e-Front runners

Fuji Medium-voltage IGBT Inverters

FRENIC4600FM5

AC Adjustable Speed Drive

Solution Service

Fuji Electric Systems Co., Ltd.

REC 92-46g

Environment-friendly inverters.

Fuji medium-voltage IGBT inverter FRENIC4600FM5 is used for direct variable-speed control of medium-voltage motors, and greatly raises the efficiency and power factor, stabilizes motor operation and conserves energy.

1 High-efficiency and high-power factor

- The use of a multi-phase diode, full-wave rectifier provides a high-power factor (95% or more) on the power source.
- The elimination of output transformers for operation has improved total efficiency (approx. 97%).
- Thanks to the snubber-less design, the switching loss of the main circuit has been reduced.
- Fuji Electric's original multi-level PWM control has reduced the IGBT switching loss.

2 FRENIC4

High-reliability

- Higher equipment reliability is achieved by reducing the number of inverter cells by using a single-phase, 3-level inverter, etc..
- Stable operation is maintained despite load fluctuations, by the simple sensor-less vector control function.
- The control device has a 32-bit MPU for quick response and high-accuracy.

3

Ideal inverter for power sources and motors

- The multi-phase diode rectifier system reduces harmonics on the power source side.
- Due to the use of Fuji Electric's unique multi-level PWM control system, the switching surge is reduced and existing motors (standard ones) can be operated.

4

Easy maintenance

- The inverter is air-cooled, requiring no cooling water.
- Start/stop operation, parameter setting, fault display and data monitoring are performed from the console with simple loader functions.
- Simple, built-in auto-tuning functions facilitate testing and adjustment.
- Fault diagnoses are easily performed.
- A dry-type input transformer is adopted.

600FM5

5

Contributes to energy saving

- A substantial energy saving is achieved by variable-speed control of a square-law reduced torque load such as a fan or pump.

Simple circuit configuration

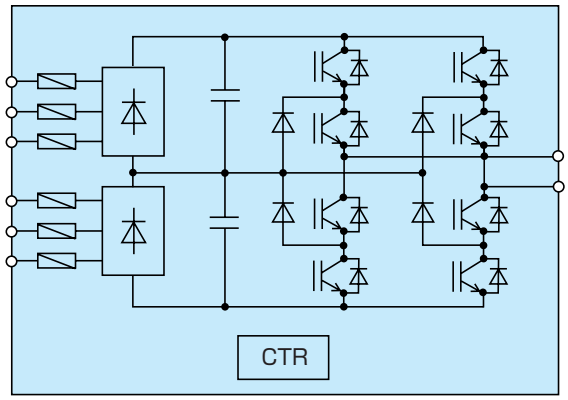
High-reliability and simple-maintenance inverters utilizing the latest power electronics such as 3-level inverter, mounting of special MPU and no need for harmonic filter/capacitor.

Cooling fan

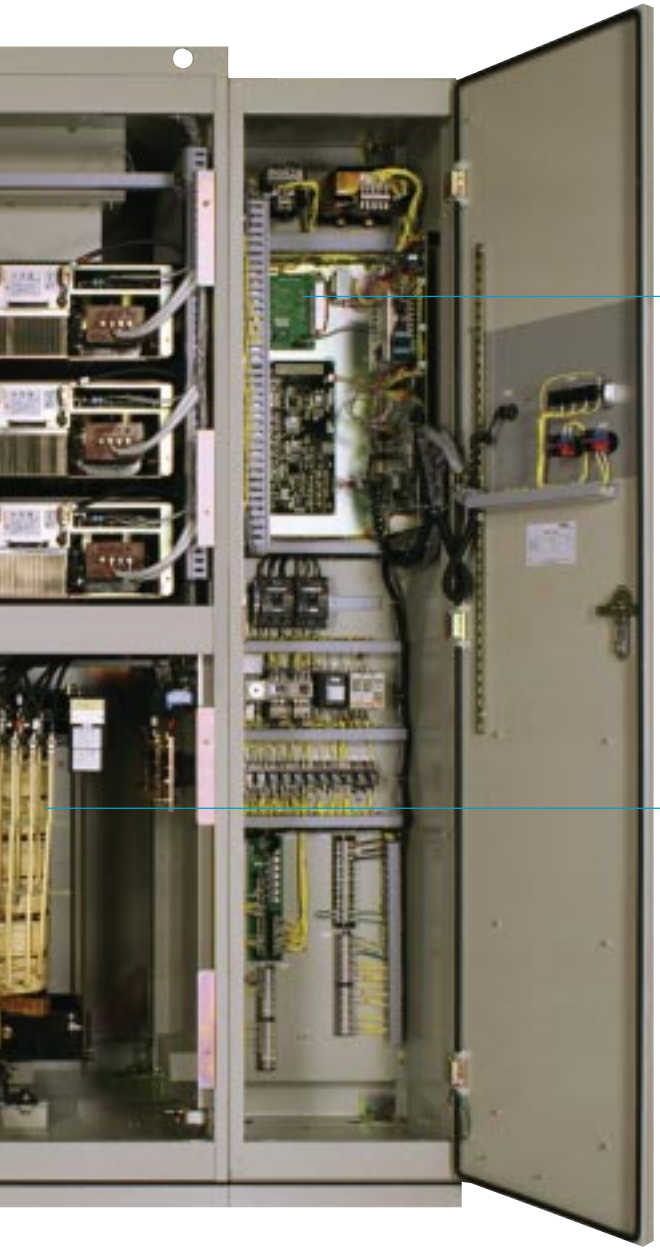
●Air-cooled inverters make maintenance easy.

Inverter cell

●The number of inverter cells has been substantially reduced by adopting a single-phase, 3-level inverter design.
●Each inverter cell alone can be replaced easily, because the controller, diodes, IGBT elements and DC intermediate capacitor are combined into an integral body.



●When requested, protection covers can be provided inside the inverter panel (as an option).
Protection covers will protect from unexpected contact with live metal parts of the main circuit.



Master control PC board

- Mounting of a 32-bit MPU, and a special MPU in the voltage and current detection system offers a quick response and high accuracy.
- Incorporation of a simple sensor-less vector control function enables inverters to maintain stable operation irrespective of load fluctuation even without a speed sensor.
- Vector control with a speed sensor is available (as an option) for equipment having high speed and torque accuracy requirements.

Input multiplex-winding transformer

- Harmonic current on the power source side is low due to a multiplex configuration of the secondary winding.
- An equivalence of 36-phase rectification is effected, so harmonic current satisfies the standard level of IEEE.
- Harmonic filters and power factor improving capacitors are not needed.
- Because a dry-type input transformer is used in the panel, external cabling work between the input transformer and inverter panel is no longer necessary.

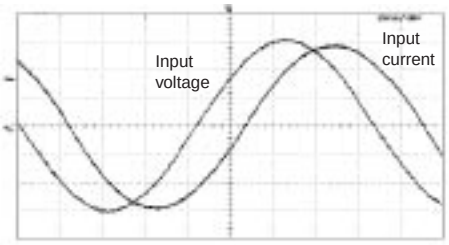
Environment-friendly

Clean power input

Substantial reduction of harmonic current on power source side

Due to progress in power electronics, semiconductors have recently been used for industrial electrical equipment and household electrical appliances in order to enhance convenience and ease of operation. However, due to harmonic currents generated from such equipment and appliances, the voltage of the power system is often distorted and many troubles occur in equipment connected to the power system. However, because the use of equipment containing power electronics will increase, measures for suppressing harmonics need to be improved.
FRENIC4600FM5 suppresses the harmonics by using a multi-phase diode rectification system (equivalent to 36-phase rectification), thereby substantially reducing the generation of harmonics in comparison with previous models.
The harmonic generation level stipulated in IEEE-519 (1992) is satisfied.
This inverter is ideal for power sources.

■Current waveform on power source side



■Harmonic current content

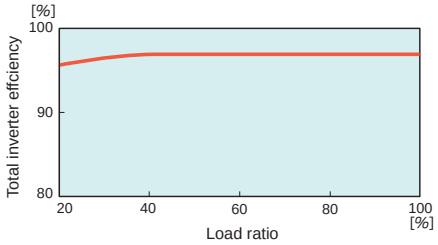
Order	5th	7th	11th	13th	17th	19th	23rd	25th	35th	37th
IEEE value [%]	4.00	2.86	1.83	1.49	1.14	1.02	0.87	0.80	0.80	0.80
Measured value (*) [%]	0.58	1.0	0.20	0.32	0.75	0.54	0.06	0.24	0.58	0.27

(*): Example value from our full load test

Total inverter efficiency as high as approximate 97% (at full load)

- Because an output transformer is unnecessary, inherent losses are eliminated.
- Switching loss is reduced because there is neither a clipper circuit for a thyristor inverter nor snubber circuit for an IGBT inverter.
- Multi-level PWM control minimizes switching loss.
- Because the harmonic current on the power source side is reduced, the primary winding of the input transformer has a reduced loss due to the harmonics.

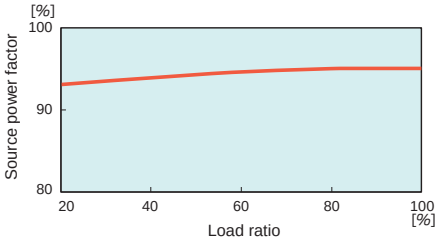
■Total inverter efficiency curve (including input transformer)



Source power factor as high as 95% or more (at full load)

- Due to full-wave rectification with multi-phase diodes, operation is allowed with the source power factor (power factor on power source side) set at a high level.
- A phase advancing capacitor and a DC reactor for improving the source power factor are unnecessary.
- A smaller power capacity suffices for inverter operation.

■Source power factor curve



Note: The efficiency and power factor data on this page are calculated by assuming that a 330kW motor is operated at the rated speed with a 3.3kV-input, 400kVA-output inverter. The data on efficiency is obtained using Fuji Electric's standard 4-pole motor.

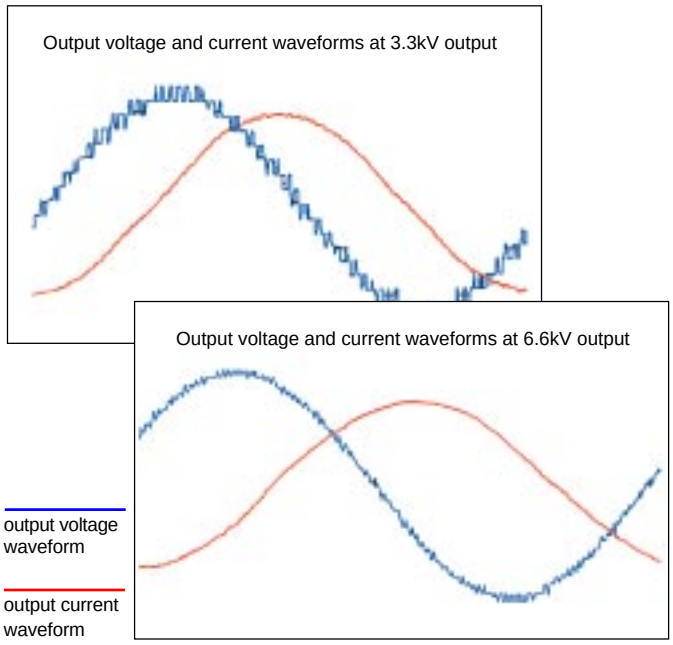
Friendly to machines

If a harmonic current component is contained in the inverter output current, a torque ripple occurs on the output shaft of a motor. A torque ripple means a change in rotational speed or a large vibration if the frequency of the torque ripple matches the natural frequency of the mechanical system and torque ripple is large.

In FRENIC4600FM5, the harmonic component on the output side is extremely small due to the multi-level (max. 17 levels) PWM control and the main component of torque ripple is at around the carrier frequency (several kHz). Therefore, torque ripple hardly affects the machine side.

Friendly to motors

- The multi-level PWM control provides an almost sinusoidal output current waveform, thus reducing motor torque ripple.
- Because the output current is almost sinusoidal, a motor suffers less loss due to harmonics.
- The multi-level (max. 17 levels) PWM control minimizes switching surge and thereby reduces stress on the motor.
- There is no need to reduce motor capacity due to inverter drive.
- There is no need for special cables, etc. due to inverter drive.
- This inverter is applicable not only to a square-law reduced torque load, but also to a constant torque load such as an extruder.
- For driving a large-capacity motor in a system that has a small power capacity, voltage fluctuation, etc. due to the starting current of a motor will cause problems. However, because the starting current can be suppressed by the soft start of this inverter, operation can be performed.



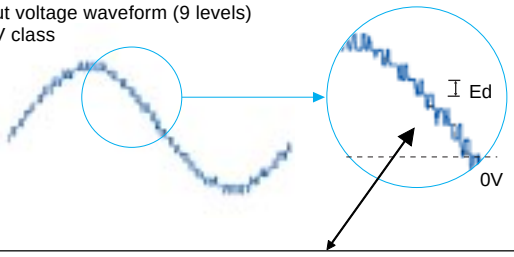
Note

Surge voltage and multi-level output

The output voltage waveform of a PWM inverter is a DC chopping voltage (called "pulse voltage = surge voltage") whose amplitude is determined by voltage Ed of the DC intermediate circuit. When this surge voltage of inverter output is applied to a motor through a cable, the voltage is reflected repeatedly between the motor terminal and inverter terminal. A sharp overvoltage higher than the inverter output voltage is thus generated at the motor terminal, which may cause dielectric breakdown of the winding.

The maximum level of the overvoltage rises close to twice the DC intermediate circuit voltage Ed of the inverter. Fuji Electric's medium-voltage inverter suppresses the DC intermediate voltage level so as to realize an output voltage waveform at 9 levels in the 3kV class and at 17 levels in the 6kV class. As a result, the overvoltage generated at the motor terminal can be suppressed.

Output voltage waveform (9 levels) in 3kV class



In the 3kV class Fuji Electric's medium-voltage inverter, the output voltage changes in 9 steps (corresponding to 9 levels) within 1/4 cycle. The voltage value of one step equals the DC intermediate circuit voltage Ed. Therefore, for the same voltage output, a larger number of steps means a smaller voltage value at one step. Thus, Fuji Electric's inverter can also reduce the surge voltage appearing at the motor terminal and thereby moderate the stress applied to the motor.

Main circuit configuration

Main circuit configuration

Fig. 1 Main circuit configuration of 3.3kV type

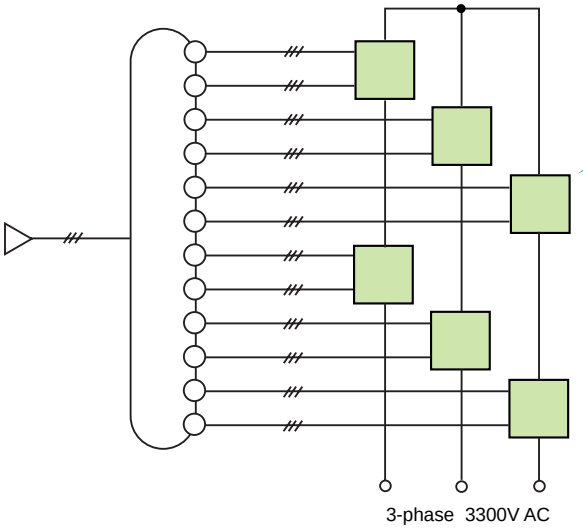
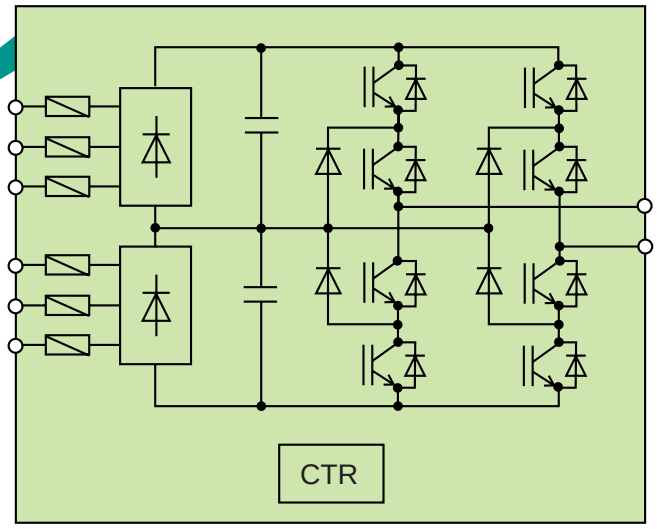


Fig. 2 Internal configuration of inverter cell



●Principle of operation

FRENIC4600FM5 consists of an input transformer and 6 inverter cells in case of the 3kV type as shown in Fig. 1 (12 inverter cells in case of the 6kV type).
One inverter cell consists of a single-phase, 3-level inverter and can receive an output voltage of 953V.
As shown in Fig. 1, the 3kV type obtains a phase voltage of about 1,900V by connecting 2 inverter cells vertically and a star connection of the vertical cell pairs can generate a line voltage of about 3,300V.
Use of the single-phase, 3-level inverter doubles the output voltage obtainable from one cell when compared with a single-phase, 2-level inverter. Therefore, an output voltage of 3.3 or 6.6kV can be obtained by using a smaller number of inverter cells. (See Figs. 3 and 4.)

Fig. 3 3-level voltage output

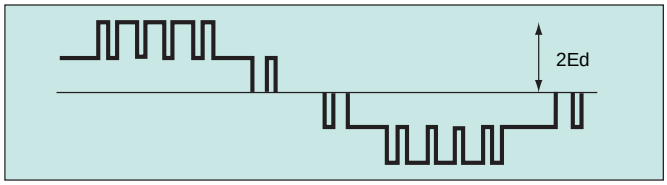
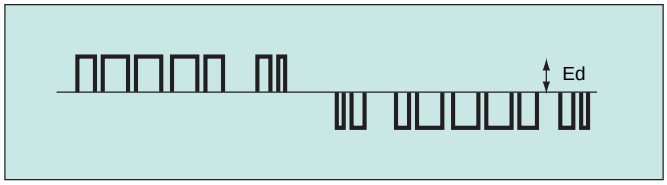


Fig. 4 2-level voltage output



Ed: DC intermediate circuit voltage

Commercial power supply bypass circuit/restarting function after momentary interruption

●Changeover to the starting circuit by commercial power supply can be made by installing a bypass circuit (option) on the inverter output side.
In this configuration, motor drive power supply is duplicated, and changeover between commercial power supply and inverter operation is allowed for running a motor at the rated speed. (See Fig. 5.)

●Shockless switching between inverter operation and commercial power operation allowed by phase control according to system voltage. (See Fig. 6.)
(Synchronizing/parallel off function: option)
An electric reactor must be installed on the output side of the inverter to enable this function.

●In the event of a voltage drop due to a momentary power interruption, the operation processing pattern can be selected according to the application.

1. **Selection of major fault at voltage drop due to momentary power interruption**
   The inverter is stopped in the major fault status and the motor is set in the free run status.
2. **Selection of restart under free run (option)**
   Inverter operation is stopped and the motor is set in the free run status. Upon power recovery, the motor under deceleration in free run or under stop is automatically accelerated again through a speed search function.
3. **Selection of continuing operation at voltage drop due to momentary power interruption (option)**
   Inverter operation is continued without setting the motor in the free run status even when a voltage drop due to a momentary power interruption occurs.
   As soon as line voltage is recovered, the motor is accelerated again back to the operating speed.

Notes:
(1) A voltage drop due to a momentary power interruption will be detected at 85% or less of the rated voltage.
(2) Operation can be continued within 300ms at a voltage drop due to a momentary power interruption, which can be extended to 1.2s by adding a board (option) or installing uninterruptible power supply system for the control power source.

Fig. 5 Power system diagram

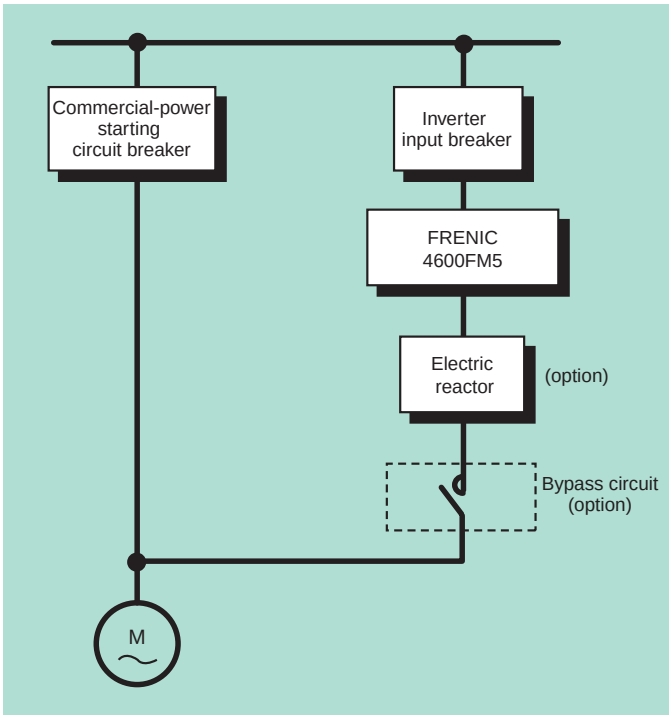
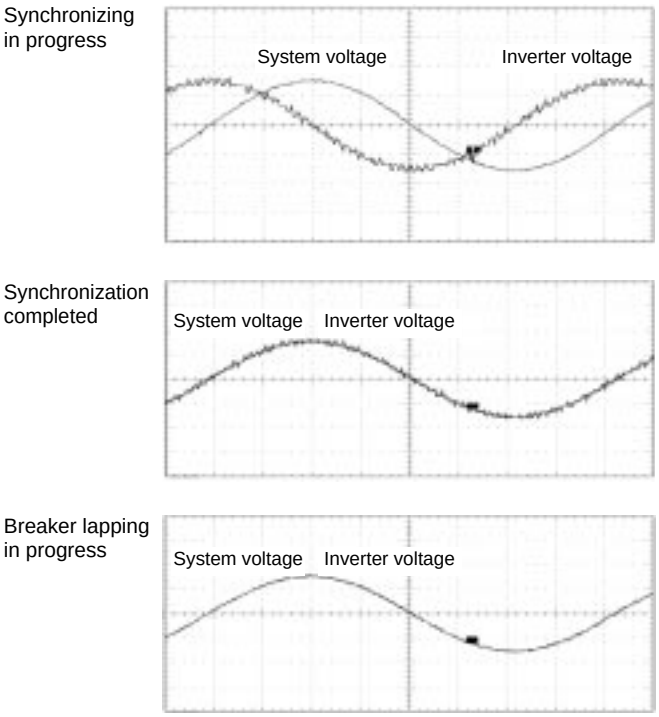


Fig. 6 Synchronization/parallel off waveform



Data setting and monitoring

Operation and monitoring simplified by console unit equipped with LCD

LED monitor
Under load running:
Displays the number of revolutions.
At tripping:
Flashing 'Err' is displayed.

LCD monitor
Displays various information including operation data, set data and fault data.

UP and down key
Used for changing data No. and values of data setting.

Program key
Used for moving to the monitor screen.

Shift key (digit shift)
Used for shift the position of the cursor from one digit to another in order to change data.

Reset key
At tripping: Releases the stop status due to tripping.
Under programming: Returns to the previous layer.

Run key

Stop key

Function/data selection key
Used for selecting display data, moving to data changing mode, and saving data.

Display description of console unit

No.	Description	Number of items
1	Current, voltage and frequency at present (*)	6
2	Parameter setting items	About 320
3	DI/DO status display	7
4	Controller RAM data	About 80
5	AI/AO status display	11
6	Sent/received data	About 20
7	Cause of fault	20
8	Present time, operation time	3

(*): Displays 6 items on the 2-image screen.

Other functions

● **Fault history**

Displays a chronological record of 100 faults with the cause and the date and time of occurrence.

● **Trip data display**

Displays the sampling values of internal data and bit data ON/OFF status in the event of a fault.

● **Save of set data, load, and comparison**

The set data can be saved in the EPROM of the console unit. The saved data can also be loaded and compared with other saved data.

Large LCD touch panel (option)

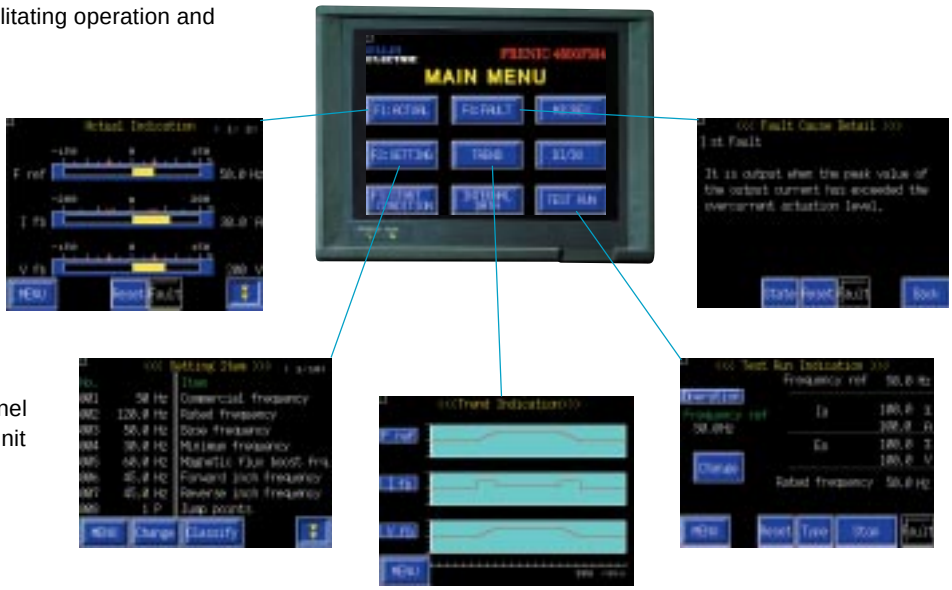
This is a setting and monitoring tool for facilitating operation and monitoring on a 5.7-inch LCD.

●Main functions of LCD touch panel

- Inverter start/stop
- Setting, change and indication of control parameters
- Bar graph display of actual value data
- Indication of fault cause (First fault/detailed indication)
- Trend display
- Test run, etc.

Note:

The LCD unit can be mounted on the panel face (at the position where the console unit is mounted in page 9).



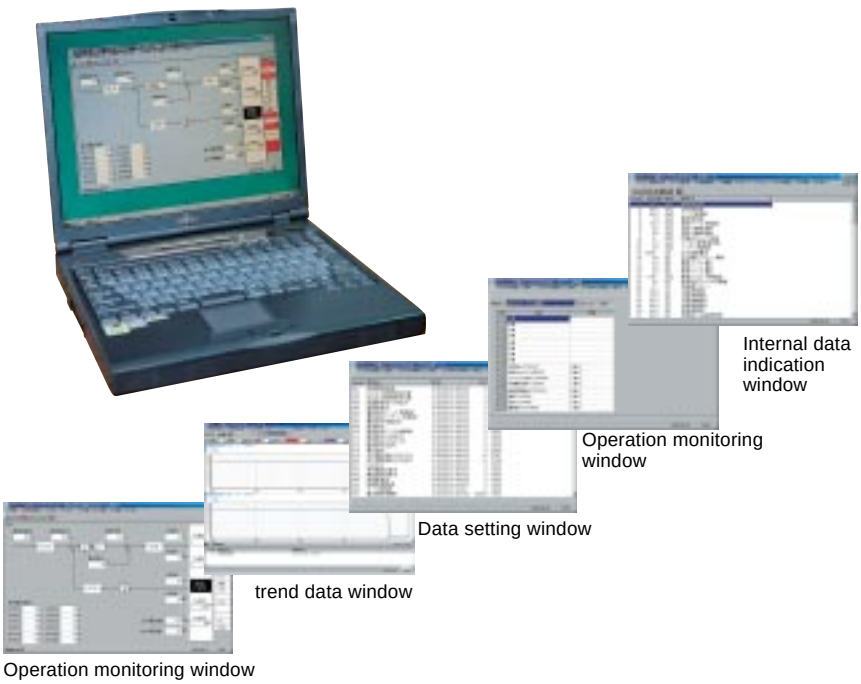
DDC loader for a maintenance tool (option)

Although maintenance and adjustment can be performed from the console unit mounted on the panel face, an optional DDC loader is available as a maintenance/adjustment tool.

The DDC loader using a notebook computer is easy to use because of its interactive mode.

●Main functions of maintenance tool

- Setting, change, indication and saving of control parameters
- Running status display
  Block diagram display, actual value indication, internal data listing
- Indication of fault cause
  First fault, detailed indication, trace-back data
- Test run



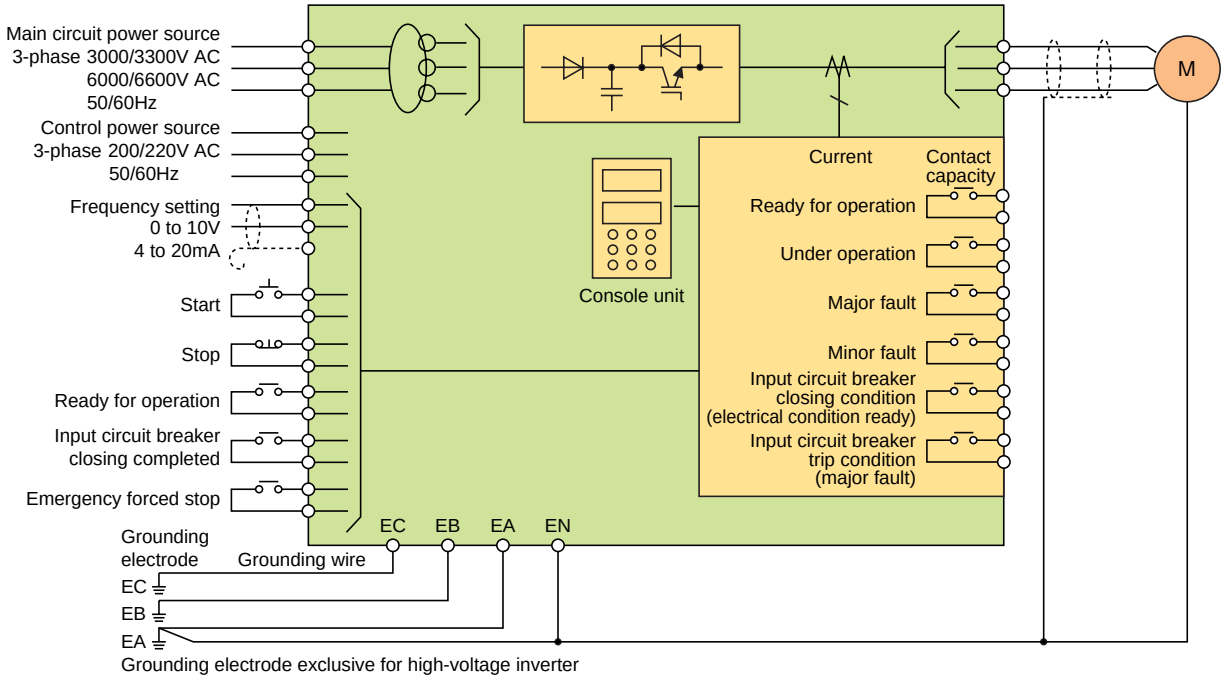
Standard specifications

Standard specifications

Fuji product name			FRENIC4600FM5															
Voltage classes		[kV]	3.3							6.6								
Output	Rated capacity	[kVA]	400	550	825	1250	1875	2500	3750	560	800	1100	1650	2500	3750	5000	7500
	Rated current	[A]	70	96	144	218	328	437	656	49	70	96	144	218	328	437	656
	Max. current (at overload)	[A]	87	120	180	273	410	546	820	61	87	120	180	273	410	546	820
Applicable max. motor output		[kW]	300	450	670	1060	1600	2150	3200	450	670	900	1400	2100	3250	4400	6400
Input	Main circuit		3-phase, 3000/3300V at 50/60Hz							3-phase, 6000/6600V at 50/60Hz							
	Main circuit insulation class		Class 3 B							Class 6 B							
	Control circuit		3-phase, 200/220V at 50/60Hz														
	Capacity of control power supply [kVA]		0.2 (single phase is allowed.)														
	Capacity of fan power supply [kVA]		1	2	2.5	3	5	5	10	2	2.5	3	3	6	9	9	20
	Cell control power source		Supplied from AC main circuit (from secondary side of input transformer)														
	Allowable power variation		Voltage: ±10%, frequency: ±5%														
Control	Control system		V/f constant with simple sensor-less vector control (vector control selectable as an option)														
	Output frequency	range	0.2 to 50/60Hz (up to 200Hz as an option)														
		accuracy	±0.5% at max. frequency (at analog frequency standard input)														
		resolution	0.1Hz														
	Accel./decel. time		0.1 to 5500s														
	Overload capability		125%, 60s														
	Main control function		Current limit, momentary drop protection and stop/restart (option)														
	Protection function		Overcurrent, main circuit fuse blown, overvoltage, undervoltage, CPU fault, cooling fan stop														
	Transmission function (option)		T-link														
Structure	Panel		Steel panel, self-standing, enclosed, front maintenance type														
	Degree of protection		IP20														
	Method of cooling		Forced ventilation with ceiling fan														
	Finish color		Munsell 5Y7/1 (inside and outside)														
Ambient conditions	Temperature		0 to +40℃ (storage temperature: −5 to +50℃)														
	Humidity		85% RH max. (no condensation)														
	Site altitude		Up to 1000m above sea level														
	Acceleration vibration		4.9m/s^2 acceptable (10 to 50Hz)														
	Installation place		Indoor														
	Atmosphere		General environment free from corrosive gas, dust and flammable/explosive gas														
Applicable standard			JIS, JEM, JEC														

Notes: (*1) The applicable motor output is the reference value of Fuji Electric's standard 3.3 and 6.6kV, 4-pole motors.
(*2) Regenerative braking is not provided.
(*3) The rated output capacity is the value when the input and output voltage are 3.3 and 6.6kV, respectively.
At 3.0 and 6.0kV, the output capacity must be multiplied by 0.9.
(*4) The inverter unit requires a dedicated input breaker.
(*5) Select a transformer of appropriate capacity according to the capacity of the motor in compliance with harmonics guidelines.
(*6) The type of rated capacity of 120% of the above is also available for continuous operation (no overload).
Contact us for details.

Standard connection diagram



Note: Be sure to use an EA grounding electrode exclusive for the high-voltage inverter, and isolate it from the main grounding lines of other devices.

Standard interface

Input side		
Main circuit power source	Main circuit power source	
Control power source	Control and cooling fan power source	
Frequency setting	0 to 10V/0 to 100%	Input impedance 1MΩ
	4 t0 20mA/0 to 100%	Input impedance 250Ω
Run command	Closure for run	Dry contact
Stop command	Opening for stop	Dry contact
Ready for operation	Closure when ready	Dry contact
Input circuit breaker status signal	Closure when closed	Dry contact
Emergency forced stop	Closure at emergency forced stop	Dry contact
Output side		
Electrical condition ready	Closure when ready	Dry contact (contact capacity: 250V AC, 2A or 30V DC, 3A)
Under operation	Closure under operation	Dry contact (contact capacity: 250V AC, 2A or 30V DC, 3A)
Major fault	Closure at major fault	Dry contact (contact capacity: 250V AC, 2A or 30V DC, 3A)
Minor fault	Closure at minor fault	Dry contact (contact capacity: 250V AC, 2A or 30V DC, 3A)
Input circuit breaker closing condition	Closure when electrical condition ready	Dry contact (contact capacity: 250V AC, 2A or 30V DC, 3A)
Input circuit breaker trip signal	Closure in major fault	Dry contact (contact capacity: 250V AC, 2A or 30V DC, 3A)
Analog signal (option) (*)	0 to 10V	Load resistance 10kΩ or more
	4 to 20mA	Load resistance 750Ω or more

(*): Contents of this signal are selectable.

Outline dimensions

Dimensions

● Front maintenance structure

Fig. 1

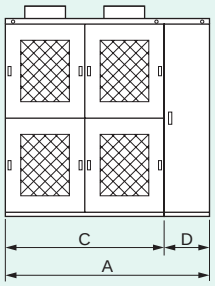


Fig. 2

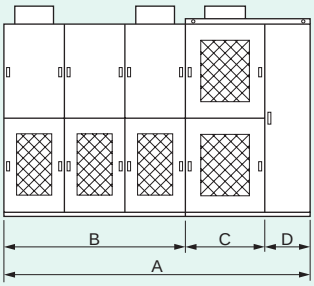
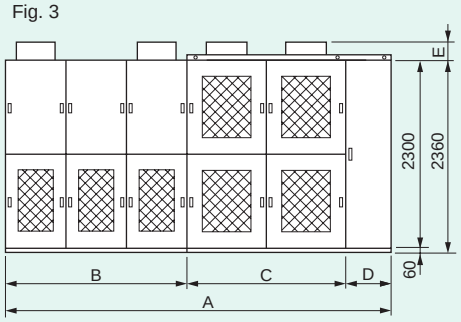


Fig. 3



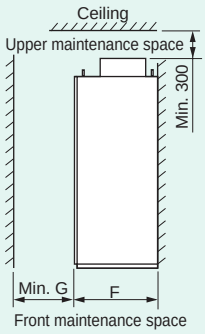


Fig. 5

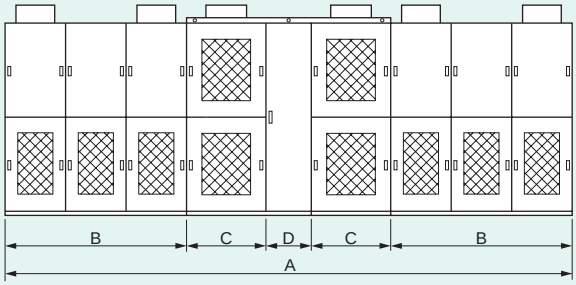
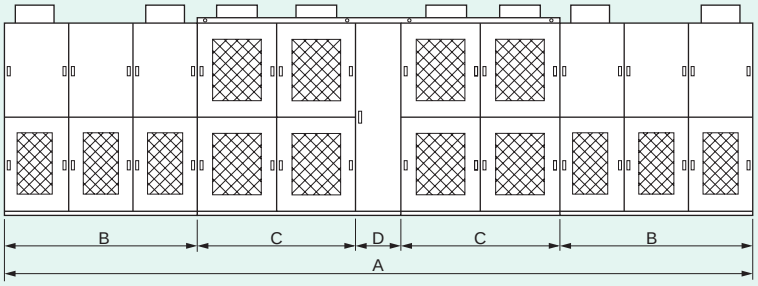
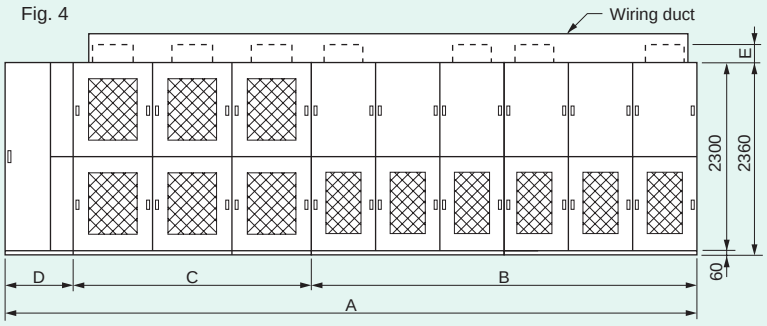


Fig. 6



● Front/rear maintenance structure

Fig. 4



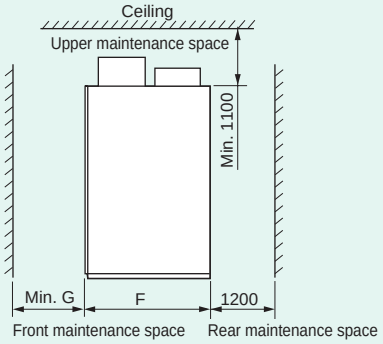
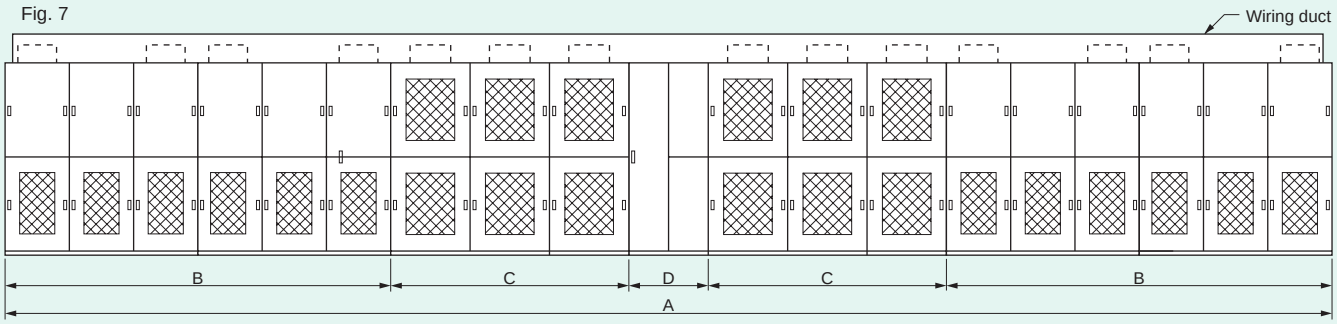


Fig. 7



● 3.3kV

Capacity [kVA]	Outline drawing	Dimension [mm] A (Full width)	B (Transformer panel)	C (Converter panel)	D (Control output panel)	E (Fan)	F (Depth)	G (Maintenance space)	Mass [kg]
400	Fig. 1	2300	–	1800	500	65	1000	1200	3200
550		2600	–	2100	500	220	1000	1200	4100
825		2700	–	2200	500	510	1200	1200	4900
1250	Fig. 2	4300	2500	1200	600	460	1200	1500	7500
1875	Fig. 3	5100	2500	2000	600	280	1200	1500	10500
2500		5100	2500	2000	600	280	1200	1500	11000
3750	Fig. 4	10200	5600	3600	1000	600 (*3)	1600	2200	20500

● 6.6kV

Capacity [kVA]	Outline drawing	Dimension [mm] A (Full width)	B (Transformer panel)	C (Converter panel)	D (Control output panel)	E (Fan)	F (Depth)	G (Maintenance space)	Mass [kg]
560	Fig. 2	3600	2000	1000	600	450	1100	1200	4600
800		3600	2000	1000	600	450	1100	1200	5600
1100		4200	2100	1500	600	320	1200	1300	6400
1650	Fig. 3	5100	2500	2000	600	320	1200	1300	7400
2500	Fig. 5	8000	2500	1200	600	460	1200	1500	14500
3750	Fig. 6	10200	2800	2000	600	280	1200	1500	21200
5000		10600	3000	2000	600	280	1200	1500	23700
7500	Fig. 7	20400	5600	3600	2000	600 (*3)	1600	2200	41000

Notes: (*1) The outline dimensions of the panel represent the maximum dimensions of a standard-capacity model.
They may differ depending on the applicable motor capacity.
(*2) The structure is for maintenance from the front.
Be sure to allow at least the maintenance space listed in column G of the above table.
(*3) A wiring duct is installed on the panel in Figs. 4 and 7 (height: 600mm).
(*4) A cooling fan is mounted on the panel. To assure maintainability and cooling performance,
allow space of at least 300mm between the top of the fan and the ceiling.
(*5) The standard front face of the panel is a covered type (except for the control output panel).
A door type can also be manufactured.
(*6) In the case of the 6.6kV type with a capacity of 2,500kVA and above, back to back installation
(front/rear maintenance structure) reduces the panel width by approximately half.
Contact us for the dimensions of this type.
(*7) The outline dimensions of the panel may be changed without notice. Contact us for details.

Contributes to energy saving

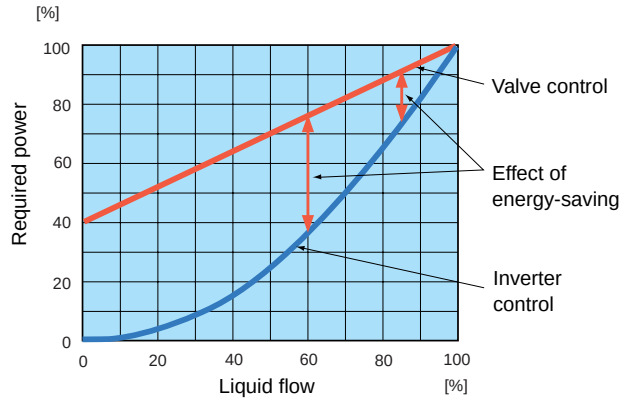
FRENIC4600FM5 inverter operation promises substantial energy-saving and carbon dioxide reduction.

In air-conditioning or pumping facilities, fans or pumps typically run at a constant speed even when the load is light.
Adjustable speed control according to the load (air or liquid flow) through inverter operation greatly reduces energy consumption and maintains the maximum possible motor efficiency even at low-speed operation.

■Example of application and energy-saving effect

The following example compares constant speed motor operation with valve (or damper) control, against inverter adjustable speed control operation, and shows the electric power saved.

Liquid flow and power characteristics



●Example conditions for calculation

Motor output:

1,000kW, for annual operation time 4,000 hours

Operation pattern:

85% flow for 1/2 of overall time (2,000 hours)

60% flow for the remaining half (2,000 hours)

●Constant speed operation of motor (with valve control)

At 85% load of liquid flow (Q)

Required Power (P) = 91%×1,000kW = 910kW

At 60% load of liquid flow (Q)

Required Power (P) = 76%×1,000kW = 760kW

Annual power consumption

910kW×2,000h+760kW×2,000h = 3,340,000kWh

●Inverter operation (adjustable speed control operation with inverter)

At 85% load of liquid flow (Q)

Required Power (P) = 61%×1,000kW = 610kW

At 60% load of liquid flow (Q)

Required Power (P) = 22%×1,000kW = 220kW

Annual power consumption

610kW×2,000h+220kW×2,000h=1,660,000kWh

●Annual energy-saving

3,340,000−1,660,000 = 1,680,000kWh

(energy-saving = about 50%)

Carbon dioxide reduction = 100,800kg

Options

●Field Web adapter (plusFSITE)

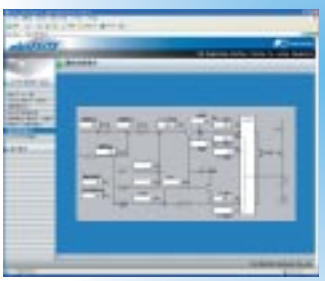
This adapter enables users to carry out remote monitoring of inverters promptly and easily with their own personal computers without using a dedicated system.

●Main features

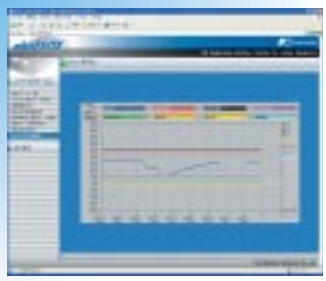
- Web server function
  Inverters can be monitored from the browser of a personal computer. (Display screen can be changed if requested.)
- Mail sending function
  Actions can be reported periodically from inverters.
- Installation and wiring both easy
  - ・A small and lightweight structure mountable on the front of the inverter panel
  - ・Connectable with the loader connector of an inverter (RS-232C interface)
  - ・Connectable with personal computers through LAN cable (IEEE802.3 10BASE-T)
- Equipped with a 32-bit RISC chip/real-time OS μITRON
- Protocol converting function
  (Changeable from RS-232C to LAN)
- The corresponding drive unit is applicable to the FRENIC4600FM5 and other products of Fuji Electric.

Field Web adapter
plusFSITE

Setting data list window



Real-time operation status window



Real-time trend graph window

●LCD touch panel

The touch panel offers the following key loader functions:

- Start and stop of inverter
- Setting, change and display of control parameters
- Fault data display and fault resetting
- Data monitoring (LED display)

The contents of the above data are displayed on the LCD.

●DDC loader

A loader using a notebook personal computer is available.
The easy-to-use interactive type of loader offers the following functions.

- Start and stop of inverter
- Online setting, change, display and printing of control parameters
- Fault resetting
- Trace-back data
- Fault data display and printing
- Data monitoring

●Analog output unit (AO unit)

Data can be output in analog mode during operation. Output data can be freely selectable among about 100 items by operating the console unit.

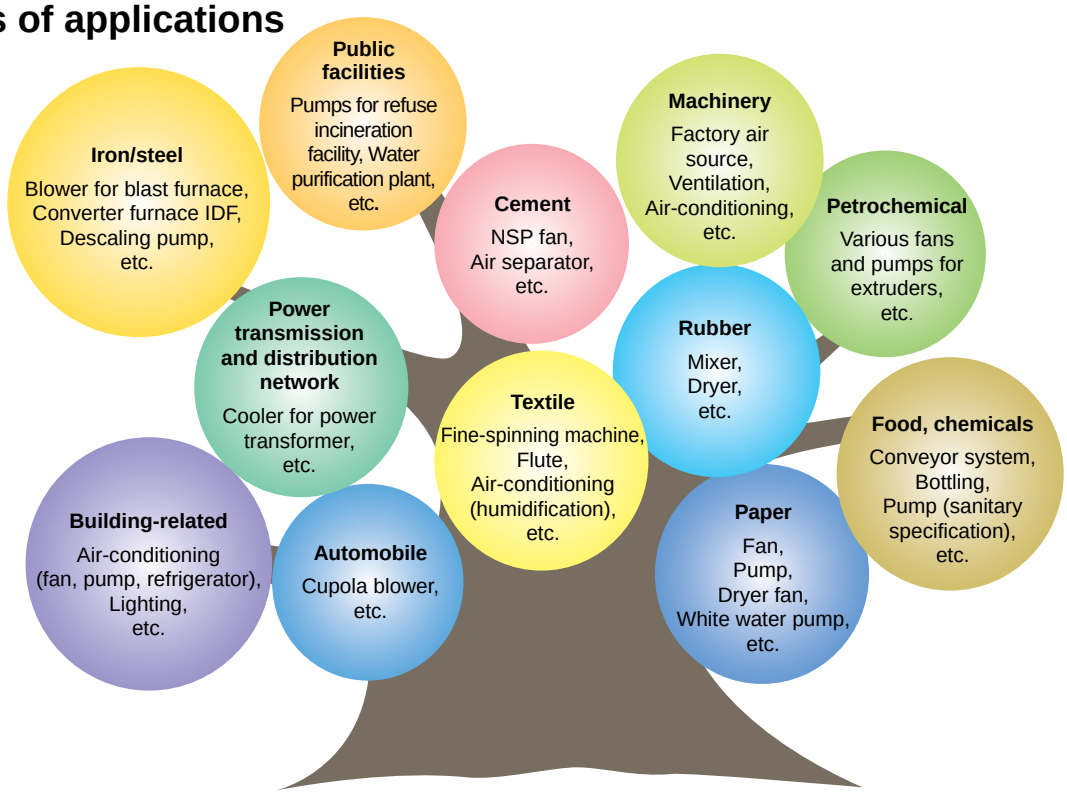
●Lifter

A special lifter for drawing out inverter cells

Wealth of functions to accommodate every need

Application	Series	Feature	Output voltage [V]	Capacity range [kVA] (10 / 100 / 1000 / 5000 / 10000)
For plant	FRENIC 4000FM5	V/f controlled inverter for plant ・Simple control system ideal for fans, pumps, and group operation of motors ・High-accuracy frequency control	400	600
	FRENIC 4000VM5	Vector controlled inverter for plants ・High-performance vector control system for quick response, high-accuracy and wide range of speed control ・High-accuracy torque control (VMT5)	400	3600
	FRENIC 4400VM4	Large-capacity vector controlled inverter ・Larger-capacity VM4 series with IGBT 3-level control system	800	7200
For general industry (medium-voltage)	FRENIC 4600FM5	Medium-voltage V/f controlled inverter ・3.3/6.6kV IGBT inverter (without using output transformer)	3300 6600	3750 7500
For general industry (low-voltage)	FRENIC 5000G11S	Low-noise, high-performance and multi-function inverters	200 400	131 563
	FRENIC 5000P11S	Low-noise inverter for fans and pumps	200 400	158 731
	FRENIC 5000VG7	High-performance vector control inverters	200 400	131 563

■Examples of applications



Selection of inverter capacity

When selecting inverter capacity, select an inverter whose rated current value is larger than the operating current of the motor to be driven.

●Selection example 1

For driving a 3.3kV, 60Hz, 300kW, 4-pole motor:
Rated current value of motor: 65A
Operating current value of motor: 65A
→Select an inverter capacity of 400kVA (70A).
(65 < 70A)

●Selection example 2

For driving a 3.3kV, 60Hz, 800kW, 4-pole motor:
Rated current value of motor: 173A
Operating current value of motor: 140A
→Select an inverter capacity of 825kVA (144A).
(140 < 144A)

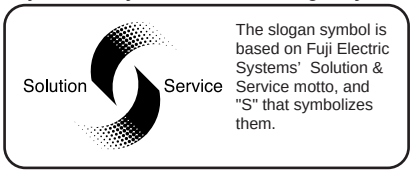
Ordering Information

When placing an order or making an inquiry, please state the following.

Application of inverter					**Remaks:**
Load machine specifications					
Name: ☐Pump, ☐Fan, ☐Blower, ☐Air compressor, ☐Other ( )					
Load torque characteristics: ☐Square-law speed, ☐Constant torque, ☐Constant output					
Moment of load inertia after conversion into motor shaft (J): kg・m²					
Overload: %					
Input specifications					
Rated voltage: V± %		Rated frequency: Hz± %			
Control power source: -phase, -wires, V, Hz					
Drive motor					
Motor specifications: ☐Squirrel-cage rotor, ☐ ( ), ☐Existing, ☐New installation					
Rating	Output: kW	No. of poles:	Voltage: kV		
	Frequency: Hz	Speed: r/min	Current: A		
Speed control					
Controllable range: r/min to r/min					
Rotational frequency setting method					
☐Analog signal: 4 to 20mA, 0 to 10V, ☐Up/down signal, ☐ ( )					
Commercial power source bypass circuit					
☐with, ☐without					
Ambient conditions					
Install location: Indoor	Humidity: %RH	Temperature: ℃	Altitude: m		
Provision of air conditioning:		Limit on carrying-in:			

Fuji Electric's inverters are manufactured in a factory that has acquired environment management system ISO14001 certification.

Fuji Electric Systems Co., Ltd. / Slogan symbol



The slogan symbol is based on Fuji Electric Systems' Solution & Service motto, and "S" that symbolizes them.

Fuji Electric Systems Co., Ltd.

6-17, Sanbancho, Chiyoda-ku, Tokyo 102-0075, Japan
Phone : (03)3515-7500

Internet address : http://www.fesys.co.jp

2005-8(H2005g/K1999)KO-D/CTP5Ok Printed in Japan

Printed on 100% Recycled Paper