

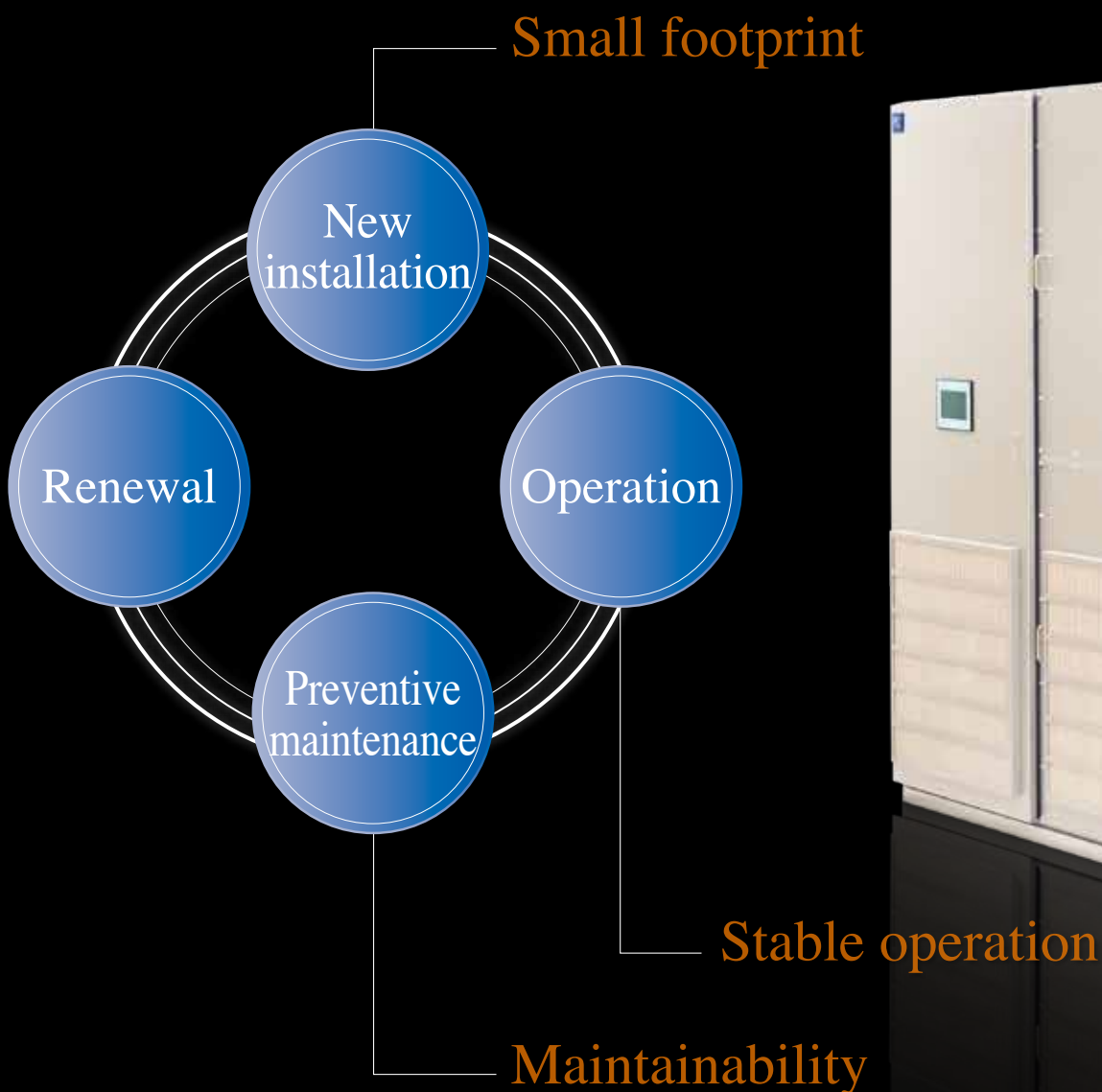
Medium-voltage Drives

FRENIC4600FM6e



Offering comprehensive benefits throughout of new equipment to renewal.

1. Industry's top class **design** enables installation with a wide range of equipment.
2. Contributes to **stable operation** by improvement of various functions and reliability.
3. Contributes to **preventive maintenance** by improved convenience during maintenance.



the entire lifecycle from installation



Application field



Steel

Fans, induction blowers, dust collectors, cooling water pumps



Petrochemicals

Granulators, compressors, fans and pumps



Water treatment

Drainage pumps, water conveying pumps, water supply pumps



Cement

Fans, kilns, separators, bucket elevators



Other

Turbo refrigerators, Banbury mixers, ball mills

Industry's top class design enables installation with a wide range of equipment.

Industry-leading compact structure

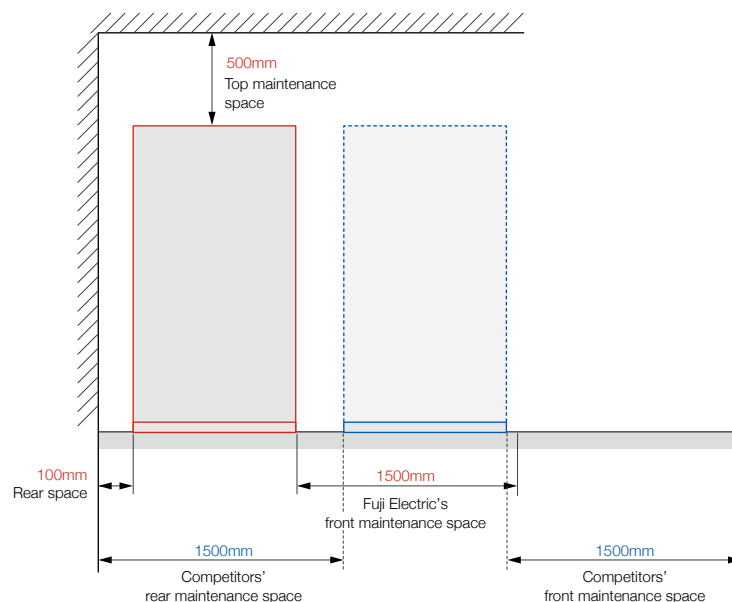
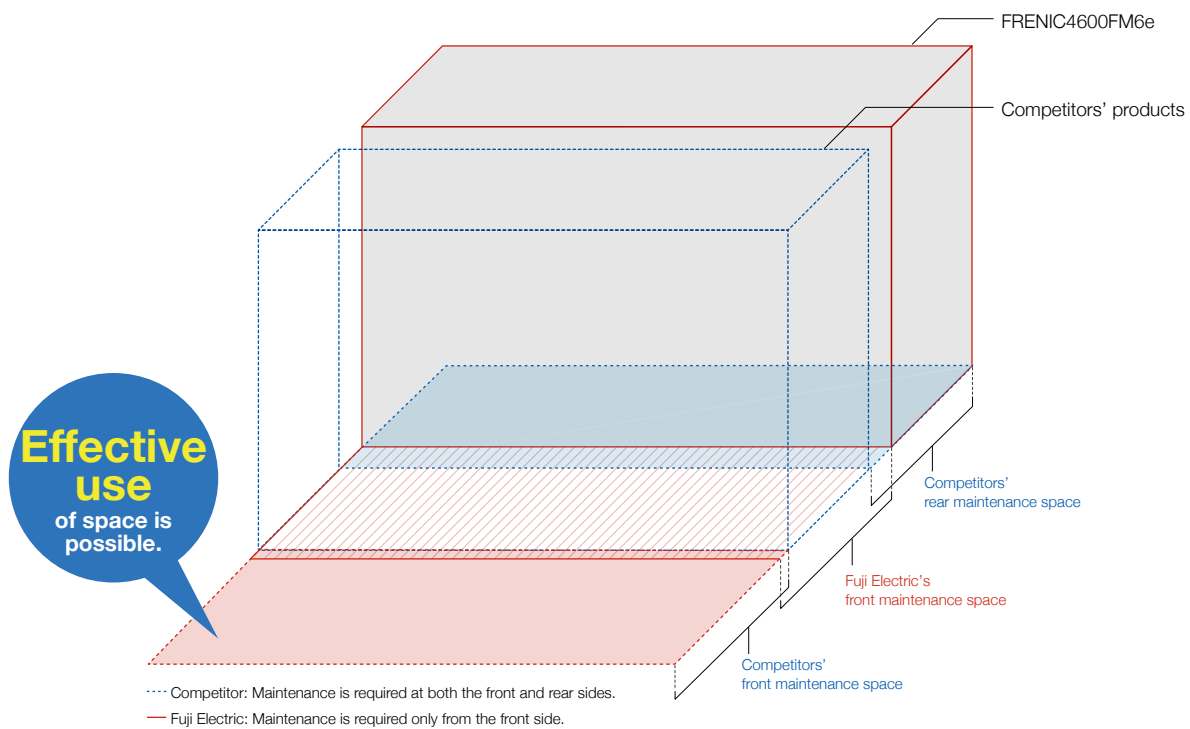
Simple main circuit configuration enables a smaller and lighter design than that of conventional models. Also contributes to a reduction in installation costs, such as building construction expenses, and enables a wider choice of installation locations.

- **Volume: reduction of approx. 27% compared to conventional models**
- **Footprint: reduction of approx. 17% compared to conventional models**



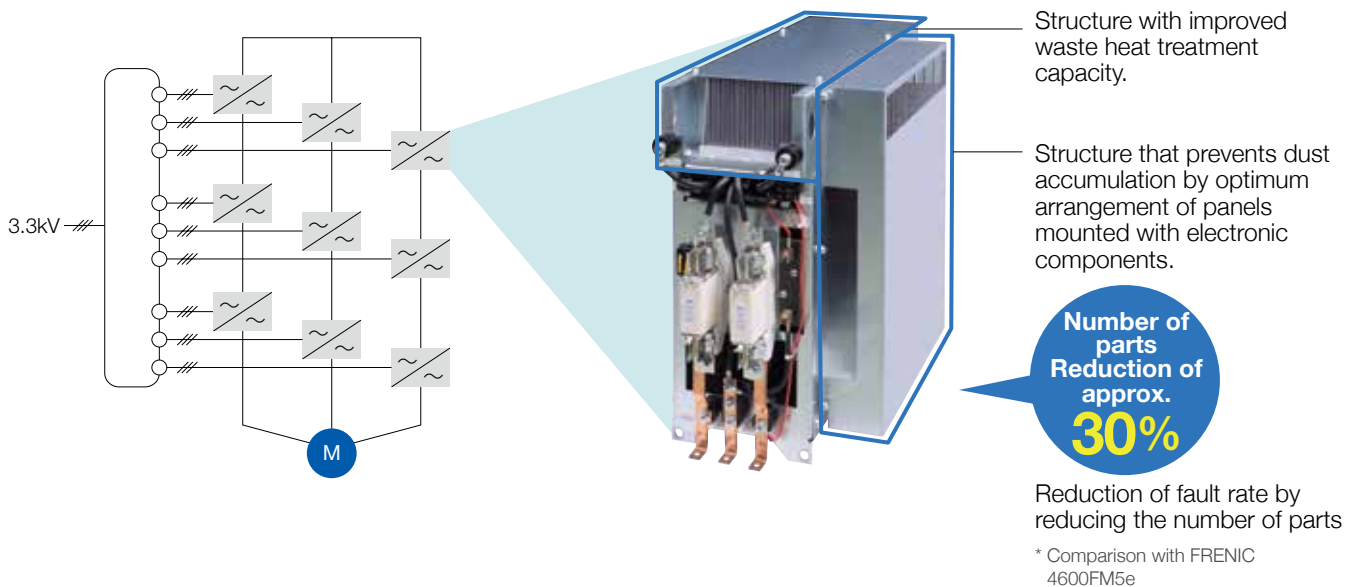
Effective utilization of electric compartment space

With complete access possible from the front of the unit, there is no need to provide maintenance space on the rear side. This enables the space in the electric compartment to be effectively utilized.



Contributes to stable operation by improvement of various functions and reliability.

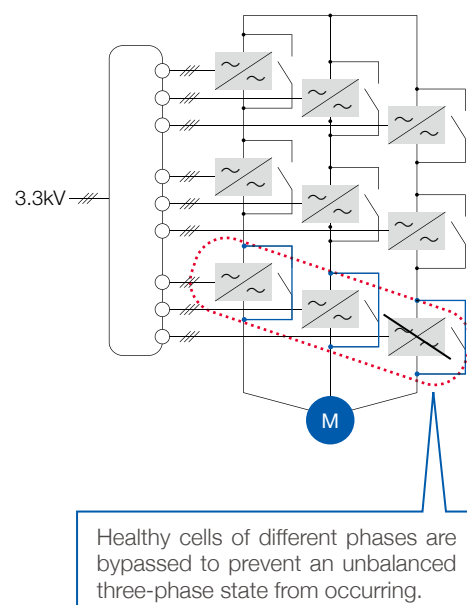
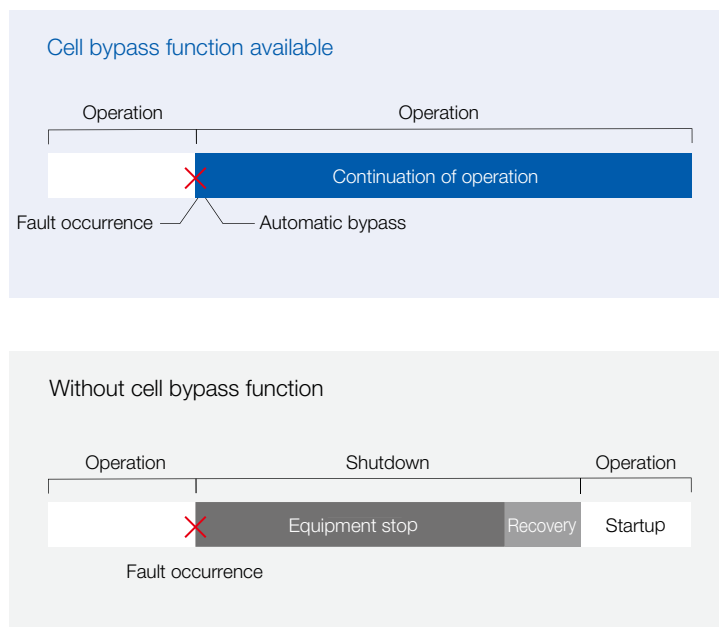
Inverter cell structure makes full use of Fuji Electric's experience and expertise.



Equipped with cell bypass function* (optional)

* Fuji Electric research

In the event of a cell fault, it is possible to bypass the failed cell and operate the unit using only healthy cells. Automatic switch-over during inverter operation does not stop the equipment.



Auto-restart function upon an instantaneous power failure can be selected to match the purpose of the equipment.

It is possible to select the operation pattern to match the application when an instantaneous voltage drop occurs.

- Selection of major fault
- Selection of free-run restart (optional)
- Selection of continued operation (optional)
 - Operation continues for 300 msec from the instantaneous power failure detection level (detected at system voltage = 85% or less)

Backup by a commercial bypass system

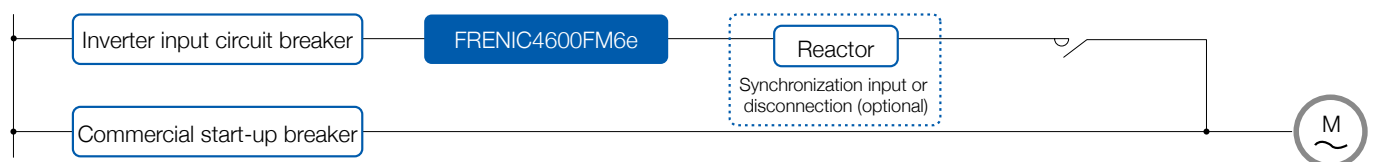
A commercial bypass system can be constructed by using a commercial start-up circuit in combination. Enables equipment operation to continue when the inverter is stopped.

Synchronized input or disconnection function that enables the power supply to be switched over without stopping the equipment.

Inverter output is switched over according to the phase of the system voltage.

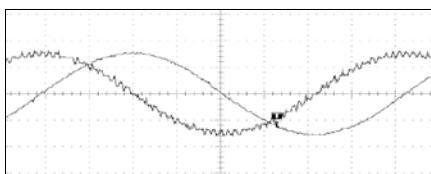
This function enables the power supply to be switched over without instantaneous disruption and shock, so the equipment does not need to be shut down.

Power system diagram

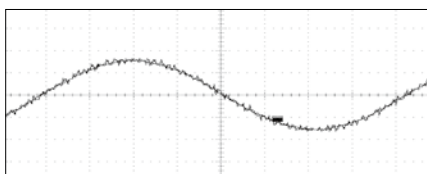


Synchronization input or disconnection waveform

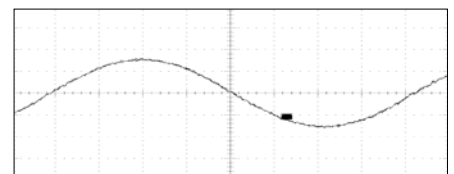
Phasing in progress



Synchronization complete



Circuit breaker lapping in progress

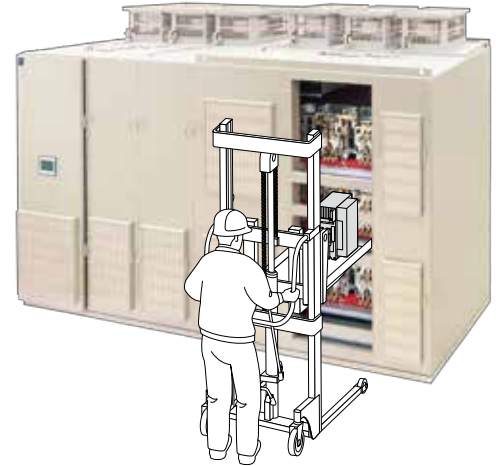


* A reactor (optional) is required on the inverter output side for this function.

Contributes to preventive maintenance by improved convenience during maintenance.

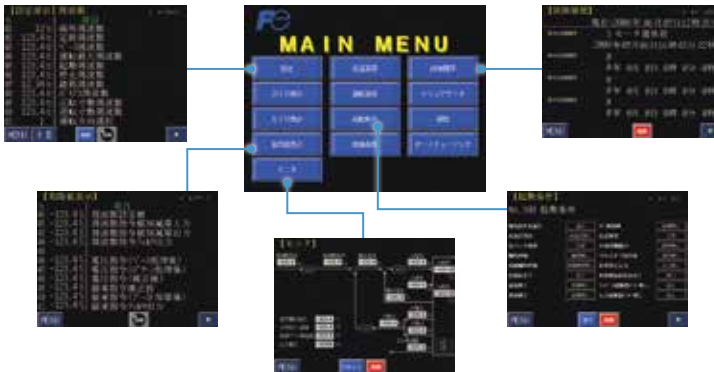
Quick exchange of cells is possible.

Easy-to-carry structure enables cells to be easily exchanged also in the event of a fault.



Standard equipped LCD touch panel features good visibility.

7-inch liquid crystal display mounted on the front enables easy monitoring and operation.



Main functions of LCD touch panel

- Start and stop of the inverter
- Set, change and display of control parameters
- Display of actual value data as bar graphs
- Display of fault causes (first fault, detailed display)
- Display of trends

* Japanese, English and Chinese are available for the LCD touch panel display language.

Air filters can be replaced without opening the door (toolless)

Air filters that need to be replaced on a regular basis are mounted on the outside of the panel. There is no danger of coming in contact with the high-voltage charging unit when replacing the filter.

* In the standard configuration, door is only control part. (The others are covers.)



Change main circuit capacitor to film capacitor is possible (optional).

Electrolytic capacitors are equipped in the standard specification. Change to a film capacitor is possible during component maintenance.

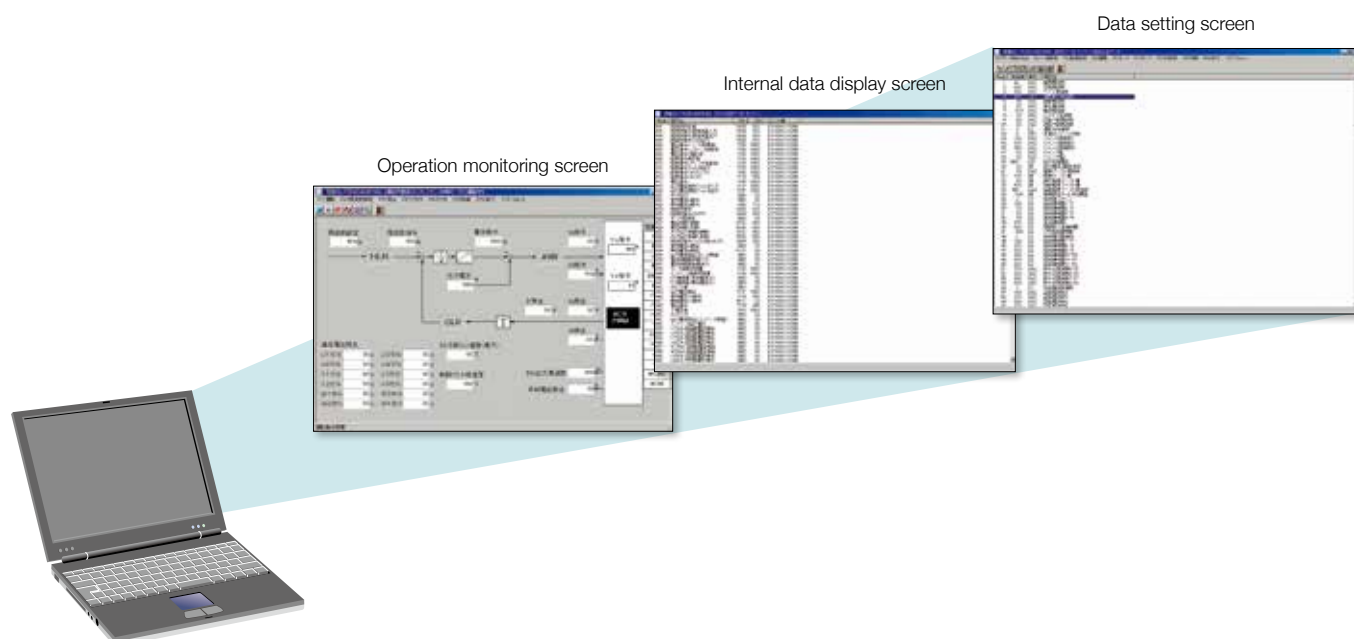
Selection is possible to meet the customer's requirements with regard to installation cost and running cost.

Interactive and easily accessible DDC loader maintenance tool

Maintenance and adjustment are normally performed using the touch panel, but a DDC loader is also available for use as a maintenance adjustment tool.

The DDC loader can be used easily and interactively on the screen of a personal computer.

* Loader software is included free of charge. PC hardware is optional.



Main functions of maintenance tool

- Set, change, display, and save control parameters
- Operating status display: Display of block diagrams, actual values, and internal data
- Display of fault causes: first fault, detailed display, trace back data

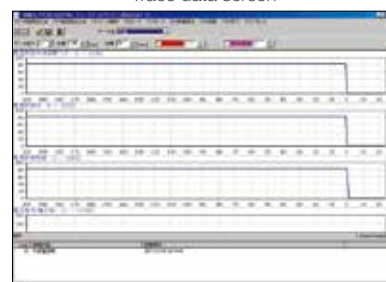
* Japanese and English are available for the display language.

* Windows 10 is the currently supported OS.

Operation monitoring screen



Trace data screen



Reduction of stress on power supply and motors

Reduces power supply side harmonic current and does not affect the equipment.

A multiphase diode rectification system is used to prevent obstacles caused by harmonic currents generated by equipment using semiconductors. This inverter does not stress the power supply in compliance with the harmonic suppression guideline.*

* Guideline on harmonics countermeasures for consumers receiving high voltage or special high voltage power, as established on September 30, 1994.

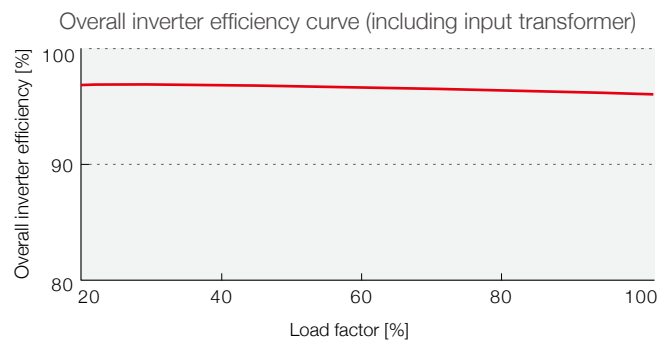
Harmonic current content (3.3 kV)

Degree	5	7	11	13	17	19	23	25
Guideline [%]	4.00	2.86	1.83	1.49	1.14	1.02	0.87	0.80
Actual value [%]	2.7	1.0	1.2	0.8	0.8	0.5	0.4	0.3

Note: Example of measurement using an actual load.

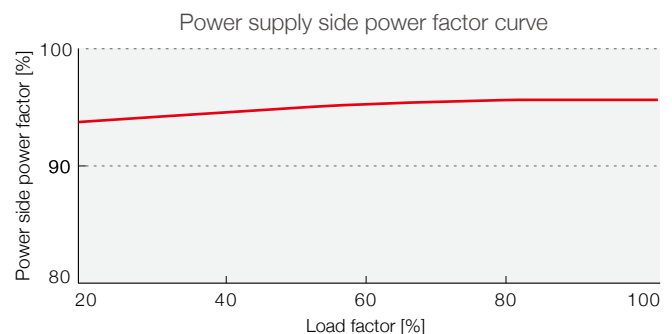
High efficiency with an overall efficiency of approx. 97%

- Output transformer is not required, and this eliminates output transformer losses.
- Switching losses are reduced by multilevel pulse width modulation (PWM) control.
- Harmonic losses of the input transformer primary winding are reduced, and this reduces harmonic current on the power supply side.



High power factor with a power supply power factor of 95% or more (at full load).

- Multiphase diode full-wave rectification enables operation with the power supply power factor as the high power factor.
- Phase-advancing capacitors and DC reactors for improving the power supply power factor are not necessary.
- Inverter operation is possible with a lower capacity power supply.



Various functions that reduce stress on motors

- Output current waveform becomes almost sinusoidal with multilevel PWM control and reduces the motor torque ripple.
- Switching surge is minimized and reduces motor stress.
- Output current is almost sinusoidal and reduces motor harmonic losses.

Providing higher quality and full support

Providing stable quality and full support

From manufacturing to inspection to shipment, our power electronics factory (Suzuka city, Mie prefecture) handles all processes to provide products of reliable quality to our customers.



Global Sales and Service Network

Our service network spans the globe.

For service information, please contact your local FUJI Electric sales and service staff.



3 kV series

Input voltage [kV]	Rated capacity [kVA]	Rated current [A]	Maximum current *1 (overload) [A]	Full width (transformer panel + converter panel) [mm]	Depth *2 [mm]	Overall height [mm]	Overall height (excluding fan) [mm]	Approximate mass *3 [kg]			
3.0	340	67	74	2200	1300	3174	2660	3220			
3.3	380										
3.0	480	93	102						1400	3620	
3.3	530										
3.0	670	130	143		4300						
3.3	740										
3.0	920	178	196	2900 (1750+1150)		1100	2574	2060	4300		
3.3	1020										
3.0	1180	228	251	3400 (1900+1500)	1200	2574			2060	5400	
3.3	1300										
3.0	1380	226	293							6100	
3.3	1520										
3.0	1610	312	343	3500 (1950+1550)	1300	2557	2160	7300			
3.3	1780										
3.0	2000	385	424	4100 (2150+1950)				1300	2557	2160	7700
3.3	2200										
3.0	2300	443	487		6900 (2700+3100+VCB panel 1100)	1600	3057				2660
3.3	2530										
3.0	3200	613	674	7400 (2800+3500+VCB panel 1100)		1700	3057	2660	12300		
3.3	3500										
3.0	4750	910	1001		1700	3057	2660	12300			
3.3	5200										

*1 Output current is limited at an output frequency of 25 Hz or less. (70% of the rated current at a frequency of 0.2 Hz)

*2 The required maintenance space in front of the unit is 1500 mm. (Space requirement is common to models of all capacities.)

*3 Approximate mass is for the standard specification, and may vary depending the use of optional features.

Note: The external dimensions are subject to change.

Model description

FRN46-6 **A** **□□□** **□□** **□□□□** **□ J**

① ② ③ ④ ⑤ ⑥ ⑦

① Basic type

Code symbol	Product category
FRN46-6	FRENIC4600FM6e

② Control method

Code symbol	制御方式
F	VT specification (V/f simplified sensorless vector)
C	CT specification (V/f simplified sensorless vector)
S	CT specification (V/f sensorless vector)
V	CT specification (Vector with sensor)

③ Input voltage, frequency

Code symbol	Input voltage, frequency
305	3.0kV 50Hz
306	3.0kV 60Hz
335	3.3kV 50Hz
336	3.3kV 60Hz
605	6.0kV 50Hz
606	6.0kV 60Hz
665	6.6kV 50Hz
666	6.6kV 60Hz

④ Output voltage

Code symbol	Output voltage
30	3.0kV
33	3.3kV
60	6.0kV
66	6.6kV

⑤ Output capacity

Code symbol	Output capacity
340~5200	340~5200kVA
450~5720	450~5720kVA

⑥ Auxiliary power supply

Code symbol	Auxiliary power supply
A	Control power supply: Single-phase, 200/220 V Fan power supply: Three-phase, 200/220 V
Z	Other

6 kV series

Input voltage [kV]	Rated capacity [kVA]	Rated current [A]	Maximum current *1 (overload) [A]	Full width (transformer panel + converter panel) [mm]	Depth *2 [mm]	Overall height [mm]	Overall height (excluding fan) [mm]	Approximate mass *3 [kg]			
6.0	450	43	47	3500 (1700+1800)	1200	2557	2160	3500			
6.6	500										
6.0	510	49	54								
6.6	560										
6.0	550	53	58								
6.6	600										
6.0	610	59	65								
6.6	670										
6.0	700	67	74								
6.6	760										
6.0	770	74	82	3600 (1800+1800)							
6.6	840										
6.0	880	85	93								
6.6	970										
6.0	1000	93	102								
6.6	1060										
6.0	1100	106	116	3700 (1800+1900)							
6.6	1210										
6.0	1200	115	127								
6.6	1320										
6.0	1350	130	143								
6.6	1480										
6.0	1500	144	159	3900 (2000+1900)							
6.6	1650										
6.0	1700	164	180								
6.6	1870										
6.0	1840	178	196								
6.6	2030										
6.0	2000	192	212	4500 (2050+2450)	1300	2657	2260	7700			
6.6	2200										
6.0	2240	217	238								
6.6	2470										
6.0	2500	241	265	4600 (2150+2450)							
6.6	2750										
6.0	2760	266	293								
6.6	3040										
6.0	3000	289	318	4700 (2200+2500)		1300	2857	2460	9300		
6.6	3300										
6.0	3230	312	343								
6.6	3560										
6.0	3700	356	392		5400 (2450+2950)		1400	2957	2560	11700	
6.6	4070										
6.0	4000	385	423								
6.6	4400										
6.0	4600	443	487								
6.6	5060										
6.0	4800	462	508	6300 (2600+3700)	1500	2957				2560	13500
6.6	5280										
6.0	5200	500	550								
6.6	5720										

*1 Output current is limited at an output frequency of 25 Hz or less. (70% of the rated current at a frequency of 0.2 Hz)

*2 The required maintenance space in front of the unit is 1500 mm. (Space requirement is common to models of all capacities.)

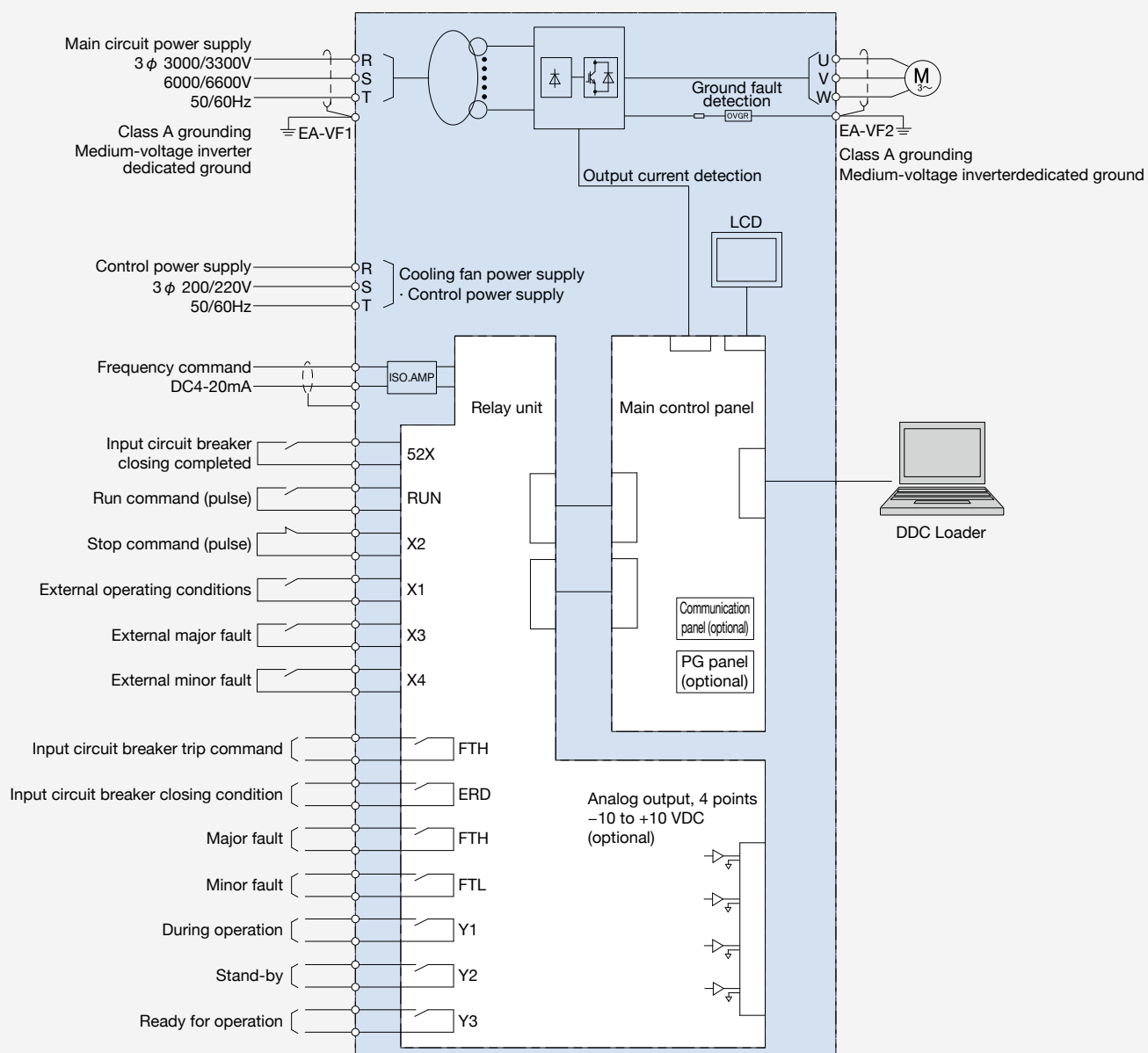
*3 Approximate mass is for the standard specification, and may vary depending the use of optional features.

Note: The external dimensions are subject to change.

Standard specification

Item		FRENIC4600FM6e
Ambient conditions	Ambient temperature	Ambient temperature: 0 to 40°C Storage temperature: -10 to 60°C Transport temperature: -20 to 70°C (-20 to -10°C, 60 to 70°C: within 24 hours)
	Humidity	Up to 90% RH (non-condensing)
	Altitude	1000 m above sea level
	Vibration	4.9 m/s ² or less (10 to 50 Hz)
	Location of installation	Indoor (General environment without corrosive gas, dust, flammable or explosive gases)
Applicable standard		JIS, JEC, JEM
Structure	Panel structure	Steel sheet, self-standing enclosed structure, with maintenance access at front
	Protective structure	IP20
	Cooling method	Forced air cooling using ceiling fan
	Paint color	Munsell 5Y7/1, semi-gloss
Input	Main circuit	Three-phase 3000/3300/6000/6600 V, 50/60 Hz
	Control power supply	Single-phase 200 V, 50/60 Hz 220 V, 50/60 Hz
	Fan power supply	Three-phase 200 V, 50/60 Hz 220 V, 50/60 Hz
	Allowable power supply fluctuation	Voltage: -10% to +10%, frequency: ±5%
Control method	Control method	Simplified sensorless vector control with V/f constant control Vector control with speed sensor (induction motors) Speed sensorless vector control (induction motors) Vector control with speed sensor (synchronous motors) * With optional resolver Speed sensorless vector control (synchronous motors)
	Output frequency	0 to 72 Hz (72 Hz to 120 Hz, optional)
	Frequency accuracy	±0.5Hz
	Frequency resolution	0.005%
	Acceleration, deceleration time	0.1 to 5500 S
	Overload tolerance	110% 60s
	Main control functions	Current limit, deceleration overvoltage avoidance, instantaneous power failure restart, cell bypass function (optional)
	Main protective functions	Overcurrent, main circuit fuse blown, overvoltage, undervoltage, CPU abnormality, cooling fan stop, etc.
	Transmission function (optional)	Modbus, Profibus-DP, T-LINK

Standard connection diagram



Standard interface		
Input side		
Main circuit voltage	Three-phase 3000/3300/6000/6600V, 50/60Hz	
Control power supply	Single-phase 200/220V - 50/60Hz	
Fan power supply	Three-phase 200V - 50Hz, 220V - 50/60Hz	
Frequency setting	0 to 10 V, 0 to 100% or	Input impedance: 1 MΩ
	4 to 20 mA, 0 to 100%	Input impedance: 250 Ω
Run command	"Closed" during operating (contact a)	Dry contact
Stop command	"Opened" when stopped (contact b)	
Run preparation	"Closed" when preparation is completed (contact a)	
Input breaker status signal	"Closed" when closed by input (contact a)	
Output side		
Electrical conditions established	"Closed" when electrical conditions are established (contact a)	Dry contact (contact capacity: 250 VAC, 2A; 30 VDC, 3A)
During operation	"Closed" during operation (contact a)	
Major fault	"Closed" by major fault (contact a)	
Minor fault	"Closed" by minor fault (contact a)	
Input circuit breaker closing condition	"Closed" when electrical conditions are established (contact a)	
Input circuit breaker trip signal	"Closed" by major fault (contact a)	
Analog signal (optional) *	0 to 10 V	Load resistance 10 kΩ or more
	4 to 20 mA	Load resistance 750 Ω or less

* The analog output signal can be selected (output current, output voltage, output frequency, etc.).



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