



D1000

REGENERATIVE CONVERTER UNIT

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Content

- ▶ 02 About YASKAWA
A Leader in Inverter Drives Technology
- ▶ 03 The Power Regenerative Converter Unit
- ▶ 04 Discover new Energy Saving Potentials
- ▶ 05 Applications
- ▶ 06 Package Selection
- ▶ 08 Model Code
- ▶ 09 D1000 Packages
- ▶ 10 Specifications and Options
- ▶ 11 Connection Diagrams and System Components

Experience and Innovation

Since 1915 YASKAWA has manufactured and supplied products for machine building and industrial automation. Our standard products as well as tailor-made solutions are well known and have a high reputation for outstanding quality and reliability.

YASKAWA is the leading global manufacturer of inverter drives, servo drives, machine controllers, medium voltage inverters, and industrial robots.

We have always been a pioneer in motion control and drive technology, launching product innovations, which optimise the productivity and efficiency of both machines and systems.



YASKAWA Eschborn, Germany

Today we produce more than 1.8 million inverters per year. Considering this, YASKAWA is probably the biggest inverter manufacturer in the world.



YASKAWA Motoman Robots

Furthermore, with a yearly production of more than 800,000 servo motors and 20,000 robots we offer a wide range of products for drive automation processes in many different industries. YASKAWA technology is used in all fields of machine building and industrial automation.

Wherever You Are – Our Local Support is Near.



Employing more than 14,600 people worldwide

More than 1,350 employees in worldwide service network

More than 1,250 employees in Europe

The Power Regenerative Converter Unit

The new D1000 regenerative converter unit complements the YASKAWA product range with a low harmonics Active Frontend Solution. Suitable for both regenerative individual drives and systems of inverter drives, servo axis or robots, the D1000 feeds excess braking energy back into power grid instead of dissipating it as heat.



ENERGY EFFICIENT FOUR-QUADRANT

D1000 saves energy by making excessive braking energy available to other consumers in the same grid instead of wasting it as heat. By providing full braking power with 100% duty cycle it allows for shorter machine cycles and can increase production efficiency.



CLEAN POWER

The sinusoidal input current with a total harmonic distortion of less than 5% and a displacement power factor of ~1 minimize losses in grid components like generators and transformers. The higher power quality additionally reduces the potential disturbance of other components.



COOL OPERATION

D1000 does away with braking choppers and resistors, thus saving valuable space and reducing the risk of fire. By not dissipating energy as heat the demand for ventilation is greatly reduced and maintenance, e.g. for resistor cleaning becomes needless.



REDUCE COSTS

The D1000 reduces the cost for energy and maintenance and quickly pays for itself.



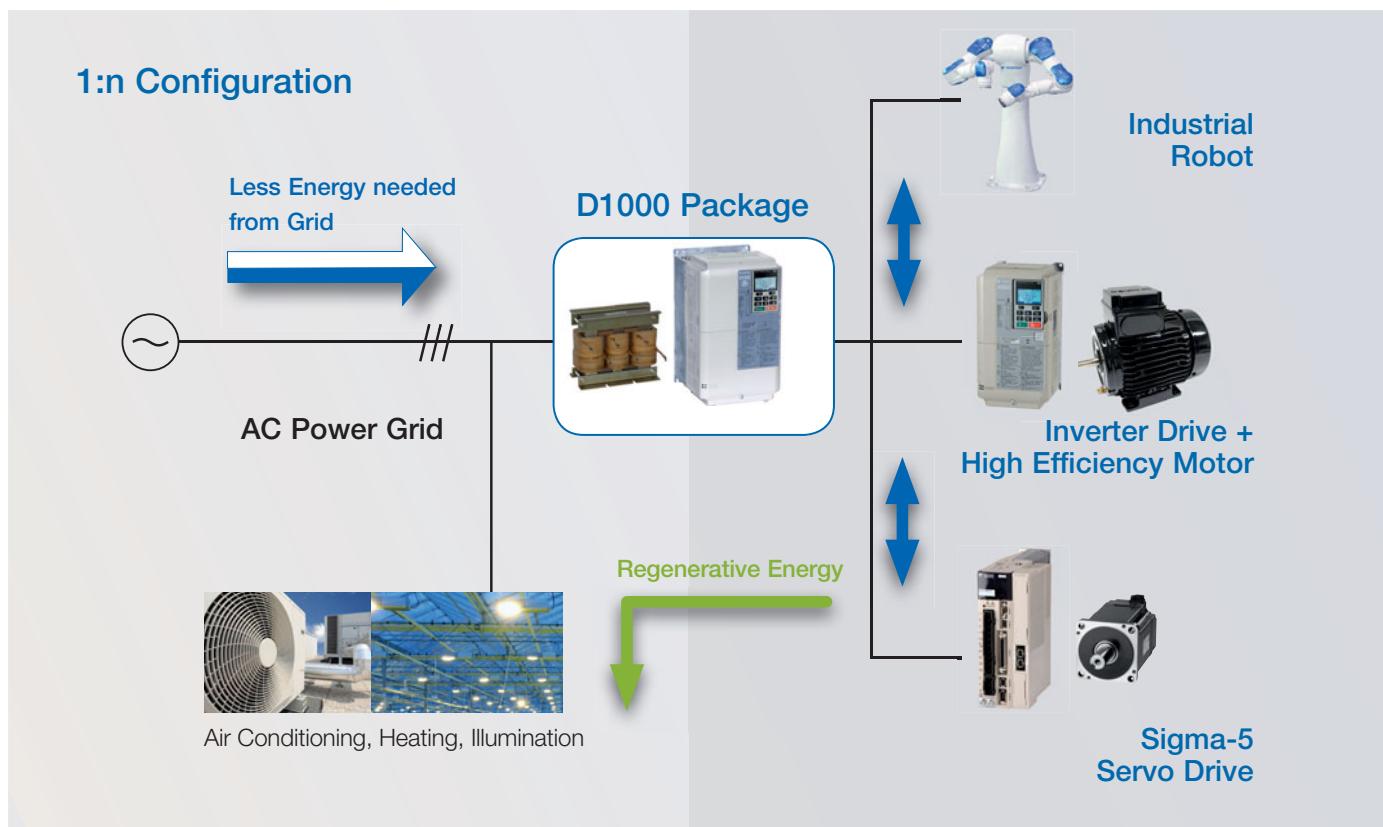
EASY TO HANDLE PACKAGE

D1000 comes in an easy to handle package. Only one material number for all components makes procurement simple and assures completeness and parts compatibility.



Save Energy with Power Regeneration

D1000 is open for various configurations. Usable in one-on-one or multiple unit connection the D1000 provides the flexibility needed to satisfy a broad range of energy efficient and low harmonics applications.



One-on-One System

Typical one-on-one applications like escalators, elevators, pumps, or presses have one inverter drive connected to a D1000. Using the D1000 they take great benefit from:

- ▶ Energy cost reduction of complete installation
- ▶ Less space and heat by removed braking resistors
- ▶ Low input current harmonics

Multiple-Unit Connection

Multiple unit systems like winders, transport systems, packaging systems, or hoists with inverter drives, servo systems or robots have an interconnected DC bus that is supplied by one D1000. Energy is shared already in the DC bus, leading to reduced take up from the power grid. In addition to benefit of one-on-one systems such applications take the advantage from:

- ▶ DC bus energy sharing
- ▶ Reduced space compared to multiple drives with built in active frontend
- ▶ Single point of supply

For a wide Range of Applications

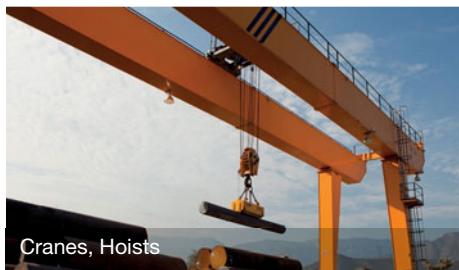
Using the D1000 Regenerative Converter Unit saves energy and thereby money within a broad range of applications. This includes applications with large-inertia loads, 4-quadrant loads, long-term energy feedback and quick braking.



Motor Test Benches



Robots



Cranes, Hoists



Winder



Elevators



Escalators

- ▶ Dewatering machines
- ▶ Semiconductor industry
- ▶ Panel industry
- ▶ Centrifugal separators
- ▶ Winders
- ▶ Presses
- ▶ Eccentrics

Single Unit Configuration (1:1)

For configurations with only one drive connected to a D1000 the correct D1000 kit can be selected from the tables below.

200 V Class

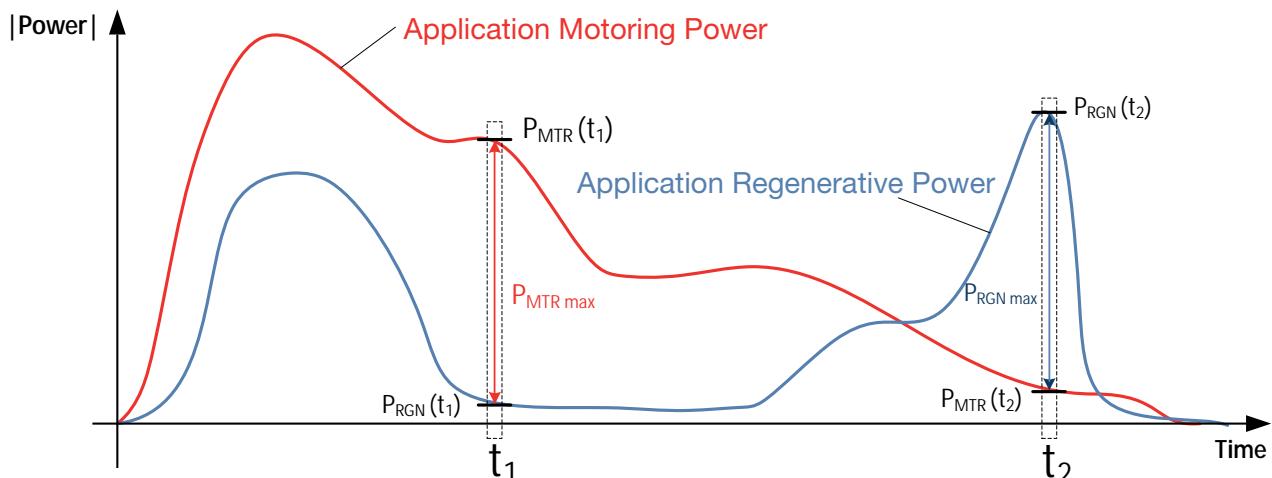
Motor Capacity (kW) / Drive Capacity (kW)	D1000 Kit D1KIT2□□□□AAAAA
≤4.0	0005
5.5 / 7.5	0010
11 / 15	0020
18.5 / 22	0030
30 / 37	0050
45 / 55	0065
75	0090
90 / 110	0130

400 V Class

Motor Capacity (kW) / Drive Capacity (kW)	D1000 Kit D1KIT4□□□□AAAAA
≤4.0	0005
5.5 / 7.5	0010
11 / 15	0020
18.5 / 22	0030
30	0040
37 / 45	0060
55 / 75	0100
90 / 110	0130
132 / 160	0185
185 / 220	0270
315	0370
450 / 560	0630

Multiple Unit Configuration (1:n)

Selecting the optimal D1000 kit when multiple units are connected to one D1000 requires an analysis of the application. Find the moments of maximum motoring and regenerative power as shown in the example below, compare them and select the right D1000 kit.



Calculating the Capacity for multiple Units

Definitions

P = Power [kW]

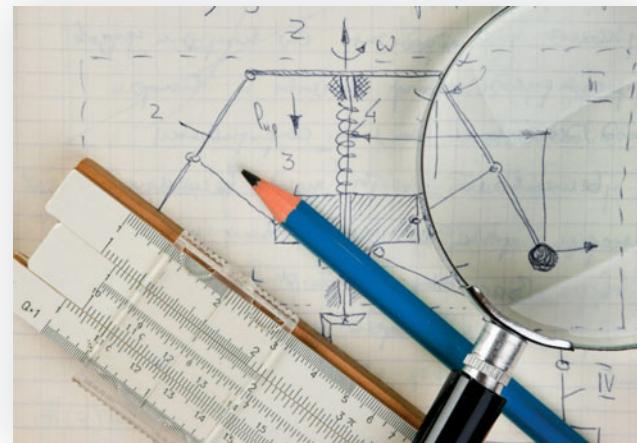
η = Efficiency

P_{MTR} = Motoring Power

P_{RGN} = Regenerative Power

$$P_{MTR}(t) = \sum_{i=1}^N \frac{P_{motor_i}(t)}{\eta_{motor_i} \cdot \eta_{drive_i}}$$

$$P_{RGN}(t) = \sum_{i=1}^N P_{motor_i}(t) \cdot \eta_{motor_i} \cdot \eta_{drive_i}$$



- Determine the moment (t_1) when the application draws the maximum motoring power from the grid, and calculate the power by subtracting the total motoring and regenerative values.

$$P_{MTRmax} = P_{MTR}(t_1) - P_{RGN}(t_1)$$

- Determine the moment (t_2) when the application returns the maximum regenerative power to the grid, and calculate the power by subtracting the total regenerative and motoring values.

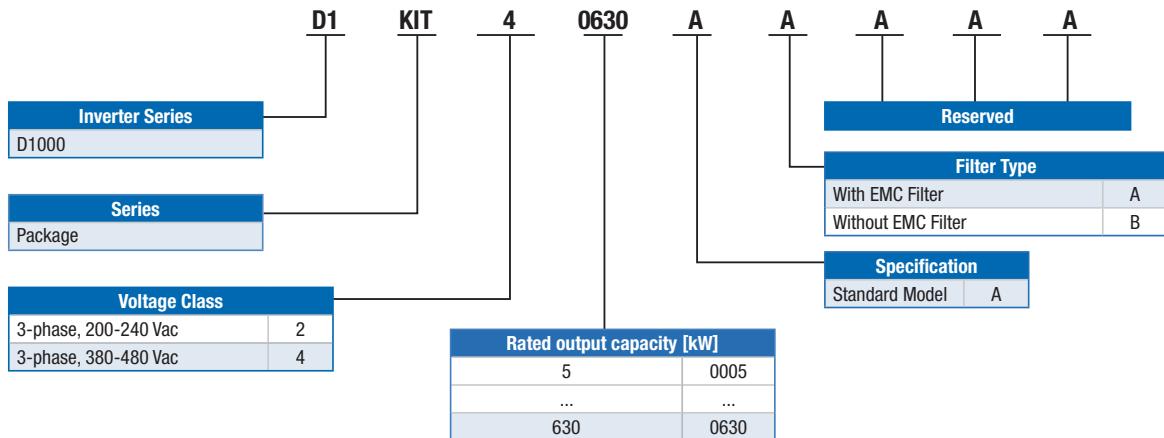
$$P_{RGNmax} = P_{RGN}(t_2) - P_{MTR}(t_2)$$

- Select a D1000 with a power rating greater than P_{MTRmax} or P_{RGNmax} , whichever is higher.

Notes

- The minimum D1000 power rating is 1/3 of the total nominal power rating of all devices connected to the DC bus
- If the peak power state has a duration of less than 60 seconds, the D1000 overload capability can be taken into account. This requires a closer analysis of the application. For technical assistance please contact YASKAWA Support.
- If efficiencies are unknown, use a motor efficiency of 0.9 (0.85 for motors <7.5kW) and a drive efficiency of 0.95.
- When calculating the motoring or regenerative power, the actual shaft power should be used. This is because some devices like Servopacks can provide up to 300% of nominal power for a short time, which can have significant influence on D1000 selection.
- When connecting devices to the DC bus that do not have their own precharge circuit there is a limit to the amount of capacitance that can be connected to the D1000. For more information please contact YASKAWA Support.
- If the interphase imbalance ratio of the power source exceeds 2%, select a D1000 unit one size larger than required by the above calculation.

Model Number Key for the D1000 Package



D1000 Package Example



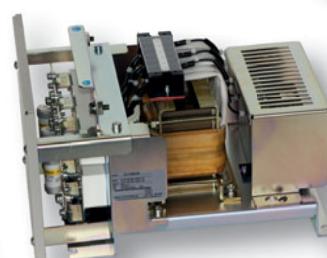
D1000
Regenerative Converter Unit



Input Reactor 1



EMC Filter



Harmonic Filter

D1000 Packages

D1000 is available in pre-configured packages that include all peripherals required making the selection and procurement simple and easy.

Package Content

- ▶ D1000 Regenerative Converter Unit
- ▶ EMC Filter (optional)
- ▶ Input Reactor(s)
- ▶ Harmonic Filter (As discrete parts for 270kW capacity and above. Fuses for these models must be purchased separately.)

200 V Class

Order Number	Capacity	Part Number						
		D1000 Unit	Input Reactor 1	Harmonic Filter	Input Reactor 2	Capacitor for Harmonic Filter	Reactor for Harmonic Filter	EMC Filter
D1KIT2□□□□AAAAA	[kW]							
0005	5	CIMR-DC2A0005BAA	100-106-071	EUJ710800.KM	-	-	-	-*
0010	10	CIMR-DC2A0010BAA	100-106-072	EUJ710810.KM	-	-	-	-*
0020	20	CIMR-DC2A0020BAA	100-106-073	EUJ710820.KM	-	-	-	-*
0030	30	CIMR-DC2A0030AAA	100-106-074	EUJ710830.KM	-	-	-	-*
0050	50	CIMR-DC2A0050AAA	100-106-075	EUJ710840.KM	-	-	-	-*
0065	65	CIMR-DC2A0065AAA	100-106-076	EUJ710850.KM	-	-	-	-*
0090	90	CIMR-DC2A0090AAA	100-106-077	EUJ710860.KM	-	-	-	-*
0130	130	CIMR-DC2A0130AAA	100-106-078	EUJ710871.KM	-	-	-	-*

* under development

400 V Class

Order Number	Capacity	Part Number						
		D1000 Unit	Input Reactor 1	Harmonic Filter	Input Reactor 2	Capacitor for Harmonic Filter	Reactor for Harmonic Filter	EMC Filter
D1KIT4□□□□AAAAA	[kW]							
0005	5	CIMR-DC4A0005BAA	100-106-079	EUJ710880.KM	-	-	-	B84143A0020R106
0010	10	CIMR-DC4A0010BAA	100-106-080	EUJ710890.KM	-	-	-	B84143A0020R106
0020	20	CIMR-DC4A0020BAA	100-106-081	EUJ710900.KM	-	-	-	B84143A0035R106
0030	30	CIMR-DC4A0030AAA	100-106-082	EUJ710910.KM	-	-	-	B84143A0065R106
0040	40	CIMR-DC4A0040AAA	100-106-083	EUJ710920.KM	-	-	-	B84143A0065R106
0060	60	CIMR-DC4A0060AAA	100-106-084	EUJ710930.KM	-	-	-	B84143B0180S080
0100	100	CIMR-DC4A0100AAA	100-106-085	EUJ710940.KM	-	-	-	B84143B0180S080
0130	130	CIMR-DC4A0130AAA	100-106-086	EUJ710951.KM	-	-	-	B84143B0400S080
0185	185	CIMR-DC4A0185AAA	100-106-087	EUJ710961.KM	-	-	-	B84143B0400S080
0270	270	CIMR-DC4A0270AAA	100-106-088	-	100-106-090	100-106-093	100-106-096	B84143B1000S080
0370	370	CIMR-DC4A0370AAA	100-106-089	-	100-106-091	100-106-094	100-106-097	B84143B1000S080
0630	630	CIMR-DC4A0630AAA	100-106-089	-	100-106-092	100-106-095	100-106-098	B84143B1600S080



Specifications

Operating Environment

► Ambient Temperature	-10 to +50 °C (open chassis)
► Humidity	95% RH or less (non condensating)
► Storage Temperature	-20 to +60 °C (short-term temperature during transportation)
► Altitude	Up to 1000 meters (output derating required above 1000 m, max. 3000 m)
► Shock	10 to 20 Hz: 9.8 m/s ² and 5.9 m/s ² for model 0630; 200 V Class 20 to 55 Hz: 5.9 m/s ² , from 0065 2.0 m/s ² , 400 V Class 5.9 m/s ² from model 0130 2.0 m/s ²
► Protection Design	IP00/IP20 Open Type enclosure, Indoor use
► Standards	UL508C, IEC 61800-5-1, IEC 61800-3, RoHS

Power Ratings

CIMR-DC□A□□□□	200 V Class								400 V Class																					
	0005	0010	0020	0030	0050	0065	0090	0130	0005	0010	0020	0030	0040	0060	0100	0130	0185	0270	0370	0630										
Maximum Applicable Motor Capacity (kW)	3.7	7.5	15	22	37	55	75	110	3.7	7.5	15	22	30	45	75	110	160	220	315	560										
Rated Output Capacity (kW)	5	10	20	30	50	65	90	130	5	10	20	30	40	60	100	130	185	270	370	630										
Rated Output Current DC (A)	15	30	61	91	152	197	273	394	8	15	30	45	61	91	152	197	280	409	561	955										
Rated Output Current AC(A)	12	29	57	83	140	200	270	400	8	16	30	43	58	86	145	210	300	410	560	1040										
Rated Output Voltage (Vdc)	330								660																					
Overload Capability	Operation stops after 60 s at 150% of rated output current																													
Rated Voltage	200 to 240 VAC -15 to +10%								380 to 480 VAC -15 to +10%																					
Rated Frequency	50/60 Hz ± 2%																													
Input Power Factor	Input power factor of 0.99 min (for rated operation)																													
Output Voltage Accuracy	±5%																													
Carrier Frequency	6				4				6				4			2														
Power Supply Frequency Fault	Operation stops for a deviation of ±6 Hz or more from the rated input frequency																													

Options

Input / Output

Item	Description	Model Code
► Analogue Monitor	2 channel analogue output option -10 to +10 VDC (Res. 1/2048)	AO-A3
► Digital Output	8 channel digital output option 6 photo couplers (48 V, 50 mA or less), 2 relay contact outputs max 250 VAC/30 VDC, 1 A	DO-A3

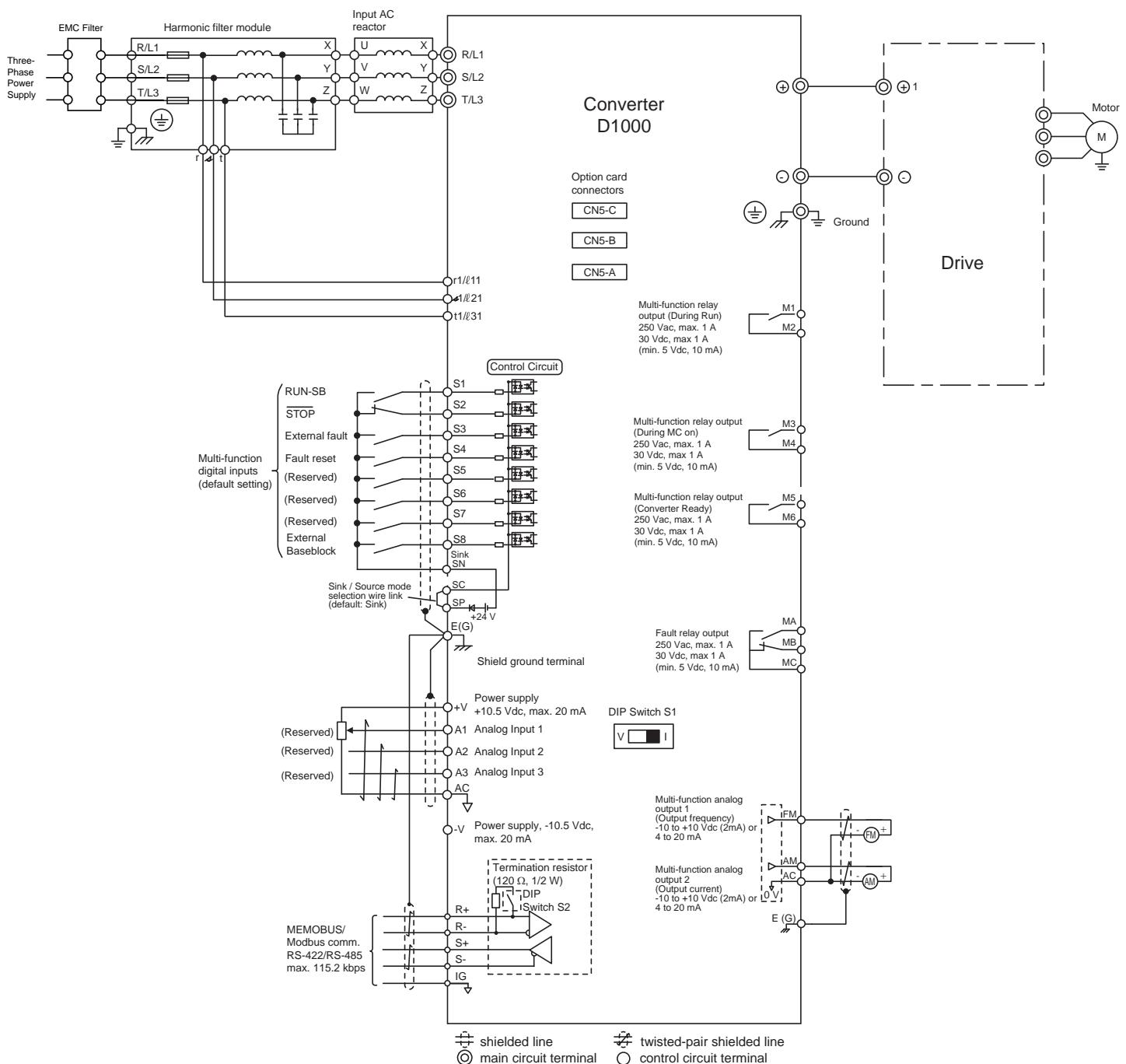
Communication

► Communication Interface Unit	CANopen CC-Link DeviceNet EtherCAT EtherNet/IP MECHATROLINK-II Modbus/TCP POWERLINK PROFIBUS-DP PROFINET	under development under development under development under development under development SI-T3 under development under development under development under development
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Others

► 24 V Power Supply	Provides power supply for the control circuit and option boards when main circuit power is off	PS-A10LB
► USB Copy Unit	USB converter for PC Tool usage and copy unit for easy parameter setup duplication and backup in one	PS-A10HB JVOP-181
► IP65 Operator Mounting Frame	Provides a simple way of installing the LCD Remote Operator of the drive on a cabinet wall or door	JVOP-V11001
► Heatsink Outside Mounting Kit	Mount the drive with heatsink outside of the panel	EZZ020800□
► DriveWizard Plus	Software used for parametrization	

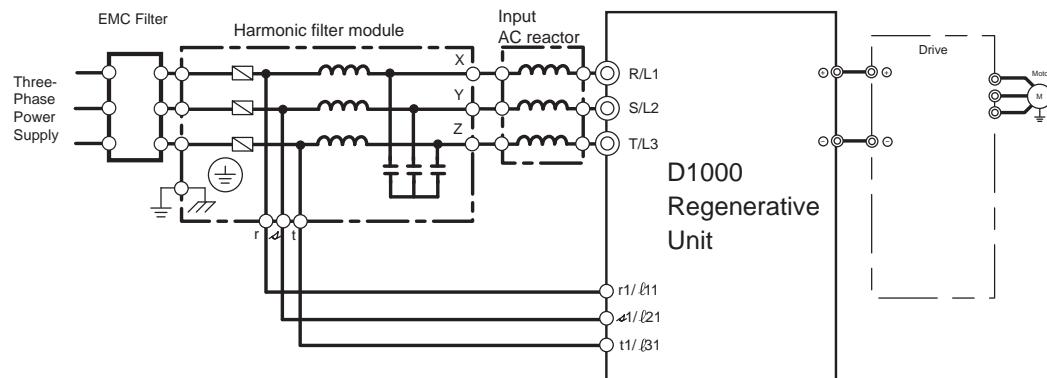
Standard Connection Diagram



Connection Diagram and System Components

Dimensions for Models from 5 kW to 185 kW

Connection Diagram



D1000 Regenerative Converter Unit 200 V

Part Number Kit	Part Number	Capacity	IP	Fig.	Dimensions [mm]								Weight [kg]
					W	H	D	W1	H1	H2	D1	d	
D1KIT2□□□AAAAA	CIMR-DC2A□□□	[kW]	20	1	180	300	187	160	284	8	75	M5	5
	0005			2	220	365	197	192	335	8	78	M6	8
	0010			1	275	450	258	220	435	7.5	100	M6	21
	0020			00	325	550	283	260	535	7.5	110	M6	32
	0030		00	2	450	705	330	325	680	12.5	130	M10	57
	0050			3	500	800	350	370	773	13	130	M12	61
	0065												85
	0090												
	0130	0130											

D1000 Regenerative Converter Unit 400 V

Part Number Kit	Part Number	Capacity	IP	Fig.	Dimensions [mm]								Weight [kg]
					W	H	D	W1	H1	H2	D1	d	
D1KIT4□□□AAAAA	CIMR-DC4A□□□	[kW]	20	1	180	300	187	160	284	8	75	M5	5
	0005			2	220	365	197	192	335	8	78	M6	8
	0010			1	275	450	258	220	435	7.5	100	M6	21
	0020			00	325	550	283	260	535	7.5	110	M6	34
	0030		00	2	450	705	330	325	680	12.5	130	M10	36
	0040			3	500	800	350	370	773	13	130	M12	85
	0060												
	0100												
	0130	0130											
	0185	0185											

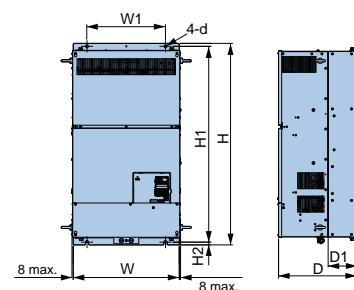
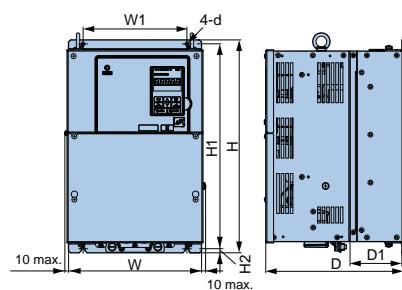
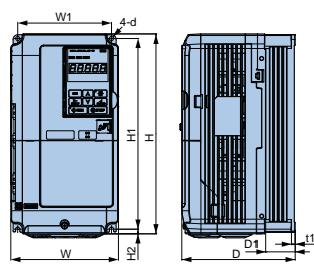


Figure 1

Figure 2

Figure 3

Dimensions Package Components



AC Input Reactor 1 - 200 V Class

Part Number Kit D1KIT2□□□□AAAAAA	Part Number	QTY	Fig.	Dimensions [mm]								Weight [kg]	
				A	B	B1	C	D	E	F	J		
0005	100-106-071	1	4	160	114	172	133	75	95	160	M6	M4	8.2
	100-106-072			205	106	179	173	75	85	205	M6	M5	14
	100-106-073		5	266	146	238	251	150	115	220	M8	M6	28
	100-106-074			266	161	260	290	150	131	220	M8	M8	38
	100-106-075			330	161	268	334	170	131	270	M10	M8	65
	100-106-076			320	211	306	343	170	181	270	M10	M12	79
	100-106-077			380	220	320	382	200	180	320	M12	M12	102
	100-106-078			445	240	386	436	240	200	420	M12	M12	164

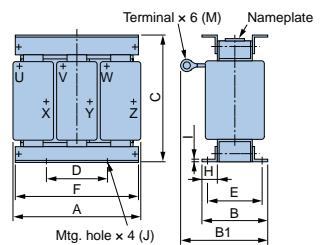


Figure 4*

AC Input Reactor 1 - 400 V Class

Part Number Kit D1KIT4□□□□AAAAAA	Part Number	QTY	Fig.	Dimensions [mm]								Weight [kg]	
				A	B	B1	C	D	E	F	J		
0005	100-106-079	1	4	160	104	162	133	75	85	160	M6	M4	7.1
	100-106-080			206	101	171	173	75	80	205	M6	M4	13
	100-106-081		5	230	146	207	200	150	115	230	M8	M6	26
	100-106-082			265	161	243	290	150	131	220	M8	M8	34
	100-106-083			268	176	272	285	150	146	220	M8	M8	44
	100-106-084			330	161	273	331	170	131	270	M10	M8	56
	100-106-085			320	211	309	366	170	181	270	M10	M8	87
	100-106-086			385	235	330	382	200	195	320	M12	M12	122
	100-106-087			450	240	335	424	240	200	420	M12	M12	150

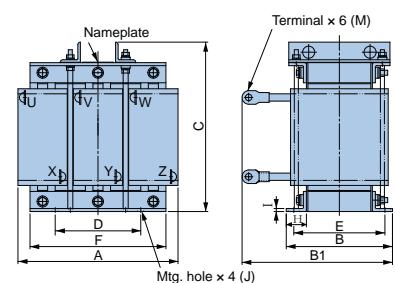


Figure 5*

PWM Filter Module - 200 V Class

Part Number Kit D1KIT2□□□□AAAAAA	Part Number	Fig.	Dimensions [mm]						Weight [kg]
			A	B	C	D	E	H	
0005	EUJ710800.KM	6	209	285	176	160	240	M6	6.5
	EUJ710810.KM		209	295	184	160	250	M6	9
	EUJ710820.KM		232	301	265	203	247	M8	14
	EUJ710830.KM		260	305	281	220	256	M8	16
	EUJ710840.KM		290	355	348	250	314	M10	27
	EUJ710850.KM		290	352	350	254	314	M10	38
	EUJ710860.KM		290	352	387	254	314	M10	43
	EUJ710871.KM		350	380	500	290	350	M10	62

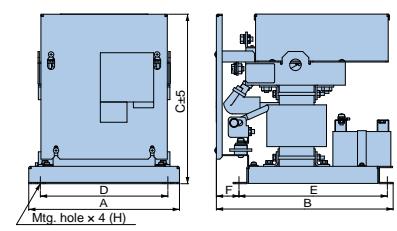


Figure 6*

PWM Filter Module - 400 V Class

Part Number Kit D1KIT4□□□□AAAAAA	Part Number	Fig.	Dimensions [mm]						Weight [kg]
			A	B	C	D	E	H	
0005	EUJ710880.KM	6	209	285	176	160	240	M6	7
	EUJ710890.KM		209	295	178	160	250	M6	9
	EUJ710900.KM		232	301	265	203	247	M8	15
	EUJ710910.KM		260	305	293	220	256	M8	17
	EUJ710920.KM		260	305	293	220	256	M8	19
	EUJ710930.KM		290	355	348	250	314	M10	27
	EUJ710940.KM		290	355	385	250	314	M10	39
	EUJ710951.KM		350	380	500	290	350	M10	64
	EUJ710961.KM		350	380	500	290	344	M10	73

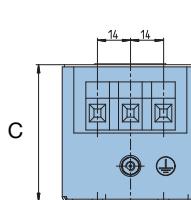


Figure 7*

EMC Filter - 400 V Class

Part Number Kit D1KIT4□□□□AAAAAA	Part Number	Figure	Dimensions [mm]			Weight [kg]
			A	B	C	
0005	B84143A0020R106	7	150	57.5	58	0.6
	B84143A0020R106		160	72.5	71	0.9
	B84143A0035R106		217	84.5	80	1.9
	B84143A0065R106		200	170	110	5.0
	B84143A0065R106		290	190	116	7.5
	B84143B0180S080					
	B84143B0180S080					

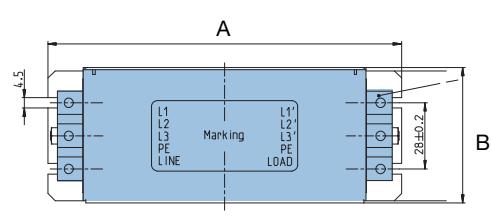


Figure 7*

* Appearance might change with capacity

Models from 270 kW to 370 kW

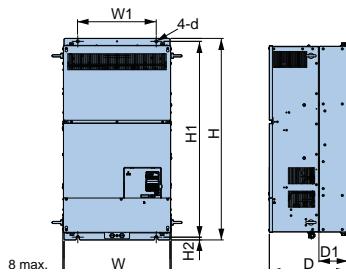


Figure 1

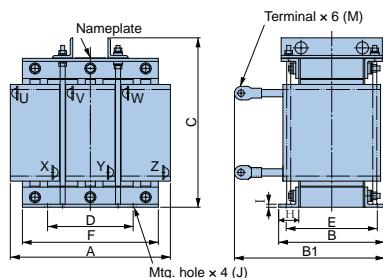
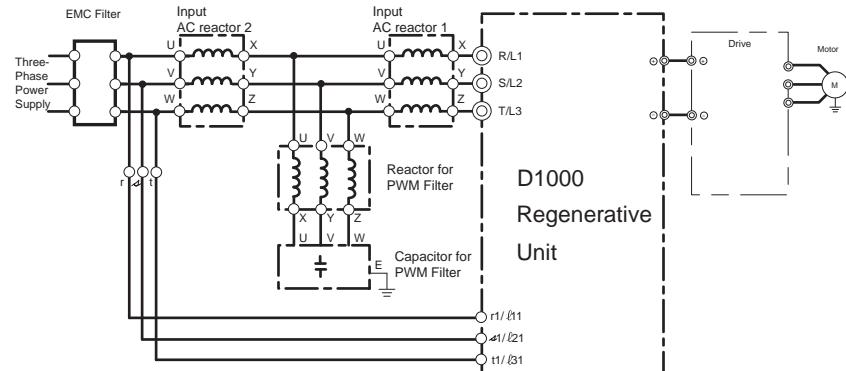


Figure 2*

D1000 Regenerative Converter Unit 400 V

Part Number Kit	Part Number	Capacity [kW]	IP	Fig.	Dimensions [mm]								Weight [kg]
					W	H	D	W1	H1	H2	D1	d	
D1KIT4□□□AAAAA	0270	CIMR-DC4A0270	270	00	370	1140	370	440	1100	15	150	M12	183
	0370	CIMR-DC4A0370	370										194

AC Input Reactor 1

Part Number Kit	Part Number	QTY	Fig.	Dimensions [mm]										Weight [kg]
				A	B	B1	C	D	E	F	J	M		
D1KIT4□□□AAAAA	0270	100-106-088	1	510	300	410	482	245	250	490	M12	M12	222	
	0370	100-106-089		560	320	435	549	300	260	530	M12	M12	293	

AC Input Reactor 2

Part Number Kit	Part Number	QTY	Fig.	Dimensions [mm]										Weight [kg]
				A	B	B1	C	D	E	F	J	M		
D1KIT4□□□AAAAA	0270	100-106-090	1	330	176	323	326	170	146	270	M10	M12	60	
	0370	100-106-091		385	220	350	382	200	180	320	M12	M12	102	

Reactor for PWM Filter

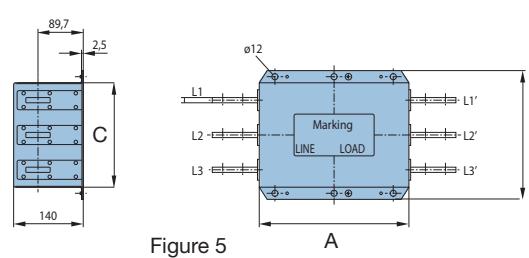
Part Number Kit	Part Number	Fig.	Dimensions [mm]										Weight [kg]	
			A	B	B1	C	D	E	F	H	J	M		
D1KIT4□□□AAAAA	0270	100-106-096	3	163	107	150	135	75±2	85±2	163	25	M6	M8	6.3
	0370	100-106-097		182	102	157	150	75±2	80±2	182	25	M6	M8	7.6

Capacitor for PWM Filter

Part Number Kit	Part Number	Fig.	Dimensions [mm]										Weight [kg]
			A	B	C	D	E	F	G	H	I		
D1KIT4□□□AAAAA	0270	100-106-093	4	438	128	502	398±3	95±2	345	433	80±5	M12	27
	0370	100-106-094		438	128	602	398±3	95±2	345	533	80±5	M12	33

EMC Filter - 400 V Class

Part Number Kit	Part Number	Fig.	Dimensions [mm]					Weight [kg]
			A	B	C	D		
D1KIT4□□□AAAAA	0270	100-143B1000S080	5	300	260	140		18.5
	0370	100-143B1000S080						



Models with 630 kW

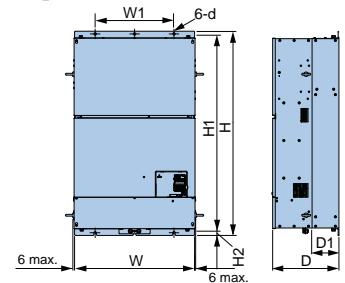
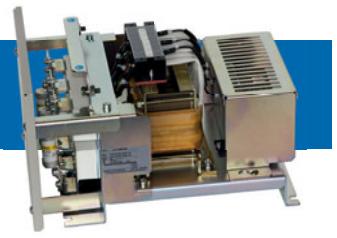
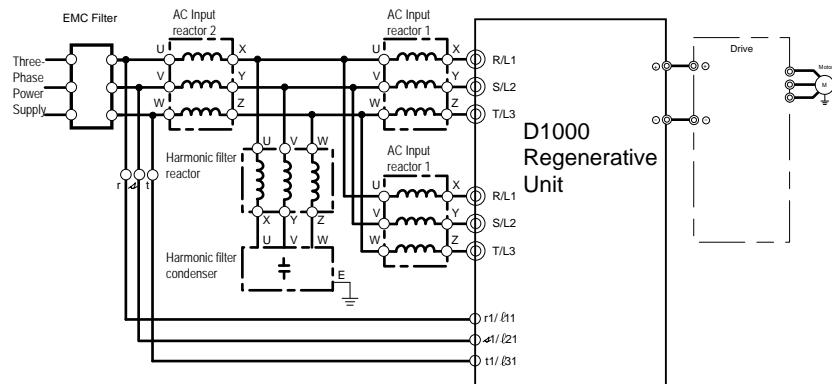


Figure 1

D1000 Regenerative Converter Unit 400 V

Part Number Kit	Part Number	Capacity [kW]	IP	Fig.	Dimensions [mm]						Weight [kg]		
					W	H	D	W1	H1	H2	D1		
D1KIT40630AAAAA	CIMR-DC4A0630	630	00	1	1250	1380	370	1100	1345	15	150	M12	413

AC Input Reactor 1

Part Number Kit	Part Number	QTY	Fig.	Dimensions [mm]								Weight [kg]	
				A	B	B1	C	D	E	F	J		
D1KIT40630AAAAA	100-106-089	2	2	560	320	435	549	300	260	530	M12	M12	293

AC Input Reactor 2

Part Number Kit	Part Number	QTY	Fig.	Dimensions [mm]								Weight [kg]
				A	B	B1	C	D	E	F	J	
D1KIT40630AAAAA	100-106-092	1	3	452	375	635	545	302	335	M12	M12	172

Reactor for PWM Filter

Part Number Kit	Part Number	Fig.	Dimensions [mm]										Weight [kg]
			A	B	B1	C	D	E	F	H	J	M	
D1KIT40630AAAAA	100-106-098	4	210	102	171	190	75	80	205	25	M6	M10	12

Capacitor for PWM Filter

Part Number Kit	Part Number	Fig.	Dimensions [mm]										Weight [kg]
			A	B	C	D	E	F	G	H	H1	I	
D1KIT40630AAAAA	100-106-095	5	695	128	582	655±3	95±2	602	513	80±5	60±5	M12	55

EMC Filter - 400 V Class

Part Number Kit	Part Number	Fig.	Dimensions [mm]			Weight
			A	B	C	
D1KIT40630AAAAA	B84143B1600S080	6	300	260	210	24.5

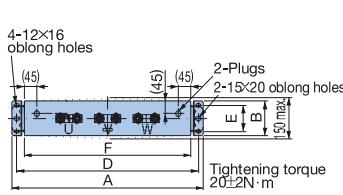


Figure 5

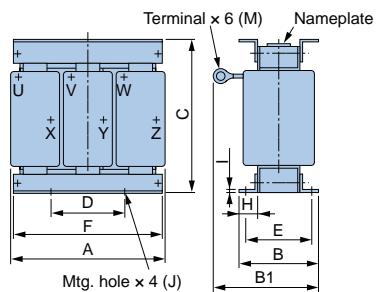


Figure 4

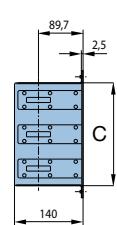
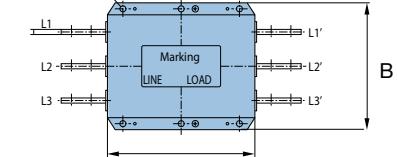


Figure 6





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