YASKAWA

SINE WAVE PWM CONVERTER WITH POWER REGENERATION

VARISPEED-656DC5

EQUIVALENT TO SELF-EXCITED THREE-PHASE BRIDGE (K5=0)

200V CLASS 20kW TO 90kW
400V CLASS 20kW TO 370kW

Certified for
ISO9001 and
ISO14001

JQA-0422 JQA-EM0498

VARISPEED-656DC5 Takes All of Your Worries Away.

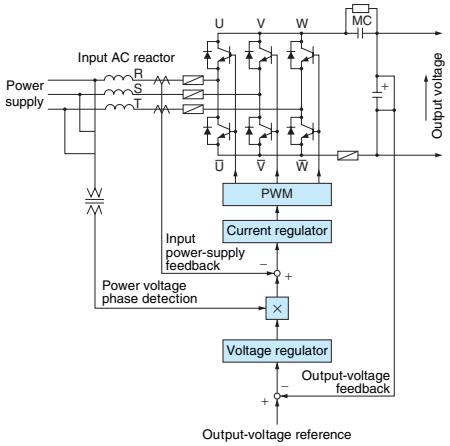
The VARISPEED-656DC5 (hereinafter referred to as VS-656DC5) is a sine wave PWM transistor converter with a power regenerating function.
The VS-656DC5 is the result of our intensive search for an easy-to-use but yet effective converter. Besides the effective use of regenerative energy and protective measures against harmonics from the power supply, the VS-656DC5 is compact and lightweight. It comes in a wide selection of models to choose from with new functions so that you can monitor the operation status and any failures with a JVOP-130 digital operator.
You can depend on the VS-656DC5 to solve all of your inverter drive problems.

Application Examples

- In a system where the harmonics of the power supply cause problems.
- For cranes and elevators having overhauling loads.
- For centrifuges and material handling equipment having a large inertia.

What is the Sine wave PWM Converter?

The sine-wave PWM converter is an unit for a DC power supply that is used to bring the distorted input power supply waveforms to sine waveforms by utilizing switching capability of transistors.
The converter controls the output voltage and keeps it a constant value by correcting the input current so that it has the same phase angle as the input voltage (power factor 1), by detecting the output voltage, and by controlling the motoring and regeneration automatically.



●Comparison with Conventional Model VS-656DC3

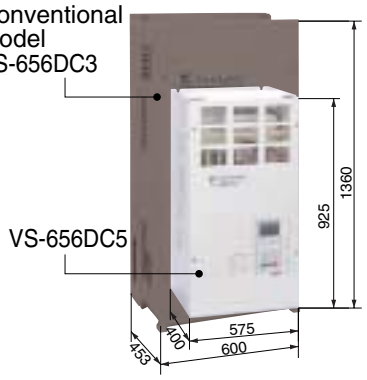
(for 400 V class 185 kW)

Size

Conventional model VS-656DC3

43% smaller

VS-656DC5

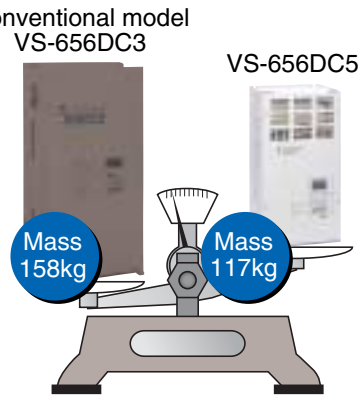


Weight

Conventional model VS-656DC3

26% lighter

VS-656DC5



For saving space and costs ...

The answer is
VS-656DC5!

Lowers cost of power supply equipment.

The power-factor 1.0 control* and the sine wave PWM control can be achieved the power supply capacity which is equivalent to the capacity required by the load. So, the power supply equipment such as power cables and distribution equipment can be minimized, which greatly reduces the plant and equipment costs.

* Power-factor 1.0 control: Controls the phase voltage and current of the power supply so that they have the same phase angle (power factor 1.0).

Enables system construction in limited space.

The optimized layout of components and design for discharging heat makes the VS-656DC5 compact and lightweight. Also, the fuses for the power supply voltage detection terminal and the control power supply (FAN), which are mounted on the outside of the conventional VS-656DC3, are built into the VS-656DC5 unit.
Because of such features, the VS-656DC5 requires less wiring and less installation space.

For protecting against harmonics ...

The answer is
VS-656DC5!

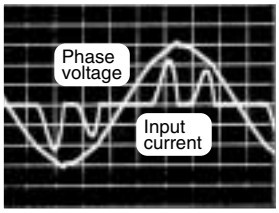
Protects against harmonics from power supply devices.

The PWM control synthesizes sine waves from the input current of the power supply and reduces waveform distortion in the harmonic current. So, the influence of the harmonic current on devices such as the phase advance capacitor can be eliminated.
Also, no protective measures need to be taken against harmonics, because the VS-656DC5 conforms to the conditions for self-excited three-phase bridges (K5=0) outlined by the "Japanese Guidelines for Reduction of Harmonic Emission" (made in compliance with IEC standards [61000-3-2 and others]) published by the Ministry of Economy, Trade and Industry in Japan.

Note: No protective measures against harmonics are needed, but protective measures against EMC (radio noise) and high frequency (harmonic) leakage current are required on the same level as that for inverter drives.

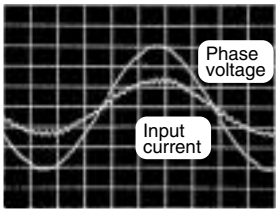
Distortion of Power-supply Current Waveforms

■ Conventional diode converter



80% distortion ratio at rated current

■ VS-656DC5 sine-wave PWM



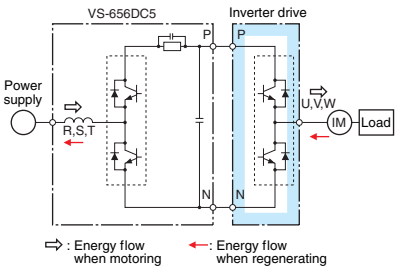
5% distortion ratio at rated current

For energy efficiency ...

The answer is
VS-656DC5!

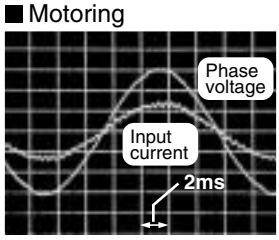
Improves inverter-drive braking.

The VS-656DC5, when combined with an inverter drive, saves energy by efficiently capturing and storing the energy that is usually lost during braking.
The power supply regeneration greatly increases the efficiency of the drive system even during deceleration when hauling heavy loads or with a large rotational inertia. Also, the VS-656DC5 is the best device for a common power supply for a line drive that is continually in a regenerative state.

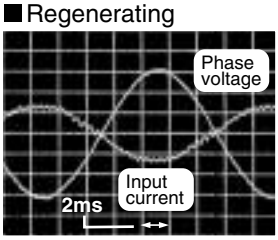


Power-supply Current Waveform

■ Motoring



■ Regenerating

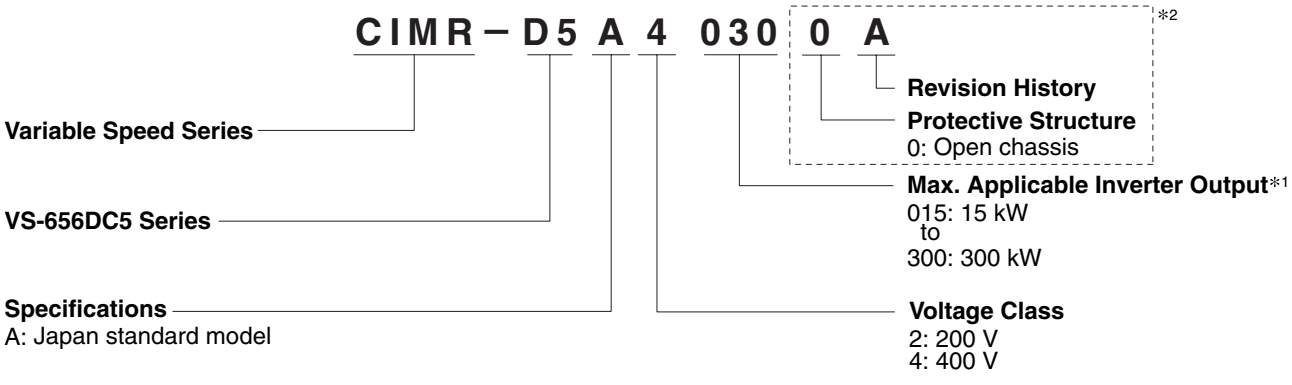


Specifications

Voltage Class			200 V Class				400 V Class						
Model CIMR-D5A□			2015	2022	2037	2075	4015	4022	4030	4045	4075	4160	4300*1
Rating	Rated Output Capacity	kW	20	30	50	90	20	30	40	60	100	185	370
	Rated Output Current (DC)	A	60	90	150	280	30	45	60	90	150	280	560
	Rated Input Current (AC)	A	64	96	160	300	32	48	64	96	165	300	600
	Rated Output Voltage		330 VDC				660 VDC						
Input Power Supply	Voltage/Frequency		200 V to 220 VAC at 50 Hz; 200 V to 230 VAC at 60 Hz				380 V to 460 VAC at 50/60 Hz						
	Allowable Voltage Fluctuation		+10% to −15%										
	Allowable Frequency Fluctuation		±3 Hz/300 ms (Free phase rotation)										
Control Characteristics	Control Method		Sine wave PWM method										
	Input Power Factor		0.95 or more (Rated current)										
	Output Voltage Accuracy		±5%										
	Overload Capacity		150% of rated current per minute.										
Operation Input			Digital Operator and external terminals										
Status Output	Fault		NONC contact output										
	Running		NO contact output										
	Alarm, etc.		Multi-function PHC output : 2 points can be selected.										
	Analog Output		Multi-function analog output : 2 points can be selected.										
Constant Setting			Using the digital operator										
Protective Function	Instantaneous Overcurrent		Stops at approx. 200% of the VS-656DC5 input current.										
	Blown Fuse		Motor stops by blown fuse.										
	Overload		Stops after 1 minute at 150% of rated current (motoring or regenerating).										
	Undervoltage (Output)		Stops at approx. 190 VDC or less.				Stops at approx. 380 VDC or less.						
	Undervoltage (Intput)		Stops at approx. 150 VAC or less.				Stops at approx. 300 VAC or less.						
	Overvoltage		Stops at approx. 400 VDC or more.				Stops at approx. 800 VDC or more.						
	Fin Overheat		Protected by thermistor										
	Ground Fault*2		Protected by electronic circuit										
	Power Frequency Error		Stops at fluctuation of more than ±3 Hz of rated input frequency.										
	Power Charge Indication		Indicated until main circuit output voltage is approx. 50 V or less.										
Environmental Conditions	Location		Indoors (Protected from corrosive gases and dust)										
	Ambient Temperature		−10℃ to +45℃										
	Humidity		90%RH or less (no condensation)										
	Vibration		9.8 m/s² at less than 20 Hz,up to 1.96 m/s² at 20 Hz to 50 Hz										

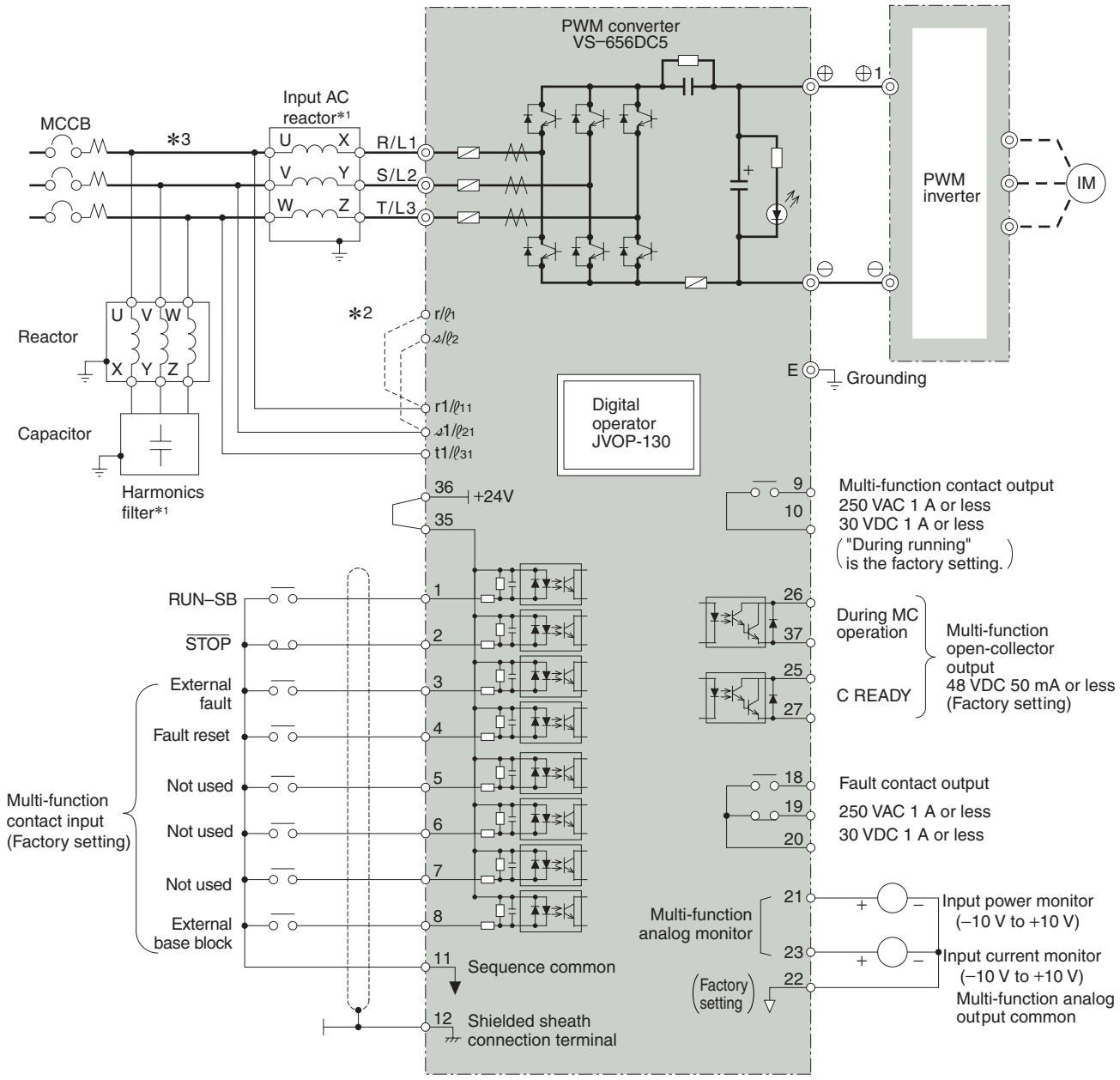
*1: Contact your YASKAWA representative.
*2: A ground fault may not be protected under the following conditions.
・A ground fault with low resistance occurs in connection cables or terminals.
・A ground fault occurs when the power is turned on.
Note: The Varispeed F7 and the Varispeed G7, 200 V class with a 0.4 kW to 75 kW capacity and 400 V class with a 0.4 kW to 300 kW capacity, can be connected to the VS-656DC5.

Model Designation



*1 : Valid if the VS-656DC5 is used with an inverter. Values are different if the VS-656DC5 is used with several inverters at the same time.
*2 : Refer to the SPEC column on the nameplate for values in the dotted frame.

Connections

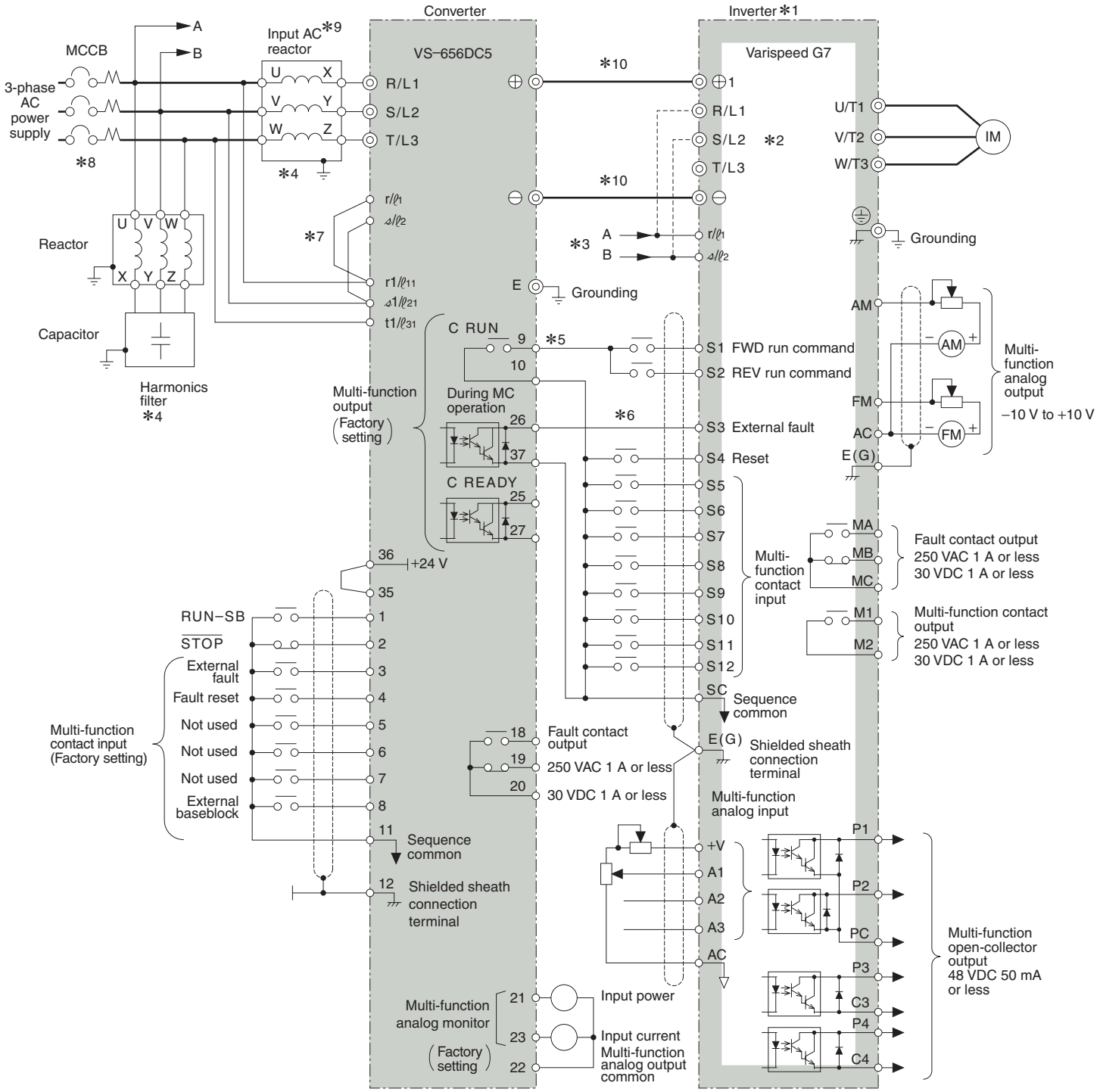


*1: Be sure to attach the input AC reactor and the harmonics filter (reactor and capacitor).

*2: For models CIMR-D5A2022 to -D5A2075 of the 200 V class and CIMR-D5A4022 to -D5A4300 of the 400 V class, the wiring is done prior to shipment. Connections are not needed for CIMR-D5A2015 of the 200 V class and -D5A4015 of the 400 V class.
The terminals r/ℓ1 and s/ℓ2 in the above diagram are the terminal names for 200 V class VS-656DC5 with 37 to 75 kW.
The terminal names are as follows respectively for each VS-656DC5 capacity:
· 200 V class 22 kW, 400V class 22 to 45 kW: s/ℓ2, t/ℓ3 (s/ℓ2 and s1/ℓ21, t/ℓ3 and t1/ℓ31 are connected respectively.)
· 400 V class 75 and 160 kW: r/ℓ1, s400/ℓ2 400 (r/ℓ1 and r1/ℓ11, s400/ℓ2 400 and s1/ℓ21 are connected respectively.)

*3: When a noise filter is attached on the VS-656DC5 power supply side, use a noise filter of the reactor type (without a capacitor) such as Finemet zero-phase reactor, and attach it behind the MCCB at the power supply side.
Do not use a capacitor-built-in type noise filter because the harmonic components may overheat or damage the capacitor.

Connection with Varispeed G7



∗1: The standard type of Varispeed G7 models for all capacities can be connected to the VS-656DC5.

∗2: Do not connect a power supply to the Varispeed G7 AC power supply terminals R/L1, S/L2, and T/L3.

∗3: For cooling fan terminals r/ℓ1 and s/ℓ2 of the Varispeed G7 200 V class 30 to 75 kW models, remove the jumper wiring between r/ℓ1 and R/L1, and between s/ℓ2 and S/L2. Then take the power supply for r/ℓ1 and s/ℓ2 from the VS-656DC5 primary power supply line.
For cooling fan terminals r/ℓ1 and s400/ℓ2 400 of the Varispeed G7 400 V class 55 to 300 kW models, remove the jumper wiring between r/ℓ1 and R/L1, and between s400/ℓ2 400 and S/L2. Then take the power supply for r/ℓ1 and s400/ℓ2 400 from the VS-656DC5 primary power supply line.

∗4: Be sure to use the specified AC reactor and harmonics filter for the VS-656DC5, to avoid abnormal operations.

∗5: Set up a sequence whereby the VS-656DC5 starts operation and then the Varispeed G7 starts after the power supply is turned on, and the power supply is turned off after the Varispeed G7, the motor, and the VS-656DC5 are stopped, in this order.
Operating the Varispeed G7 without starting the VS-656DC5, or turning off the power supply while the VS-656DC5 is running may cause the VS-656DC5 to malfunction.

∗6: Refer to "Precautions on Application of Inverters" in "Precautions on VS-656DC5 Application" for details about using an interlock with an inverter.

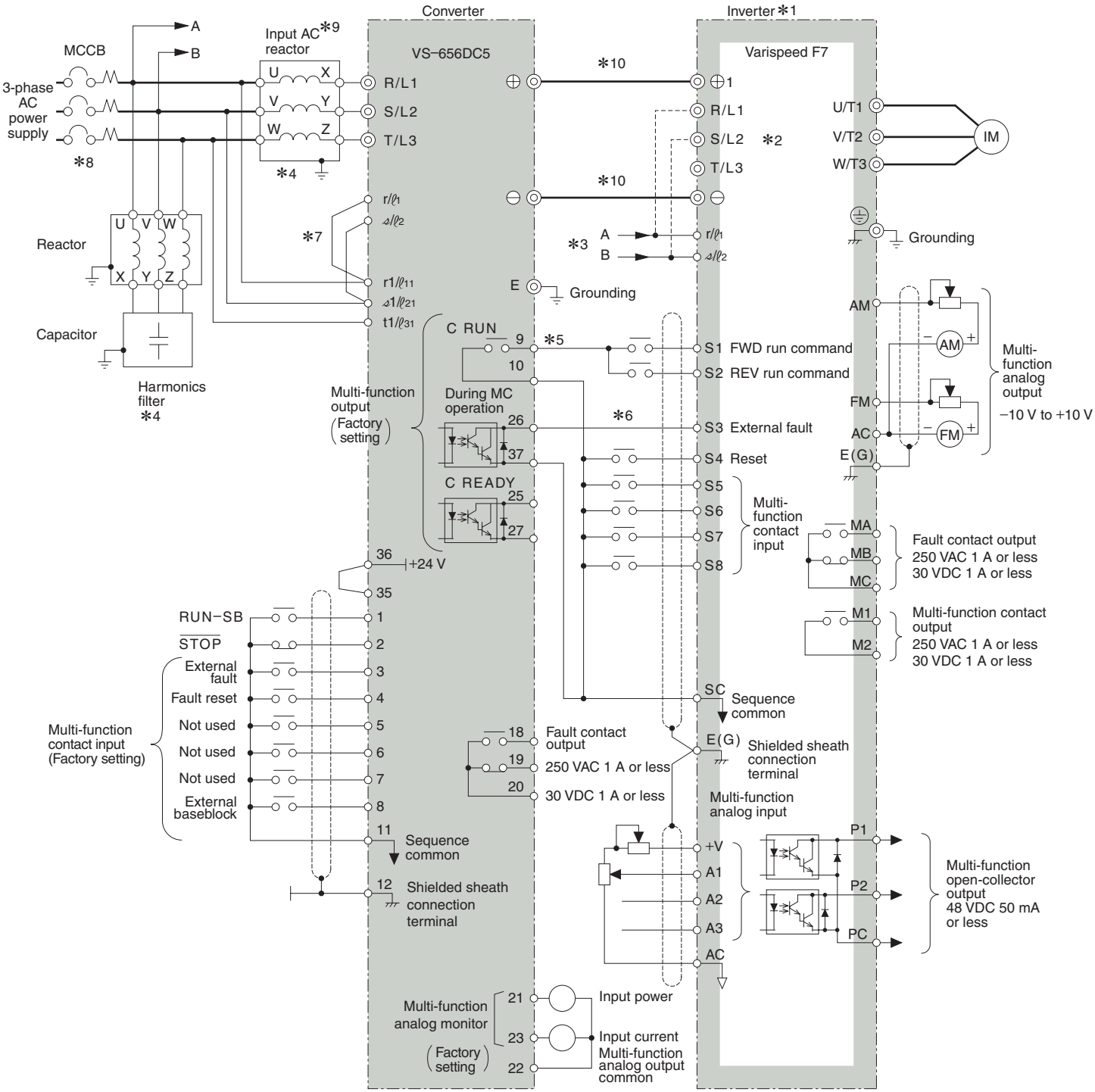
∗7: For models CIMR-D5A2022 to -D5A2075 of the 200 V class and CIMR-D5A4022 to -D5A4300 of the 400 V class, the wiring is done prior to shipment. Connections are not needed for CIMR-D5A2015 and -D5A4015.

∗8: When a noise filter is attached on the VS-656DC5 power supply side, use a noise filter of the reactor type (without a capacitor) such as Finemet zero-phase reactor, and attach it behind the MCCB at the power supply side. Do not use a capacitor-built-in type noise filter since the harmonic components may overheat or damage the capacitor.

∗9: The wiring between the input AC reactor and the VS-656DC5 must be within 10 m.

∗10: The DC current bus bar wiring between the VS-656DC5 and the Inverter must be within 5 m.

Connection with Varispeed F7



∗1: The standard type of Varispeed F7 models for all capacities can be connected to the VS-656DC5.

∗2: Do not connect a power supply to the Varispeed F7 AC power supply terminals R/L1, S/L2, and T/L3.

∗3: For cooling fan terminals r/ℓ1 and s/ℓ2 of the Varispeed F7 200 V class 37 to 110 kW models, remove the jumper wiring between r/ℓ1 and R/L1, and between s/ℓ2 and S/L2. Then take the power supply for r/ℓ1 and s/ℓ2 from the VS-656DC5 primary power supply line.
For cooling fan terminals r/ℓ1 and s400/ℓ2 400 of the Varispeed F7 400 V class 75 to 300 kW models, remove the jumper wiring between r/ℓ1 and R/L1, and between s400/ℓ2 400 and S/L2. Then take the power supply for r/ℓ1 and s400/ℓ2 400 from the VS-656DC5 primary power supply line.

∗4: Be sure to use the specified AC reactor and harmonics filter for the VS-656DC5, to avoid abnormal operations.

∗5: Set up a sequence whereby the VS-656DC5 starts operation and then the Varispeed F7 starts after the power supply is turned on, and the power supply is turned off after the Varispeed F7, the motor, and the VS-656DC5 are stopped, in this order.
Operating the Varispeed F7 without starting the VS-656DC5, or turning off the power supply while the VS-656DC5 is running may cause the VS-656DC5 to malfunction.

∗6: Refer to "Precautions on Application of Inverters" in "Precautions on VS-656DC5 Application" for details about using an interlock with an inverter.

∗7: For models CIMR-D5A2022 to -D5A2075 of the 200 V class and CIMR-D5A4022 to -D5A4300 of the 400 V class, the wiring is done prior to shipment. Connections are not needed for CIMR-D5A2015 and -D5A4015.

∗8: When a noise filter is attached on the VS-656DC5 power supply side, use a noise filter of the reactor type (without a capacitor) such as Finemet zero-phase reactor, and attach it behind the MCCB at the power supply side. Do not use a capacitor-built-in type noise filter since the harmonic components may overheat or damage the capacitor.

∗9: The wiring between the input AC reactor and the VS-656DC5 must be within 10 m.

∗10: The DC current bus bar wiring between the VS-656DC5 and the Inverter must be within 5 m.

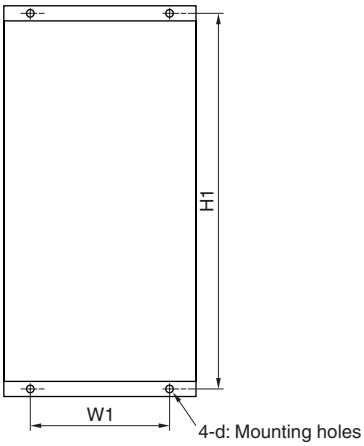
Dimensions

Voltage Class	Model CIMR-D5A□	Output Capacity kW	Dimensions in mm			Mounting Holes in mm			Approx. Mass kg
			W	H	D	W1	H1	d	
200 V Class	2015	20	250	380	225	236	365	M6	11
	2022	30	325	450	285	275	435	M6	23
	2037	50	425	725	350	320	700	M10	47
	2075	90	575	885	380	445	855	M12	85
400 V Class	4015	20	250	380	225	236	365	M6	10
	4022	30	325	450	285	275	435	M6	26
	4030	40	325	625	285	275	610	M6	33
	4045	60	325	625	285	275	610	M6	36
	4075	100	455	820	350	350	795	M10	60
	4160	185	575	925	400	445	895	M12	117
	4300*	370	✻						

✻: Contact your YASKAWA representative.

Dimensions

Mounting Holes



Heat Loss

200 V class

Model CIMR-D5A□			2015	2022	2037	2075
Rated Output Capacity		kW	20	30	50	90
Rated Output Current		A	60	90	150	280
Heat Loss	Cooling Fin	W	330	550	750	1400
	Inside Unit	W	170	250	370	700
	Total Heat Loss	W	500	800	1120	2100

400 V class

Model CIMR-D5A□			4015	4022	4030	4045	4075	4160	4300*
Rated Output Capacity		kW	20	30	40	60	100	185	370
Rated Output Current		A	30	45	60	90	150	280	560
Heat Loss	Cooling Fin	W	210	340	450	570	1050	2000	✻
	Inside Unit	W	150	200	250	330	600	1000	
	Total Heat Loss	W	360	540	700	900	1650	3000	

✻: Contact your YASKAWA representative.

AC Reactor (UZBA-B: For input)

200 V class

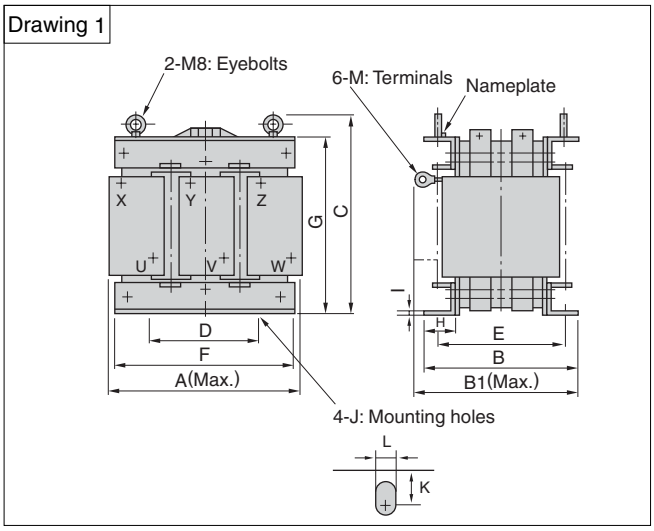
Model CIMR-D5A□	DWG	Rated Current Arms	Inductance mH	Code No.	Dimensions in mm														Approx. Mass kg	Loss W
					A	B	B1	C	D	E	F	G	H	I	J	K	L	M		
2015	1	64	1.32	X002666	290	182	266	280$^{\pm 10}$	150	145	255	240$^{\pm 10}$	40	5	M10	25	12	M8	50	285
2022	1	96	0.88	X002667	310	222	286	315$^{\pm 10}$	150	180	270	275$^{\pm 10}$	50	6	M10	27.5	12	M10	65	395
2037	2	160	0.53	X002668	390	220	320	375$^{\pm 10}$	150	180	380	330$^{\pm 10}$	50	6	M12	26	15	M10	95	440
2075	2	300	0.28	X002670	450	240	375	435$^{\pm 10}$	200	200	430	390$^{\pm 10}$	50	6	M12	25.5	14	M12	145	680

400 V class

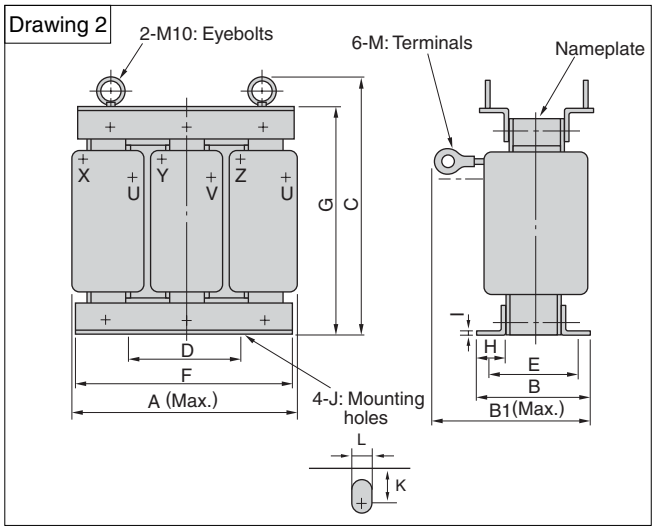
Model CIMR-D5A□	DWG	Rated Current Arms	Inductance mH	Code No.	Dimensions in mm														Approx. Mass kg	Loss W
					A	B	B1	C	D	E	F	G	H	I	J	K	L	M		
4015	1	32	5.28	X002671	290	182	246	280$^{\pm 10}$	150	145	255	240$^{\pm 10}$	40	5	M10	25	12	M6	50	275
4022	3	48	3.52	X010155	330	162	230	330$^{\pm 10}$	170	130	270	290$^{\pm 10}$	40	6	M10	20	12	M8	54	335
4030	1	64	2.64	X002672	330	245	322.5	355$^{\pm 10}$	150	210	300	310$^{\pm 10}$	50	6	M10	27.5	12	M8	100	525
4045	2	96	1.76	X002673	455	240	330	435$^{\pm 10}$	200	200	430	390$^{\pm 10}$	50	6	M12	25.5	14	M10	150	760
4075	2	165	1.02	X002674	450	240	365	435$^{\pm 10}$	200	200	430	390$^{\pm 10}$	50	6	M12	25.5	14	M10	155	690
4160	2	300	0.57	X002675	575	330	445	525$^{\pm 10}$	200	270	530	470$^{\pm 10}$	75	9	M12	36	15	M12	350	1120
4300*	∗																			

∗: Contact your YASKAWA representative.

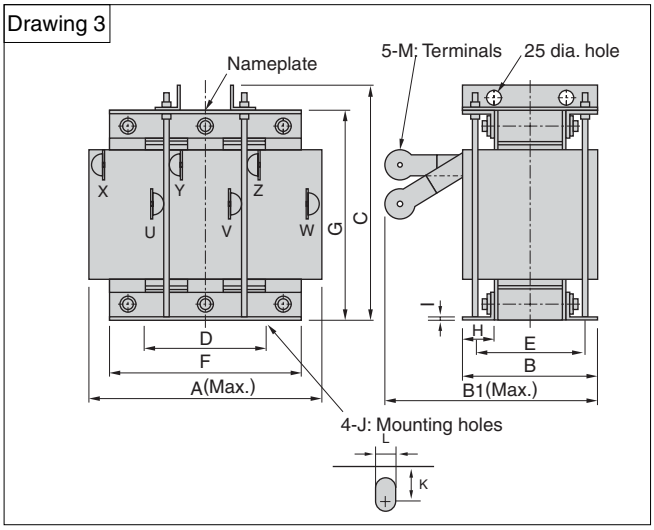
Drawing 1



Drawing 2



Drawing 3



Harmonics Filter Reactor

200 V class

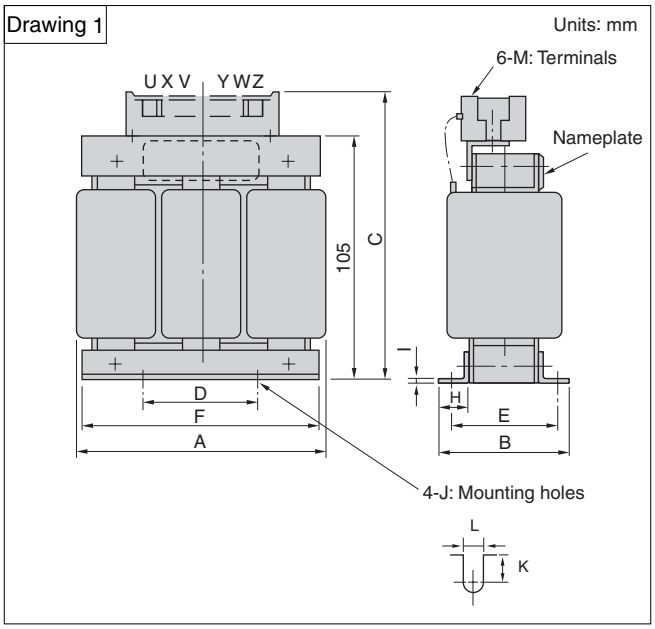
Model CIMR-D5A□	DWG	Specifications	Code No.	Dimensions in mm													Approx. Mass kg	Loss W
				A	B	B1	C	D	E	F	H	I	J	K	L	M		
2015	2	30A,0.35mH	X002492	130	88	119	105	50	70	130	22	3.2	M6	9	7	M5	3	45
2022	2	50A,0.21mH	X002494	160	90	125	130	75	70	160	25	2.3	M6	10	7	M6	5	55
2037	2	80A,0.13mH	X002497	180	100	155	150	75	80	180	25	2.3	M6	10	7	M8	8	75
2075	2	160A,0.07mH	X002556	210	100	170	175	75	80	205	25	3.2	M6	10	7	M10	12	100

400 V class

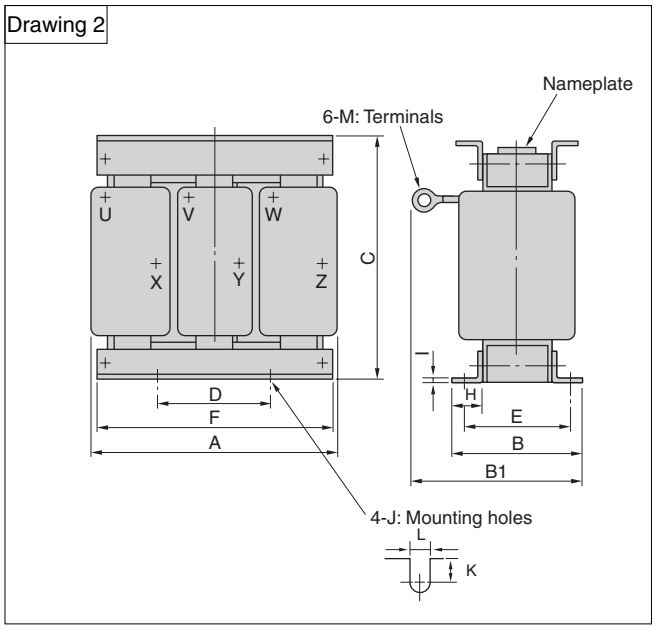
Model CIMR-D5A□	DWG	Specifications	Code No.	Dimensions in mm													Approx. Mass kg	Loss W
				A	B	B1	C	D	E	F	H	I	J	K	L	M		
4015	1	15A,1.42mH	X002501	130	98	–	130	50	80	130	22	3.2	M6	9	7	M4	4	50
4022	2	20A,1.06mH	X002502	160	90	115	130	75	70	160	25	2.3	M6	10	7	M5	5	50
4030	2	30A,0.7mH	X002503	160	105	132.5	130	75	85	160	25	2.3	M6	10	7	M5	6	65
4045	2	50A,0.42mH	X002505	180	100	145	150	75	80	180	25	2.3	M6	10	7	M6	8	90
4075	2	80A,0.26mH	X002508	210	100	150	175	75	80	205	25	3.2	M6	10	7	M8	12	95
4160	2	150A,0.15mH	X002567	240	126	198	$205^{\pm 5}$	150	110	240	25	3.2	M8	8	10	M10	23	150
4300*	∗																	

∗: Contact your YASKAWA representative.

Drawing 1



Drawing 2



Harmonics Filter Capacitor

200 V class

Model CIMR-D5A□	DWG	Specifications	Code No.	Dimensions in mm		Approx. Mass kg	Loss W
				H	H1		
2015	1	100μF	C003477	See Drawing 1.		0.4	1.8
2022	2	150μF	C003186	160	$107^{\pm3}$	1.2	2.7
2037	2	200μF	C003187	160	$107^{\pm3}$	1.2	3.6
2075	2	400μF	C003190	200	$147^{\pm3}$	1.6	7.2

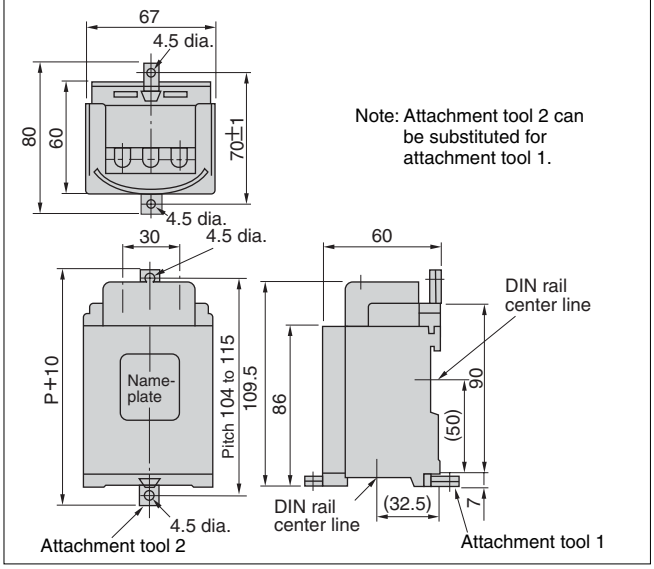
400 V class

Model CIMR-D5A□	DWG	Specifications	Code No.	Dimensions in mm									Approx. Mass kg	Loss W
				A	B	C	D	E	F	G	H	I		
4015	3	25μF	C003481	$165^{\pm2}$	$70^{\pm2}$	135	$150^{\pm1}$	$40^{\pm1}$	$130^{\pm2}$	$100^{\pm3}$	$30^{\pm5}$	M5	1.3	2.4
4022	3	40μF	300-001-337	$165^{\pm2}$	$70^{\pm2}$	155	$150^{\pm1}$	$40^{\pm1}$	$130^{\pm2}$	$120^{\pm3}$	$30^{\pm5}$	M5	1.6	3.6
4030	3	50μF	C003482	$165^{\pm2}$	$70^{\pm2}$	155	$150^{\pm1}$	$40^{\pm1}$	$130^{\pm2}$	$120^{\pm3}$	$30^{\pm5}$	M5	1.5	4.8
4045	3	75μF	C003483	$165^{\pm2}$	$70^{\pm2}$	215	$150^{\pm1}$	$40^{\pm1}$	$130^{\pm2}$	$180^{\pm3}$	$30^{\pm5}$	M5	2.3	7.2
4075	3	100μF	C003484	$205^{\pm2}$	$70^{\pm2}$	185	$190^{\pm1}$	$40^{\pm1}$	$173^{\pm2}$	$150^{\pm3}$	$30^{\pm5}$	M5	2.5	9.6
4160	3	200μF	C003485	$205^{\pm2}$	$70^{\pm2}$	305	$190^{\pm1}$	$40^{\pm1}$	$173^{\pm2}$	$270^{\pm3}$	$30^{\pm5}$	M5	4.5	19.2
4300*	∗													

∗: Contact your YASKAWA representative.

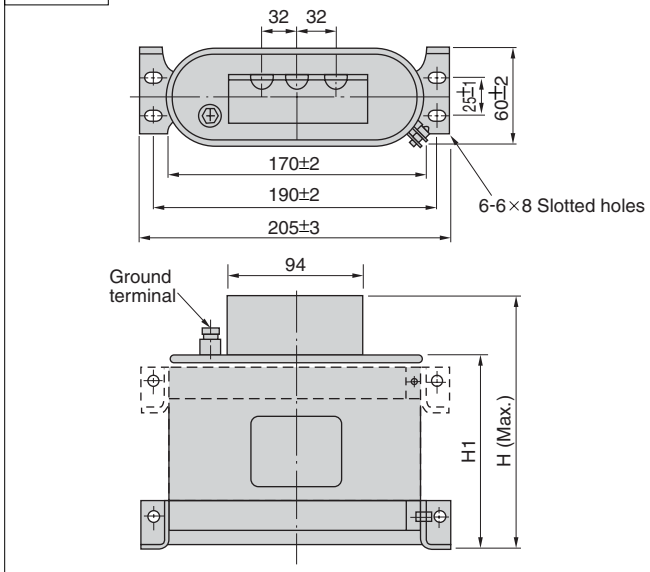
Drawing 1

Units: mm



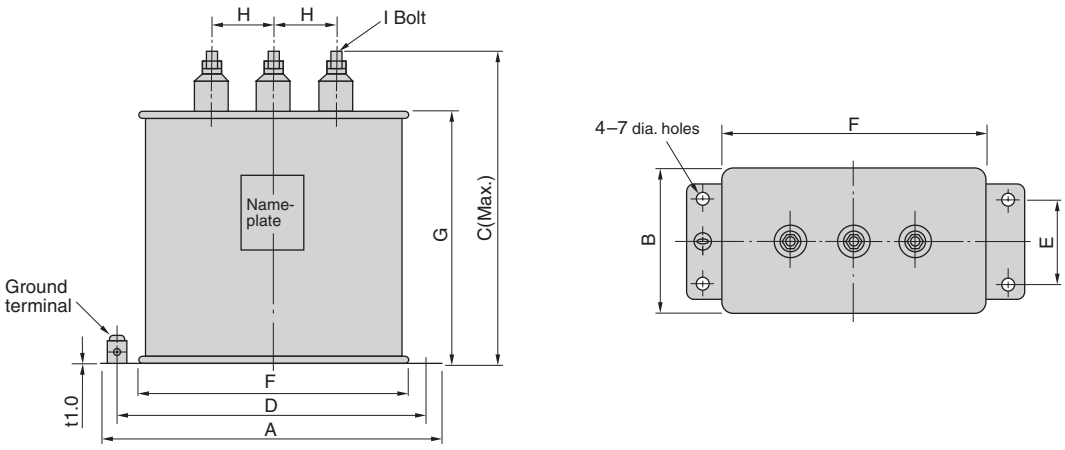
Drawing 2

Units: mm



Drawing 3

Units: mm



Peripheral Devices

Molded-case Circuit Breaker (MCCB) and Magnetic Contactor (MC)

Be sure to connect MCCBs between power supply and input AC reactor. Recommended MCCBs are listed as follows. Connect MC if required.

Molded-case Circuit Breaker (MCCB)
[Mitsubishi Electric Corporation]

200 V class

VS-656DC5 Model:CIMR-D5A□	Input Current A	Molded-case Circuit Breaker		Magnetic Contactor	
		Model	Rated Current (A)	Model	Rated Current (A)
2015	**64**	NF100	100	SC-N5	93
2022	**96**	NF225	150	SC-N7	152
2037	**160**	NF400	300	SC-N11	300
2075	**300**	NF600	600	SC-N14	600

400 V class

VS-656DC5 Model:CIMR-D5A□	Input Current A	Molded-case Circuit Breaker		Magnetic Contactor	
		Model	Rated Current (A)	Model	Rated Current (A)
4015	**32**	NF100	60	SC-N3	65
4022	**48**	NF100	75	SC-N4	80
4030	**64**	NF100	100	SC-N6	110
4045	**96**	NF225	150	SC-N7	152
4075	**165**	NF400	300	SC-N11	300
4160	**300**	NF600	600	SC-N14	600
4300*	**600**	✻			

✻: Contact your YASKAWA representative for details.

Power Supply Magnetic Contactor (MC)
[Fuji Electric FA Components & Systems Co.,Ltd.]

Surge Suppressor (by Nippon Chemi-con Corporation)

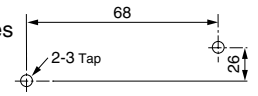
Surge suppressors used for coils in magnetic contactors, control relays, electromagnetic valves, and electromagnetic brakes used as the VS-656DC5 peripheral units.

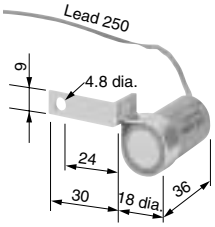
Surge Suppressor / Coils and Relays			Model	Specifications	Code No.
200 V to 230 V	Large-size Magnetic Contactors		DCR2-50A22E	220VAC 0.5μF+200Ω	C002417
	Control Relay	MY2,MY3*1 MM2,MM4*1 HH22,HH23*2	DCR2-10A25C	250VAC 0.1μF+100Ω	C002482
380 to 460 V Units			RFN3AL504KD	1000VDC 0.5μF+220Ω	C002630

✻1: Manufactured by Omron Corporation.
✻2: Manufactured by Fuji Electric FA Components & Systems Co., Ltd.

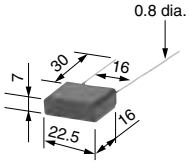
Units: mm

Details of Mounting Holes

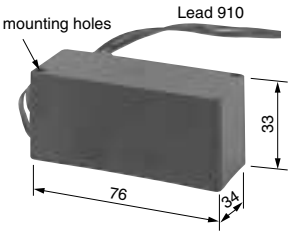




Mass : 22 g
Type DCR2-50A22E



Mass : 5 g
Type DCR2-10A25C



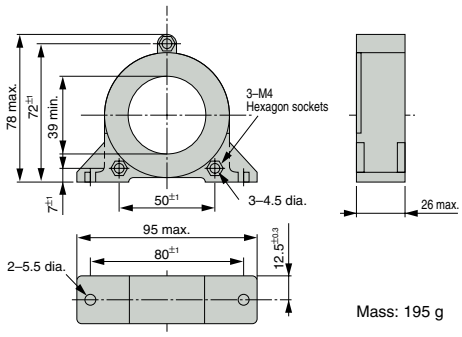
Mass : 150 g
Type RFN3AL504KD

Finemet Zero-phase Reactor to Reduce Radio Noise (by Hitachi Metals,Ltd.)

Use the reactor on the VS-656DC5's input side.

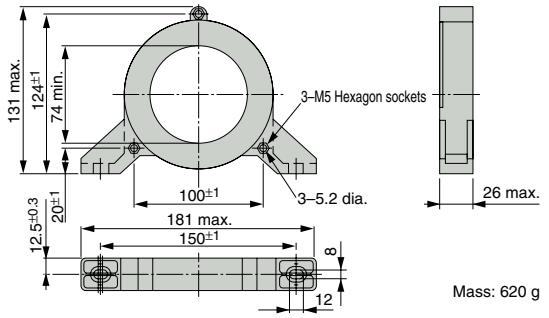
Note: Finemet is a registered trademark of Hitachi Metals,Ltd.

Units: mm



Mass: 195 g

Model: F6045GB

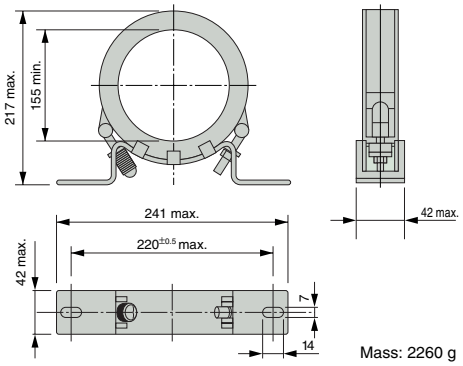


Mass: 620 g

Model: F11080GB

200 V class

Converter		Finemet Zero-phase Reactor			
Model CIMR-□	Recommended Wire Size mm²	Model	Code No.	Qty.	Wiring Method (Connection Diagram)
D5A2015	22	F6045GB	FIL001098	4	4 series (Diagram b)
D5A2022	38				
D5A2037	80	F11080GB	FIL001097		
D5A2075	200				



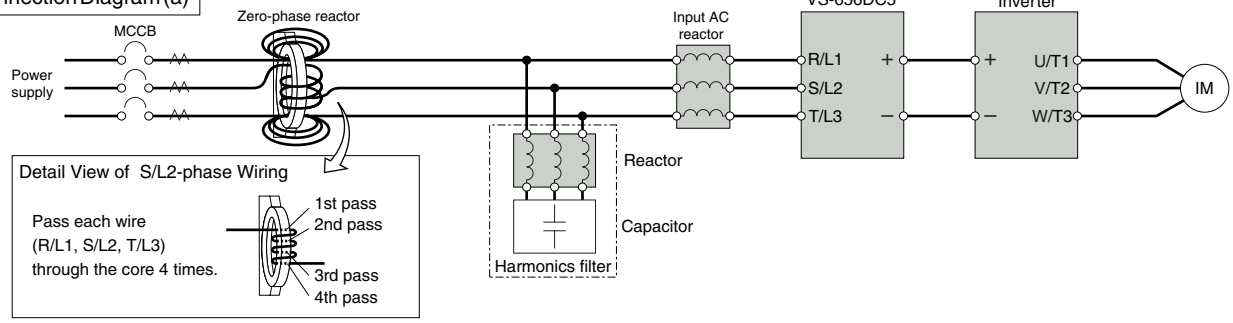
Mass: 2260 g

Model: F200160PB

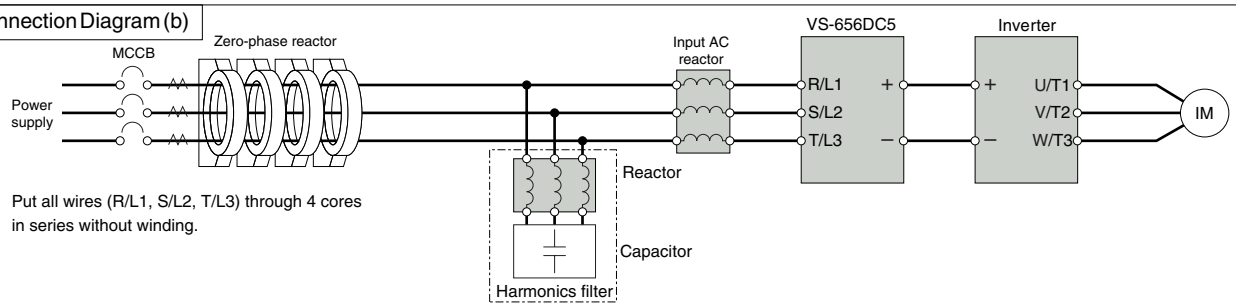
400 V class

Converter		Finemet Zero-phase Reactor			
Model CIMR-□	Recommended Wire Size mm²	Model	Code No.	Qty.	Wiring Method (Connection Diagram)
D5A4015	8	F11080GB	FIL001097	1	3 winds (Diagram a)
D5A4022	14	F6045GB	FIL001098	4	4 series (Diagram b)
D5A4030	22				
D5A4045	38				
D5A4075	80	F11080GB	FIL001097		
D5A4160	200				
D5A4300	325 × 2P	F200160PB	300-001-041		

Connection Diagram (a)



Connection Diagram (b)



Precautions on VS-656DC5 Application

VS-656DC5 Capacity Selection

The VS-656DC5 (P_{out}) must be larger than P_1, P_2, and P_3.

$$\cdot P_{1(kW)} \geqq \underbrace{\frac{1}{\eta_M \times \eta_{INV}}\left(P_{M1}+\cdots+P_{MN}\right)}_{\text{Motoring Side Capacity}} \underbrace{-\eta_{INV}\times\eta_M\left(P_{M1}'+\cdots+P_{MN}'\right)}_{\text{Regenerating Side Capacity}}$$

P_{out}	: VS-656DC5 rated output (kW)	✻: These efficiency settings are only rough guides. Apply the actual efficiency of the motors or inverters, if known.
$P_{M1\ TO}\ P_{MN'}$	: Motor output (kW)	
η_M	: Motor efficiency* 0.9 (0.85 when motor is less than 7.5 kW)	
η_{INV}	: Inverter efficiency* 0.95 (0.9 when motor is less than 7.5 kW)	

- $P_{2\,(kW)}$: Capacity of the largest inverters when running multiple inverters from the same VS-656DC5.
- $P_{3\,(kW)}$: One third of the total capacity of Inverters connected to the VS-656DC5.

Note: When phase imbalance exceeds 2%, increase the frame capacity of the VS-656DC5.
The imbalance ratio between the phases can be calculated as follows [Conforms to IEC 61800-3 (5.2.3)] :

$$\text{Phase imbalance [\%]} = \frac{\text{Max.voltage} - \text{Min.voltage}}{\text{3-phase average voltage}} \times 67$$

Power Supply Capacity Selection

Use a power supply that is greater than the rated input capacity (kVA) of the VS-656DC5. If the power is less than the rated capacity of the VS-656DC5, a fault may occur. When selecting a smaller power supply, contact your Yaskawa representative.

Use the following formula to obtain the VS-656DC5 rated input capacity (S_{conv}).

$S_{conv}\,(kVA) = \sqrt{3} \times I_{AC\_rate} \times V_{in} \div 1000$
[I_{AC_rate}: VS-656DC5 rated input current (A), V_{in}: Applicable power line voltage (V)]

Input AC Reactor

All VS-656DC5 converters require one input AC reactor per converter for the saturation current and heat. Use the correct reactor for the capacity of the converter being used.

VS-656DC5 Power off and Harmonics Filter

This is a set-up sequence that opens at the VS-656DC5 power supply side after the VS-656DC5 operation is stopped. Be sure to attach the specified harmonic filter to reduce the influence on other devices caused by surge voltage by opening that unexpectedly occurs during run.

Precautions on Application of Inverters

Operation

Do not subject the inverter to halogen gases, such as fluorine, chlorine, bromine, and iodine, at any time, even during transportation or installation.

Interlocking

It is necessary to interlock between the VS-656DC5 and the inverter to stop the inverter by using the VS-656DC5 fault signal. To restart the operation after a momentary power loss at the inverter side, the timing for restart must be assured. The “During MC operation” signal that the VS-656DC5 outputs from the control terminal is used to assure the timing. When the “During MC operation” signal is “open,” use the inverter external baseblock input to make a sequence to shut off the inverter output. Refer to Comment 5 (✻5) for Connections on pages 6 and 7.

Case1 When a restart after momentary power loss is not performed (Coasting to a stop by momentary power loss detection)
Connect the “During MC operation” output signal of the VS-656DC5 to the inverter “External fault” input terminal. The input for the inverter “External fault” is set to NC contact. To prevent external fault operation at power supply on, select “External fault accepted only during RUN.”

Case2 When a restart after momentary power loss is performed as a system

- For Varispeed F7 and Varispeed G7
  Connect the “During MC operation” output signal of the VS-656DC5 to the inverter “External baseblock” input terminal.
  Select a restart after momentary power loss at the inverter side.
  Select the setting for NC contact input for the inverter “External baseblock” input.
- For all other inverters
  Connect the “During MC operation” output signal of the VS-656DC5 to the inverter “External search command 3” input terminal. If using inverters without an “External search command 3” input terminal, contact your Yaskawa representative for details.

Precautions on Application of Peripheral Devices

When a noise filter is attached on the power supply side, use a noise filter of the reactor type (without a capacitor) such as Finemet zero-phase reactor, and attach it behind the MCCB at the power supply side. Do not use a capacitor-built-in type noise filter since the harmonic components may overheat or damage the capacitor.

When the Power Supply is a Generator

Select a generator capacity approx. twice as large as the VS-656DC5 input power supply capacity.
Set deceleration time or load so that the regenerative power from the motor will be 10% or less of the generator capacity.
(For further information, contact your YASKAWA representative.)

When a Phase Advance Capacitor or Thyristor Controller is Provided for the Power Supply

No phase advance capacitor is needed for the VS-656DC5. Installing one on the VS-656DC5 will result in reduction of the power factor.
For the phase advance capacitor that has already been installed on the same power supply system as the VS-656DC5, attach a series reactor to prevent oscillation with the VS-656DC5.
Contact your YASKAWA representative if any device generating voltage surge or voltage distortion, such as the DC motor drive thyristor controller or magnetic agitator, is installed on the same power supply system.

Prevention of EMC (Radio Noise) or Harmonic Leakage Current

No preventive action for harmonic current is needed. However, some preventive actions for EMC (radio noise) or harmonic leakage current are necessary for the VS-656DC5 just as with the general inverter drives.
If a device that will be affected by noise is near the VS-656DC5, use a zero-phase reactor as a noise filter.
Use a leakage relay or an earth leakage breaker designed for inverters (products provided with prevention against harmonic leakage current) when necessary.

Guideline for Reduction of Harmonic Emission

- A guideline for reduction of harmonic emission is available for users who receive 6.6 kV or more from the power supply system.

- Though the VS-656DC5 is equivalent to a self-excited, three-phase bridge (K5=0), which generates no harmonics, note that harmonics are not completely eliminated.

Influence of Power Supply Distortion

When the power supply voltage is distorted, or when several devices are connected in parallel to the same power supply, the harmonic contents become larger since the harmonics of the power supply system enter the VS-656DC5.

VARISPEED-656DC5

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YASKAWA ELECTRIC CORPORATION

YASKAWA

In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.

Specifications are subject to change without notice
for ongoing product modifications and improvements.

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