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Find the *Mitsubishi FR-A220E-2.2K-UL* at our website: ***Click HERE***

A-201E Series

Line Regenerative AC Variable Frequency Drives 71/2 to 75HP





MITSUBISHI ELECTRIC AUTOMATION, INC.

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Built-in Power Supply Regeneration Function Makes Mitsubishi Inverters even more Powerful. The A201E Takes Inverter Performance to the Next Level

The high performance general purpose A200E series of inverters has just expanded with the addition of a line regenerative version for demanding brake applications; the A201E. Advanced technologies have been incorporated into a compact single unit to produce performance that is perfect for applications such as elevators and line controls. It can improve performance while reducing the panel size for any machinery that requires heavy duty braking such as elevators, centrifuges, testing equipment and winders.



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Features

■ The inverter is integrated with a line regenerative converter for a more compact unit.
The area needed for installation is only 60-80% of conventional models with stand-alone converters, for a big saving in required panel space. Since the braking circuitry is built in, the troublesome chore of selecting a braking unit is eliminated.

■ Braking power dramatically increased
Enables 100% continuous regeneration and provides an ample margin for overloads, handling 150% overloads for 60 seconds.

■ Packed with specialized functions
Operating functions ideal for elevator applications, such as stopping control and load detection high speed frequency control, are standard.

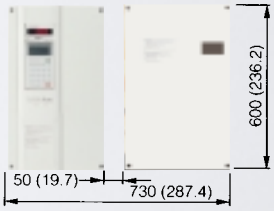
■ Uses a multi-function, high-performance inverter
The inverter is based on the A200E which includes magnetic flux vector control, auto-tuning, fast-response current restriction and instant stop restarting. (See the user manual for details.)

■ Total costs can be reduced
Costs are lower than conventional system combinations (inverter power supply regenerative converters with power factor improvement AC reactors). Since regenerative energy is returned to the power supply, less heat is generated than in resistor braking systems and energy is used more efficiently.

■ Full line-up
5.5K to 55K ratings are provided for both 200 V and 400 V classes.

● Comparison Chart (For 30 KW rating)

Inverter + power supply regenerative converter



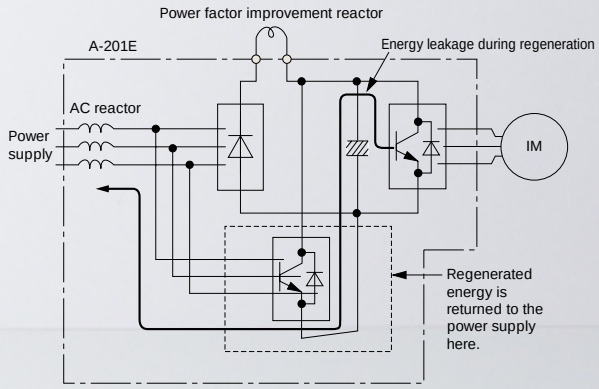
Comparative installation area: 100%
Comparative standard price: 100%
Braking power: 75% continuous, 150% for 3 seconds
Main circuit wiring: 8 locations in the inverter, 5 locations in the power supply regenerative converter, 11 total lines

Inverter with built-in power supply regeneration



Comparative installation area: 72%
Comparative standard price: 96%
Braking power: 100% continuous, 150% for 60 seconds
Main circuit wiring: 6 total I/Os

● Line Regeneration



Braking force is greatly increased by channeling regenerative energy back from motor to power supply.

Certified under ISO9001.

Note: ISO9001 is a standard covering products, processes, and quality systems.

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Technical Overview

Machine Configurations

Applicable Motor Rating (KW)	200 V class	400 V class
5.5	FR-A221E-5.5K-UL	FR-A241E-5.5K-UL
7.5	FR-A221E-7.5K-UL	FR-A241E-7.5K-UL
11	FR-A221E-11K-UL	FR-A241E-11K-UL
15	FR-A221E-15K-UL	FR-A241E-15K-UL
18.5	FR-A221E-18.5K-UL	FR-A241E-18.5K-UL
22	FR-A221E-22K-UL	FR-A241E-22K-UL
30	FR-A221E-30K-UL	FR-A241E-30K-UL
37	FR-A221E-37K-UL	FR-A241E-37K-UL
45	FR-A221E-45K-UL	FR-A241E-45K-UL
55	FR-A221E-55K-UL	FR-A241E-55K-UL

FR - A221E - 5.5K - UL

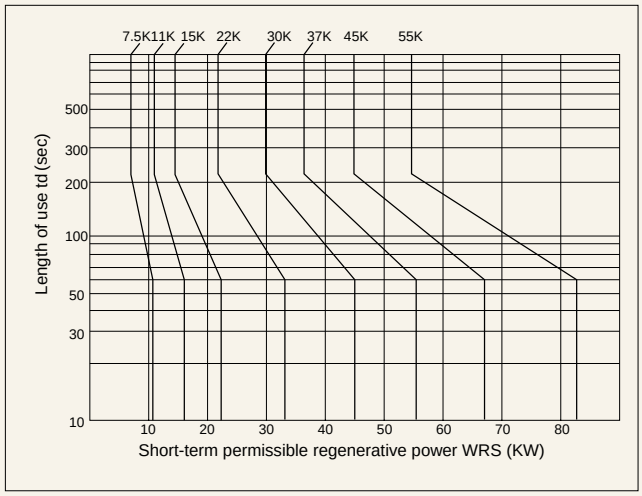
UL/C-UL Listed

Symbol	Applicable Motor Rating
5.5K ↓ 55K	Rating indicated in kW

Symbol	Voltage Class
A221E	200V Class
A241E	400V Class

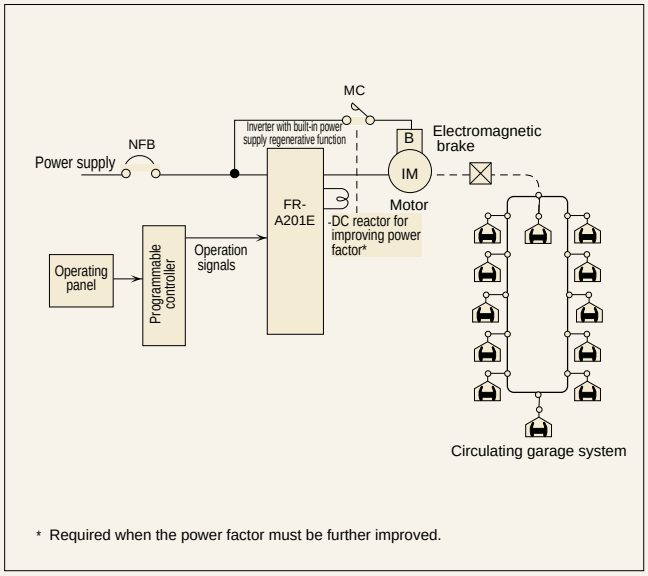
Symbol	Model
FR	FREQROL

Characteristics

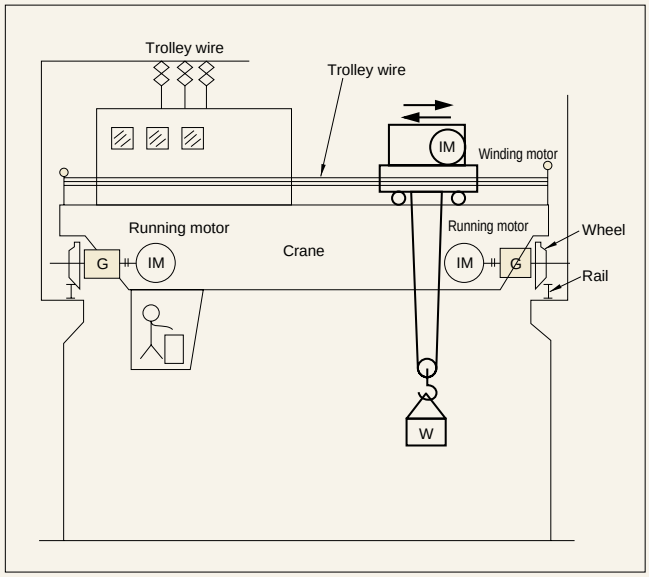


Sample applications

● Elevator garages



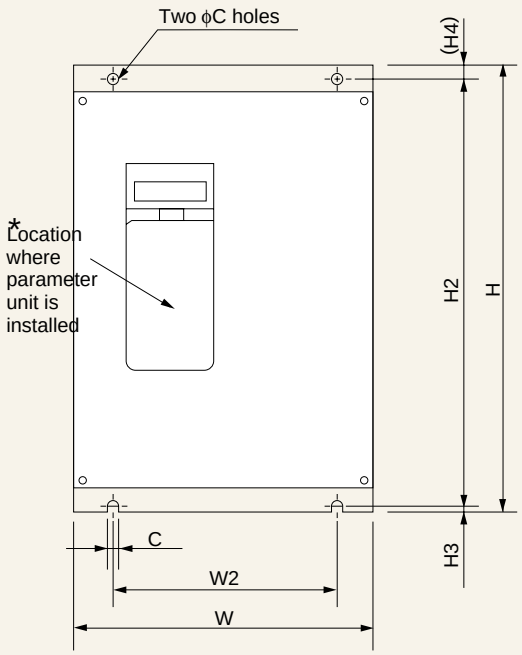
● Ceiling Crane

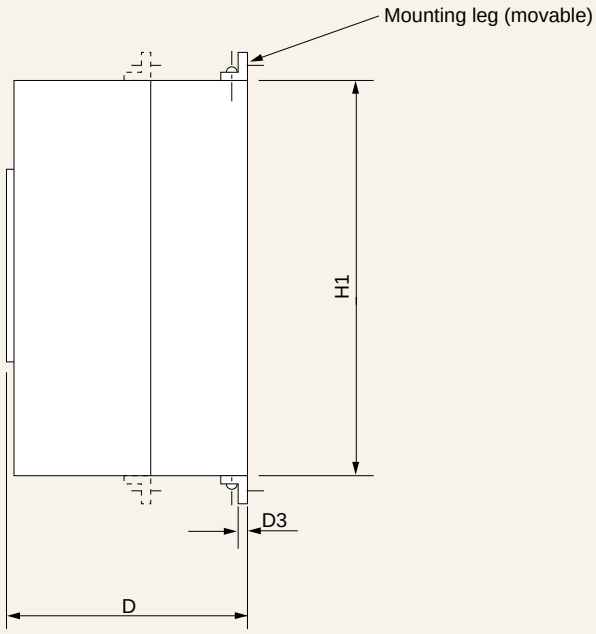


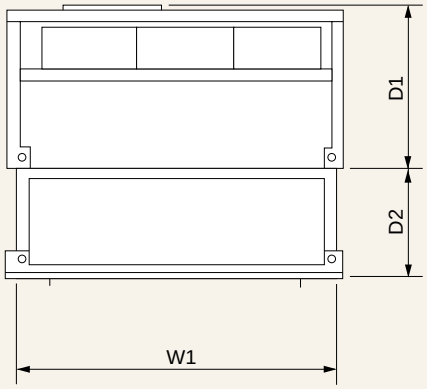
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External Dimension Drawings

(Units: mm)





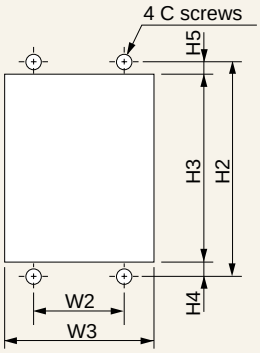


	Inverter model	W	W1	W2	H	H1	H2	H3	H4	D	D1	D2	D3	C
200 V Class	FR-A221E-5.5/7.5K-UL	250	234	190	470	425	454	8	8	270	170	100	2.3	10
	FR-A221E-11/15K-UL	300	284	220	600	540	575	10	15	294	169	125	3.2	10
	FR-A221E-18.5/22K-UL	390	370	290	600	535	575	10	15	320	190	130	3.2	12
	FR-A221E-30K-UL	450	430	350	700	635	675	10	15	340	195	145	3.2	12
	FR-A221E-37/45K-UL	470	450	370	700	630	670	15	15	368	205	163	3.2	14
	FR-A221E-55K -UL	600	580	480	900	830	870	15	15	405	215	190	3.2	14

	Inverter model	W	W1	W2	H	H1	H2	H3	H4	D	D1	D2	D3	C
400 V Class	FR-A241E-5.5/7.5K-UL	250	234	190	470	425	454	8	8	270	170	100	2.3	10
	FR-A241E-11/15K-UL	300	284	220	600	540	575	10	15	294	169	125	3.2	10
	FR-A241E-18.5/22K-UL	390	370	290	600	535	575	10	15	320	190	130	3.2	12
	FR-A241E-30K-UL	450	430	350	700	635	675	10	15	340	195	145	3.2	12
	FR-A241E-37/45K-UL	470	450	370	700	630	670	15	15	368	205	163	3.2	14
	FR-A241E-55K-UL	600	580	480	900	830	870	15	15	405	215	190	3.2	14

* Parameter unit is optional.

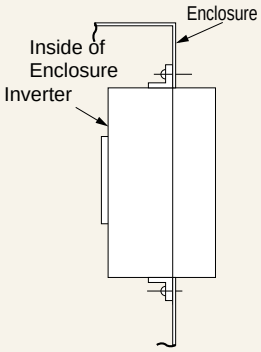
●Panel Cut-out Dimensions



(Units: mm)

Inverter model	W2	W3	H2	H3	H4	H5	C
FR-A221E-5.5/7.5K-UL	190	240	454	434	12	8	M8
FR-A221E-11/15K-UL	220	290	575	548	17	10	M8
FR-A221E-18.5/22K-UL	290	376	575	546	17	12	M10
FR-A221E-30K-UL	350	436	675	646	17	12	M10
FR-A221E-37/45K-UL	370	456	670	641	17	12	M12
FR-A221E-55K-UL	480	586	870	841	17	12	M12

■Modifications For a Smaller Enclosure



When enclosing the inverter, placing the heat sink fin so that it protrudes from the casing, as shown in the figure at left, can dramatically reduce the heat generated within the casing.
Mitsubishi recommends these mounting dimensions when designing more compact fully sealed inverters, encased inverters, and the like.

Note: Remove the upper and lower mounting brackets during installation so they can be moved. Follow the panel cut-out dimensions below for the mounted sections.

(Units: mm)

Inverter model	W2	W3	H2	H3	H4	H5	C
FR-A241E-5.5/7.5K-UL	190	240	454	434	12	8	M8
FR-A241E-11/15K-UL	220	290	575	548	17	10	M8
FR-A241E-18.5/22K-UL	260	346	575	546	17	12	M10
FR-A241E-30K-UL	350	436	675	646	17	12	M10
FR-A241E-37/45K-UL	370	456	670	641	17	12	M12
FR-A241E-55K-UL	480	586	870	841	17	12	M12

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Specifications

Control specifications	Control system			High carrier frequency sine-wave PWM control(select V/F control or magnetic flux vector control)
	Output frequency range			0.2 to 400 Hz
	Frequency setting resolution		Analog input	0.015 Hz/60 Hz (terminal input 2: 12 bit/0 to 10 V, 11 bit/0 to 5 V; terminal input 1: 12 bit/-10 to +10 V, 11 bit/-5 to +5 V) 0.030 Hz/60 Hz
			Digital input	0.002 Hz/60 Hz (when using PU: 0.01 Hz)
	Frequency precision			For analog input: within ±0.2% of the maximum output frequency (25(°C ±10(°C). For digital input: within ±0.01% of the set output frequency.
	Voltage/frequency characteristics			Can be set anywhere with a base frequency of 0 to 400 Hz. Select constant torque or declining torque pattern.
	Starting torque			150% 1 Hz (for magnetic flux vector control)
	Torque boost			Manual and automatic torque boost
	Acceleration/deceleration time setting			0 to 3600 sec (set independently for acceleration and deceleration). Select between linear and S curve acceleration deceleration modes.
	DC injection braking			Variable operating frequency (0 to 120 Hz), operating time (0 to 10 sec) and operating voltage (0 to 30%).
	Stall prevention operating level			Settable operating current (0 to 200%); can be set whether to have a level or not.
Operating specifications	Frequency setting signal		Analog input	DC 0 to 5 V, 0 to 10 V, 0 to ± 5 V, 0 to ±10 V, 4 to 20 mA
			Digital input	Set to BCD3 digit of 12 bit binary using the parameter unit (when using the optional FR-EPA or FR-EPE).
	Input signal	Starting signal		Select between independent forward and reverse or start signal self-holding input (3-wire input)
		Multi-stage speed selection		Select up to 7 speeds (Each speed settable in 0 to 400 Hz range. Operating speed can be changed during operation using the parameter unit.)
		Second acceleration/deceleration time selection		0 to 3600 sec (set independently for acceleration and deceleration).
		Jogging operation selection		Terminal for selecting jogging (JOG) operating mode.*5
		Current input selection		Select the input of a frequency setting signal DC 4 to 20 mA (terminal 4).
		Output stop		Instant shut-off of inverter output (frequency and voltage)
		Error reset		Clears holds after the protection function engages.
	Operation function			Upper and lower limit frequency settings, frequency jump operation, external thermal input selection, reversible polarity operation, instant stop restart operation, commercial switching operation, forward/reverse prevention, slip compensation, operating mode selection, auto-tuning function, break sequence for elevators,*9 and load torque high-speed frequency control.*9
	Output signal	Operating status		Select 4 from among inverter operating, frequency reached, instant power stop (insufficient voltage), frequency detection, second frequency detection, PU operating, overload alarm, and electronic thermal pre-alarm. Open collector output. Contact output: 1c contact (AC 230 V 0.3 A, DC 30 V 0.3 A). Open collector: Alarm code (4 bit) output.
		Error (inverter trip)		Contact output: 1c contact (AC 230 V 0.3 A, DC 30V 0.3 A). Open collector: Alarm code (4 bit) output.
		For display meter		Select 1 from among output frequency, motor current (constant or peak value), output voltage, frequency setting, operating speed, motor torque, converter output voltage (constant or peak value), electronic thermal load factor, input power, output power, load meter, and motor excitation current. Pulse string output (1440 Hz/full-scale) or analog output (DC 0 to 10 V).
Dislay	Display on parameter unit or main unit LED		Operating status	Select from among output frequency, motor current (constant or peak value), output voltage, frequency setting, operating speed, motor torque, overload, converter output voltage (constant or peak value), electronic thermal load factor, input power, output power,*6 load meter, and cumulative running time.
			Error	Display of error contents when protection function is engaged and storage of information of 8 errors.
	Addition display possible only on parameter unit		Operating status	Presence of input terminal signal and status of output terminal signal.
			Error	Output voltage, current, frequency, and I/O terminals status prior to engagement of protection function.
			Interactive guidance	Operations guide, trouble-shooting and graphic display for help function
Protection and alarm function				Overcurrent breaking (acceleration, deceleration, constant speed), regenerative overvoltage breaking, insufficient voltage, instant stop, overload breaking (electronic thermal), ground overcurrent, output short, main circuit element overheating, stall prevention, overload warning, and power supply regeneration circuit error.
Dislay	Ambient temperature			–10°to +50°C (no freezing)
	Ambient humidity			90% RH max. (no condensation)
	Storage temperature*7			–20° to +65°C
	Atmosphere			Indoor use. No corrosive gases, flammable gases, oil misting, or dust.
	Altitude/vibration			1000 m above sea level max., 5.9 m/S^2 {0.6 G max.} (based on JIS C 0911)

Notes
1 The rated output capacity shown is for an output voltage of 220 V for 200 V class and 440 V for 400 V class.
2 The % value for overload current rating indicates the ratio to the inverter's rated output current.When using repeatedly, wait until the inverter and motor temperature fall below the temperature when at 100% load.
3 The maximum output voltage cannot go above the power supply voltage.The maximum output voltage can be set anywhere below the power supply voltage.
4 The power supply capacity varies with the value of the power supply impedance (including input reactor and power lines).
5 Jogging operation is also possible with the parameter unit.
6 Shown as a positive value when running under power and a negative value during regeneration.
7 The temperature that can be applied for short times, such as in transit.
8 When the power supply voltage fluctuation with a 400 V class inverter is at or below 342 V or at or above 484 V, a built-in transformer tap switch is required. See the manual for details.
9 See the manual for details

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Ratings

		200 V class										400 V Class									
Model		5.5K	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K	5.5K	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K
Applicable Motor capacity (kw)		5.5	7.5	11	15	18.5	22	30	37	45	55	5.5	7.5	11	15	18.5	22	30	37	45	55
Output	Rated capacity (kVA)*1	9.2	12.6	17.6	23.3	29	34	44	55	67	82	9.1	13	17.5	23.6	29	32.8	43.4	54	65	84
	Rated current (A)	24	33	46	61	76	90	115	145	175	215	12	17	23	31	38	43	57	71	86	110
	Overload current rating*2	150% 60 sec, 200% 0.5 sec (characteristics when outside limits)										150% 60 sec, 200% 0.5 sec (characteristics when outside limits)									
	Voltage *3	3 phase 200-220 V 50 Hz, 200-230 V 60 Hz										3 phase 380 to 460 V 50/60 Hz									
	Regenerative braking torque	100% continuous, 150% 60 sec										100% continuous, 150% 60 sec									
Power supply	Rated input AC voltage and frequency	3 phase 200-220 V 50 Hz, 200-230 V 60 Hz										3 phase 380-460 V 50/60 Hz									
	Permissible fluctuation in AC voltage	170-242 V 50 Hz, 170-253 V 60 Hz										323-506 V 50/60 Hz*8									
	Permissible fluctuation in frequency	±5%										±5%									
	Amount of instantaneous voltage drop that can be withstood	When operated at or above 165 V continuously and voltage falls from rated voltage to under 165 V, 15 msec of continuous operation										When operated at or above 320 V continuously and voltage falls from rated voltage to under 320 V, 15 msec of continuous operation									
	Power supply facility capacity (kVA)*4	12	17	20	28	34	41	52	66	80	100	12	17	20	28	34	41	52	66	80	100
Protective structure (JEM 1030)		Open type (IP00)										Open type (IP00)									
Cooling system		Forced-air cooling										Forced-air cooling									
Approximate mass (kg (lb.))		23 (50.6)	23 (50.6)	34 (74.9)	32 (81.4)	52 (114.4)	52 (114.4)	63 (138.6)	85 (187)	87 (191.4)	120 (264)	24 (52.8)	24 (52.8)	37 (81.5)	37 (81.5)	48 (105.6)	48 (105.6)	63 (138.6)	85 (187)	85 (187)	120 (264)

Cautions

See the A200E Series catalog for information on cautions other than those listed below.

■ To Ensure Safe Use

- To ensure safe use, read the manual before using the product.
- This general-purpose inverter is not designed or manufactured to be used in machinery and systems in situations where life may depend on their operation. Contact the Mitsubishi customer liaison office before using this product in special applications such as machinery or systems for automobiles, medical applications, aerospace, nuclear power, electrical power, or undersea relays.
- Although this inverter was manufactured under strict quality control, safety devices should be installed if it is used in equipment in which its failure may cause major damage or loss.
- Do not use it with loads other than 3-phase inductive motors.
- This product requires electrical work. Have all electrical work done by an electrician.

■ Noise

During quiet operation, electromagnetic noise tends to increase, so countermeasures should be taken. Depending on how the inverter is installed, noise may have effects even when the carrier frequency is lowered.

Main Countermeasures

- The noise level can be reduced by lowering the carrier frequency.
- An FR-BIF(H) radio noise filter is effective at countering AM radio noise.
- An FR-BSFO1 or FR-BLF line noise filter is effective at preventing sensor malfunctions.
- Separate it at least 30 cm (at the very least 10 cm) from inductive noise from inverter power wires and use twisted pair shielded cable for signal lines.

■ Leaking Current

Electrostatic capacitance occurs between inverter I/O wiring and other wiring, the ground and motors. Current can leak through any of these. Its value can be affected by the carrier frequency and the like, so in low noise operation leaking current increases and leaking power breakers and relays can operate at unwanted times. Adopt the following counter measure to prevent this.

Countermeasure

- Lower inverter carrier frequency Pr.72. Motor noise, however, will increase.

■ Power Supply Harmonics

A harmonic is defined as having a frequency that is an integer multiple of its basic frequency. Normally, frequencies up to 40 or 50 times (to several kHz) are defined as harmonics, while higher harmonics are treated as noise. The table below clarifies causes and responses to noise and harmonics.

Item	Noise	Harmonic
Frequency band	Harmonic (10 kHz on up)	40 to 50 times (to several kHz)
Main cause	Inverter area	Converter area
Transmission route	Cable runs, space, induction	Cable runs
Effect	Distance, wiring route	Line impedance
Amount produced	Voltage change rate Switching frequency	Current capacitance
Phenomenon	Misdetection of sensors, radio noise, etc.	Heat produced by condensive capacitors and generators
Remedy	Change wiring route Install noise filter	Install reactor

■ Inverter Drives for 400 V Class Motors

When inverter drives are used on 400 V class motors, microsurge voltages to the motor terminals can be produced, causing insulation breakdown.

(1) Strengthen motor insulation

Use a motor recommended by its manufacturer for use with IGBT type variable frequency drives.

(2) Suppress microsurge voltages on the inverter side

Connect a filter on the inverter's secondary side to suppress microsurge voltages that might create motor terminal voltages of 850 V or below. When driving a Mitsubishi inverter, connect the optional surge voltage suppression filter (FR-ASF-H) to the inverter's secondary side.

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