 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









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