

YASKAWA AC Drive - J1000

Compact V/f Control Drive

Finless Type Installation Manual

Type CIMR-J□□□□□□□□J□□

Models 200 V Class, Three-Phase Input: 0.1 to 5.5 kW
200 V Class, Single-Phase Input: 0.1 to 2.2 kW
400 V Class, Three-Phase Input: 0.2 to 5.5 kW

To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.

安川インバータ J1000

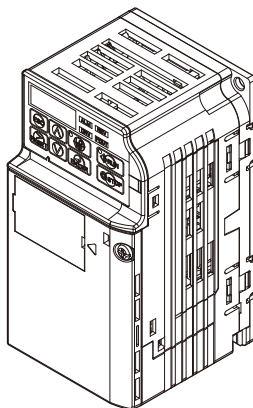
小形シンプル

フィンレスタイプ 設置要領書

形 式 CIMR-J□□□□□□□□J□□

容量範囲 200 V級(三相電源用)0.1~5.5 kW
200 V級(单相電源用)0.1~2.2 kW
400 V級(三相電源用)0.2~5.5 kW

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1 Preface

◆ Applicable Documentation

This manual provides instructions on installing the J1000 Finless drive. For more specific information on the operation of this product, refer to the other manuals listed in the following table:

	Yaskawa AC Drive-J1000 Finless Installation Manual Manual No.: TOBPC71060640	This manual contains basic information required to install the J1000 Finless.
	Yaskawa AC Drive-J1000 Technical Manual	To obtain instruction manuals for Yaskawa products access these sites: U.S.: http://www.yaskawa.com Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com Other areas: contact a Yaskawa representative. For questions, contact the local Yaskawa sales office or the nearest Yaskawa representative.
	U.S and Europe: Yaskawa AC Drive-J1000 Quick Start Guide Other Areas: Yaskawa AC Drive-J1000 Installation & Start-up Manual	

◆ Terms

Note: Indicates supplementary information that Yaskawa highly recommends be followed, even though equipment may not be at risk.

Drive: Yaskawa AC Drive-J1000 Finless Drive

◆ Registered Trademarks

- Company names and product names listed in this manual are registered trademarks of those companies.

General Precautions

- The diagrams in this manual may be indicated without covers or safety shields to show details. Restore covers or shields before operating the drive and run the drive according to the instructions described in this manual.
- The products and specifications described in this manual or the content and presentation of the manual may be modified without notice to improve the product and/or the manual. Such modifications are indicated by a revised manual number.
- When ordering a new copy of the manual due to damage or loss, contact your Yaskawa representative or the nearest Yaskawa sales office and provide the manual number shown on the front cover.
- If nameplate becomes worn or damaged, order a replacement from your Yaskawa representative or the nearest Yaskawa sales office.
- Yaskawa is not responsible for any modification of the product by the end user. Modification of the product voids the warranty.

2 Product Overview

◆ About This Product

This manual describes installation conditions and dimensions for the J1000 Finless drive. Use this product only after you have a full understanding of the manual and its contents.

This J1000 Finless drive is a component recognized by Underwriters Laboratories Inc.(UL). The installation procedure and instructions have been provided to fulfill the requirements as specified by the “Conditions of Acceptability”.

◆ Model Number and Nameplate Check

Please perform the following tasks after receiving the drive:

- Inspect the drive for damage.
- If the drive appears damaged upon receipt, contact the shipper immediately.
- Verify receipt of the correct model by checking the information on the nameplate.
- If you have received the wrong model or the drive does not function properly, contact your supplier.

■ Nameplate

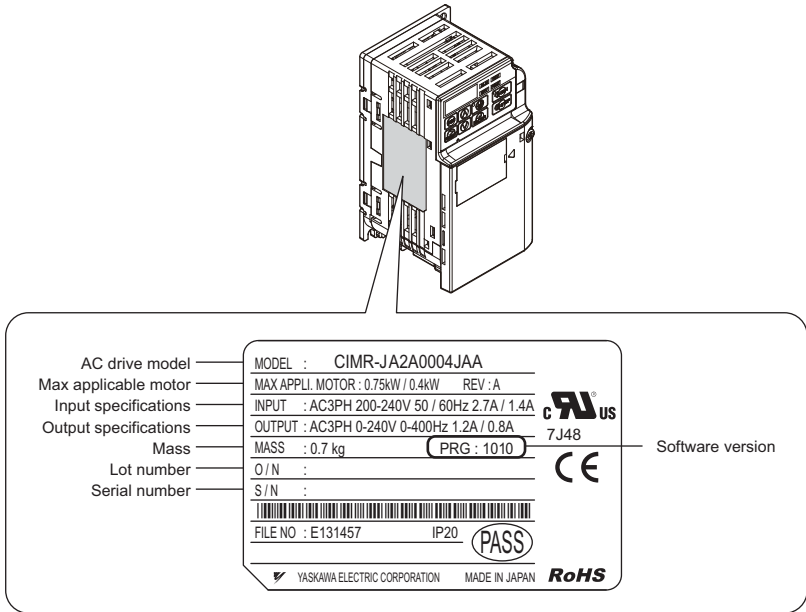


Figure 1 Nameplate Information

■ Drive Model Identification

The J1000 finless drive type is indicated by the letter “J” in the AC drive model designation code. Refer to the Quick Start Guide for complete model number information.

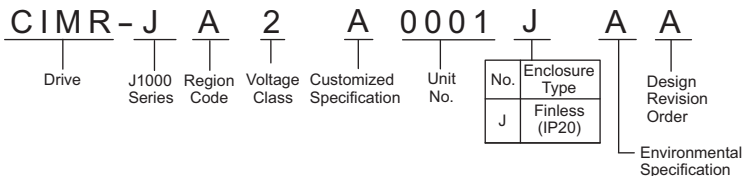


Figure 2 Understanding the Model Number

3 Conditions of Acceptability

Adhere to the installation conditions specified in this manual to take full advantage of the finless design of this drive.

◆ Ambient Temperature

The drive ambient temperature shall not exceed 50 °C (122 °F) for the drives installed location.

◆ Heatsink Plate Temperature

The aluminum panel on the back of the drive is referred to as the “heatsink plate.” The heatsink plate temperature should never exceed 90 °C

Table 6 and *Table 7* lists the thermal characteristics of the drive.

Use parameter U4-08 to check the temperature of the heatsink plate as described below.

NOTICE: *The drive may be damaged if the temperature of the heatsink plate exceeds specified tolerance level (90 °C). Excessive heat can also shorten the performance life of various drive components.*

■ Checking and Monitoring Heatsink Plate Temperature

Checking Heatsink Plate Temperature Using the LED Operator

Scroll to parameter U4-08 (heatsink plate temperature).

When the temperature of the heatsink plate is 89 °C, U4-08 will display:

00089

Checking Heatsink Plate Temperature Using an Analog Output

Example: When using Multi-Function Analog Output Terminal AM, set the parameters shown in *Table 1*.

Table 1 Using Analog Output 1

No.	Name	Description
H4-01	Analog Output Terminal AM Function Selection	00408 (heatsink plate temperature)
H4-02	Analog Output Terminal AM Gain	100.0%
H4-03	Analog Output Terminal AM Bias	0.0%

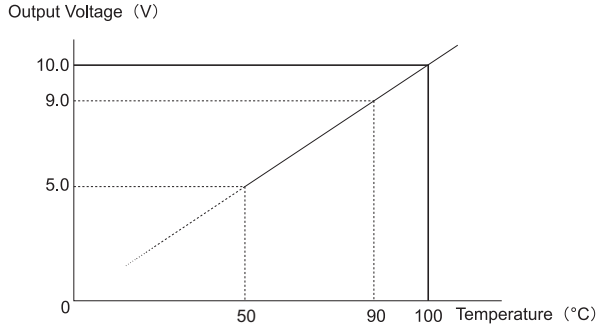


Figure 3 Output of Heatsink Plate Temperature by Analog Output

- Note:**
1. Accuracy of the temperature reading may vary ± 5 °C between 50 and 100 °C.
 2. The heatsink temperature is affected by the ambient temperature. Never exceed the allowable maximum heatsink plate temperature.

◆ Installation to Metallic Surface

The mating surface shall have the following properties:

- Surface flatness shall not exceed 0.2 mm across the entire mating surface.
- Surface roughness shall not exceed 25 S.

Note: A surface roughness of 25 S means “Ra” (average roughness) is not greater than 6.3 a and “Ry” (maximum peak) is not greater than 25 μm .

◆ Thermal Compound

Apply a thermal compound between the heatsink plate and the mating surface. The thermal compound assists in drive heat dissipation.

Yaskawa recommends the thermal compounds in [Table 2](#).

Table 2 Recommended Heatsink Plate Thermal Compounds

Manufacturer	Type	Model	Recommended spread amount
Shin-Etsu Chemical Inc.	Oil-based compound	G746	100 μm Apply the coating evenly across the surface
Dow Corning Toray Inc.	Silicone compound for heat dissipation	SC4471CV	

When applying the thermal compound, spread it over the surface of the heatsink plate. After mounting the heatsink plate to the metal back panel, wipe away any excess compound from around the heatsink plate.

3 Conditions of Acceptability

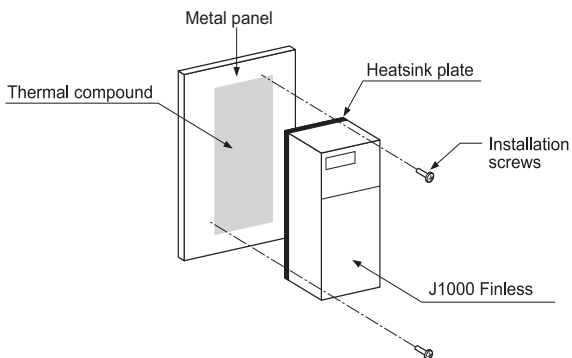


Figure 4 Application of Thermal Compound

◆ Drive Heatsink Plate Installation Screw Size and Tightening Torque

Screw size and torque specifications for heatsink plate installation screws that hold the drive to a metal back panel are listed in [Table 3](#).

Table 3 Screw Size and Tightening Torque

Voltage Class	Model CIMR-J□	Screw Size	Tightening Torque N • m (ft-lbf)
Single-Phase 200 V class	BA0001 ~ BA0010	M4	1.0 to 1.3 (0.74 to 0.96)
Three-phase 200V class	2A0001 ~ 2A0020	M4	1.0 to 1.3 (0.74 to 0.96)
Three-phase 400V class	4A0001 ~ 4A0011	M4	1.0 to 1.3 (0.74 to 0.96)

NOTICE: Tighten all screws according to specified torques. Failure to do so may inhibit drive cooling and possible damage the drive.

◆ Installation Spacing

Figure 5 illustrates correct installation spacing for proper airflow, and wiring. The drive should be installed so that the heatsink plate rests flat against the metal back panel to ensure proper cooling.

Table 4 Correct Installation Spacing

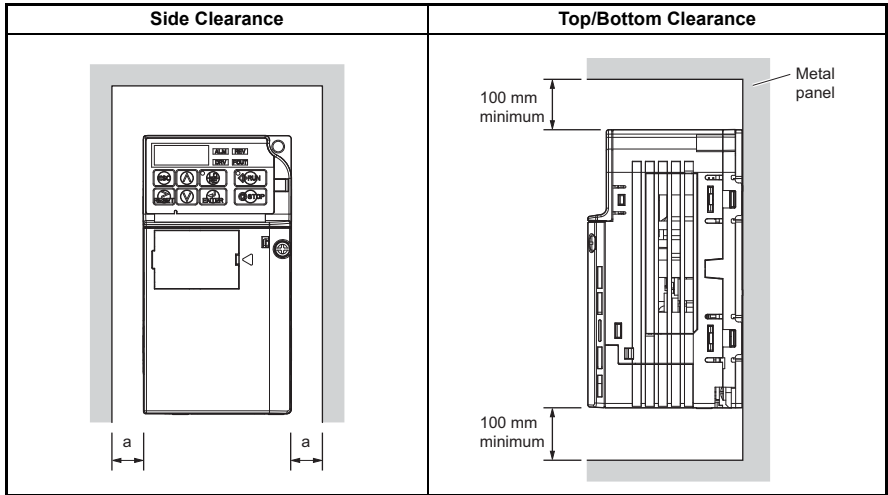


Table 5 Correct Installation Spacing

Voltage Class	Drive Model CIMR-J□	Side Clearance (a) mm / (in)
Single-Phase 200 V Class	BA0001 to BA0010	30 / (1.18)
Three-Phase 200 V Class	2A0001 to 2A0020	
Three-Phase 400 V Class	4A0001 to 4A0011	

NOTICE: Do not install J1000 Finless drives using the Side-by-Side method available in standard J1000 drive models. Improper drive cooling may result in damage to the drive. Install J1000 Finless drives with a minimum side-by-side clearance of 30 mm (1.18 in).

3 Conditions of Acceptability

■ Ambient Temperature Derating

Parameters L8-12 (Ambient Temperature Setting) and L8-35 (Installation Method Selection) must be set according to the installation conditions if the ambient temperature is higher than 35°C. Refer to [Figure 5](#) for drive derating according to ambient temperature.

Parameter L8-12 = 30°C (default). The setting range is -10 to 50°C.

Operating the J1000 Finless drive between -10 and 35 °C allows 100% continuous current without derating. Drive operation between 35 and 50 °C requires drive derating according to [Figure 5](#).

The drive can be used with 100% rating between -10 and 50°C ambient temperature if the airflow around the unit is 0.5 m/s or more. In this case set L8-35 = 0 (Installation method = IP20 standard drive).

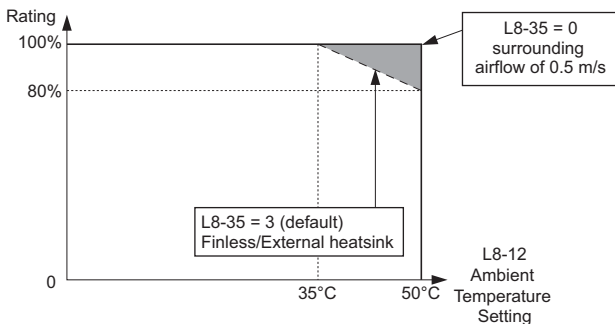


Figure 5 Ambient Temperature and Drive Derating

◆ J1000 Finless Drive Watt Loss Thermal Characteristics

■ Normal Duty

Table 6 Drive Watt Loss (Normal Duty Rating)

200 V Single-Phase Class										
Model CIMR-J□BA		0001	0002	0003	0006	0010	–	–	–	–
Rated Output Current (A)		1.2	1.9	3.3	6.0	9.6	–	–	–	–
Generated Heat Loss	Heatsink Plate (W)	5.0	7.6	14.6	30.1	51.7	–	–	–	–
	Internal (W)	8.0	9.7	14.4	19.4	29.8	–	–	–	–
	Total (W)	13.5	17.3	29.0	49.5	81.5	–	–	–	–
200 V Three-Phase Class										
Model CIMR-J□2A		0001	0002	0004	0006	0008	0010	0012	0018	0020
Rated Output Current (A)		1.2	1.9	3.5	6.0	8.0	9.6	12.0	17.5	19.6
Generated Heat Loss	Heatsink Plate (W)	5.0	7.6	15.8	27.5	44.6	51.7	61.3	89.8	98.7
	Internal (W)	8.0	9.5	13.6	17.2	24.0	25.8	30.4	44.1	46.3
	Total (W)	13.0	17.1	29.4	44.7	68.6	77.5	91.7	133.9	145.0
400 V Three-Phase Class										
Model CIMR-J□4A		0001	0002	0004	0005	0007	0009	0011	–	–
Rated Output Current (A)		1.2	2.1	4.1	5.4	6.9	8.8	11.1	–	–
Generated Heat Loss	Heatsink Plate (W)	10.0	18.5	30.5	44.5	58.5	63.7	81.7	–	–
	Internal (W)	9.6	13.9	16.8	21.8	28.5	31.4	46.0	–	–
	Total (W)	19.6	32.4	47.3	66.3	87.0	95.1	127.7	–	–

Note: Carrier frequency is set to 2 kHz.

3 Conditions of Acceptability

■ Heavy Duty

Table 7 Drive Watt Loss (Heavy Duty Rating)

200 V Single-Phase Class										
Model CIMR-J□BA		0001 <1>	0002 <2>	0003 <1>	0006 <2>	0010 <2>	-	-	-	-
Rated Output Current (A)		0.8	1.6	3.0	5.0	8.0	-	-	-	-
Generated Heat Loss	Heatsink Plate (W)	4.3	7.9	16.1	33.7	54.8	-	-	-	-
	Internal (W)	7.4	8.9	11.5	16.8	25.9	-	-	-	-
	Total (W)	11.7	16.8	27.6	50.5	80.7	-	-	-	-
200 V Three-Phase Class										
Model CIMR-J□2A		0001 <1>	0002 <2>	0004 <1>	0006 <2>	0008 <2>	0010 <2>	0012 <2>	0018 <2>	0020 <2>
Rated Output Current (A)		0.8	1.6	3.0	5.0	6.9	8.0	11.0	14.0	17.5
Generated Heat Loss	Heatsink Plate (W)	4.3	7.9	16.1	27.4	48.7	54.8	70.7	92.6	110.5
	Internal (W)	7.3	8.8	11.5	15.9	22.2	23.8	30.0	38.8	43.3
	Total (W)	11.6	16.7	27.6	43.3	70.9	78.6	100.7	131.4	153.8
400 V Three-Phase Class										
Model CIMR-J□4A		0001 <2>	0002 <2>	0004 <2>	0005 <2>	0007 <2>	0009 <2>	0011 <2>	-	-
Rated Output Current (A)		1.2	1.8	3.4	4.8	5.5	7.2	9.2	-	-
Generated Heat Loss	Heatsink Plate (W)	19.2	28.9	42.3	70.7	81.0	84.6	107.2	-	-
	Internal (W)	11.4	14.9	17.9	26.2	30.7	32.9	41.5	-	-
	Total (W)	30.6	43.8	60.2	96.9	111.7	117.5	148.7	-	-

<1> Carrier frequency is set to 10 kHz.

<2> Carrier frequency is set to 8 kHz.

4 Periodic Maintenance

◆ Replacement

Estimated drive performance life is based on specific usage conditions. These conditions are provided for the purpose of maximizing useful drive life and performance. Drive performance and/or useful life are affected by application in harsh environments or rigorous use.

■ Conditions for Estimating Performance Life

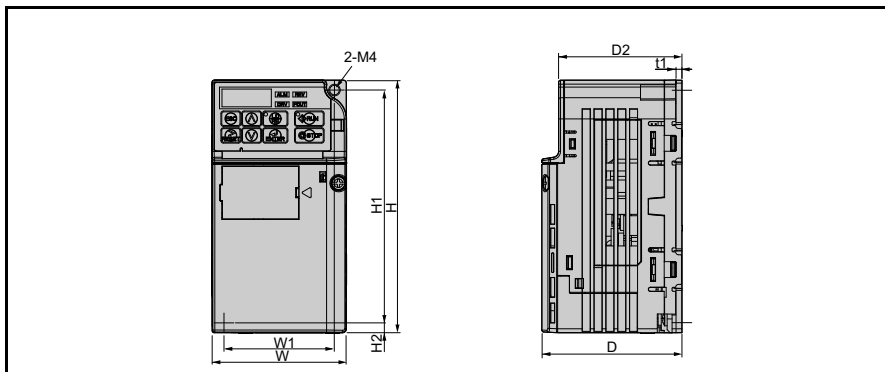
The estimated performance life of the drive is 10 years under the following conditions:

- Drive ambient temperature: Yearly average of 30°C
- Load factor: 80% max.
- Operation time: 12 hours a day

Drive performance life may be less than 10 years if drive use exceeds the conditions above.

5 Dimensions

Table 8 J1000 Finless Dimensions for Models BA0001~2A0006 (metric)

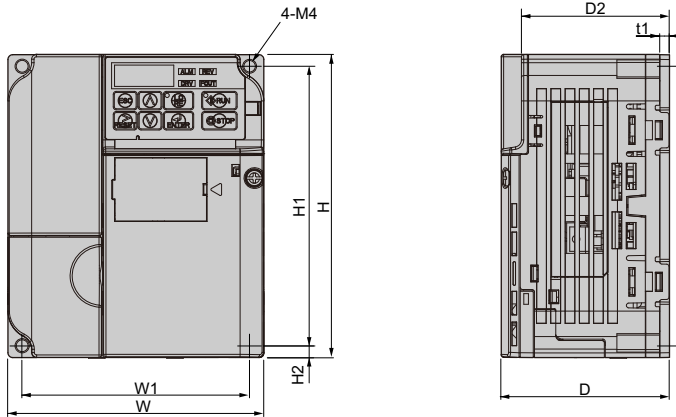


Voltage Class	Drive Model CIMR-J□	Dimensions (mm)								Weight (kg)
		W	H	D	D2	W1	H1	H2	t1	
Single-Phase 200 V class	BA0001	68	128	71	62.5	56	118	5	3	0.6
	BA0002	68	128	71	62.5	56	118	5	3	0.6
	BA0003	68	128	81	72.5	56	118	5	3	0.8
Three-Phase 200 V class	2A0001	68	128	71	62.5	56	118	5	3	0.6
	2A0002	68	128	71	62.5	56	118	5	3	0.6
	2A0004	68	128	71	62.5	56	118	5	3	0.7
	2A0006	68	128	71	62.5	56	118	5	3	0.7

Table 9 J1000 Finless Dimensions for Models BA0001~2A0006 (U.S. units)

Voltage Class	Drive Model CIMR-J□	Dimensions (in)								Weight (lb.)
		W	H	D	D2	W1	H1	H2	t1	
Single-Phase 200 V class	BA0001	2.68	5.04	2.80	2.46	2.21	4.65	0.20	0.12	1.32
	BA0002	2.68	5.04	2.80	2.46	2.21	4.65	0.20	0.12	1.32
	BA0003	2.68	5.04	3.19	2.85	2.21	4.65	0.20	0.12	1.76
Three-Phase 200 V class	2A0001	2.68	5.04	2.80	2.46	2.21	4.65	0.20	0.12	1.32
	2A0002	2.68	5.04	2.80	2.46	2.21	4.65	0.20	0.12	1.32
	2A0004	2.68	5.04	2.80	2.46	2.21	4.65	0.20	0.12	1.54
	2A0006	2.68	5.04	2.80	2.46	2.21	4.65	0.20	0.12	1.54

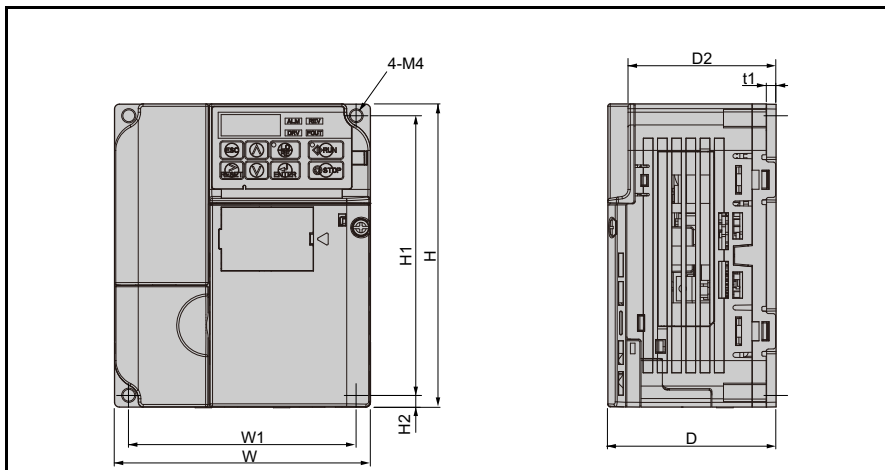
Table 10 J1000 Finless Dimensions for Models BA0006~4A0009 (metric)



Voltage Class	Drive Model CIMR-J□	Dimensions (mm)								Weight (kg)
		W	H	D	D2	W1	H1	H2	t1	
Single-Phase 200 V class	BA0006	108	128	79.5	71	96	118	5	4	1.1
	BA0010	108	128	91	82.5	96	118	5	4	1.1
Three-Phase 200 V class	2A0008	108	128	71	62.5	96	118	5	4	1.0
	2A0010	108	128	71	62.5	96	118	5	4	1.0
Three-Phase 400 V class	2A0012	108	128	79.5	71	96	118	5	4	1.0
	4A0001	108	128	71	62.5	96	118	5	4	0.9
	4A0002	108	128	71	62.5	96	118	5	4	0.9
	4A0004	108	128	79.5	71	96	118	5	4	1.0
	4A0005	108	128	96	87.5	96	118	5	4	1.0
	4A0007	108	128	96	87.5	96	118	5	4	1.1
	4A0009	108	128	96	87.5	96	118	5	4	1.1

5 Dimensions

Table 11 J1000 Finless Dimensions for Models BA0006~4A0009 (U.S. units)



Voltage Class	Drive Model CIMR-J□	Dimensions (in)								
		W	H	D	D2	W1	H1	H2	t1	Weight (lb.)
Single-Phase 200 V class	BA0006	4.26	5.04	3.13	2.80	3.78	4.65	0.20	0.16	2.43
	BA0010	4.26	5.04	3.59	3.25	3.78	4.65	0.20	0.16	2.43
Three-Phase 200 V class	2A0008	4.26	5.04	2.80	2.46	3.78	4.65	0.20	0.16	2.20
	2A0010	4.26	5.04	2.80	2.46	3.78	4.65	0.20	0.16	2.20
	2A0012	4.26	5.04	3.13	2.80	3.78	4.65	0.20	0.16	2.20
Three-Phase 400 V class	4A0001	4.26	5.04	2.80	2.46	3.78	4.65	0.20	0.16	1.98
	4A0002	4.26	5.04	2.80	2.46	3.78	4.65	0.20	0.16	1.98
	4A0004	4.26	5.04	3.13	2.80	3.78	4.65	0.20	0.16	2.20
	4A0005	4.26	5.04	3.78	3.45	3.78	4.65	0.20	0.16	2.20
	4A0007	4.26	5.04	3.78	3.45	3.78	4.65	0.20	0.16	2.43
	4A0009	4.26	5.04	3.78	3.45	3.78	4.65	0.20	0.16	2.43

6 Selecting an External Heatsink

6 Selecting an External Heatsink

This section describes the selection of a suitable external heatsink when using a J1000 Finless drive.

◆ Data Required for Heatsink Selection

The table below shows data that are needed to select a heatsink that suits drive and application.

Symbol	Description	
P_{Loss}	Drive heat loss Refer to <i>J1000 Finless Drive Watt Loss Thermal Characteristics on page 13</i> to check the amount of heat loss from the heatsink plate of the drive.	
T_{HSP_max}	Maximum heatsink plate temperature This is the temperature at the surface of the heatsink plate. It can be monitored with U4-08. The maximum allowable value is 90 °C.	
T_{Amb}	External heatsink ambient temperature (air temperature around heatsink)	
$R\theta_{HSP}$	Heatsink plate thermal resistance This value is 0.05 K/W	
$R\theta_{HSP-EHS}$	Thermal resistance between the heatsink plate and the external heatsink Can be calculated by $R\theta_{HSP-EHS} = \frac{d_{Comp}}{\lambda_{comp} \cdot A_{th}}$	
	A_{th}	Heat transfer area between drive heatsink plate and external heatsink Note: Due to uneven heat generation across the heatsink plate (by arrangement of internal components) the effective area for heat transfer is only ~70% of heatsink plate area. This must be considered when calculating the thermal resistance. Refer to <i>Dimensions on page 16</i> for values of H and W to calculate the area of the heatsink plate.
	λ_{Comp}	Thermal conductivity of the heatsink thermal compound
	d_{Comp}	Thickness of the thermal compound
$R\theta_{EHS}$	Thermal resistance of the external heatsink	

◆ External Heatsink Selection

Figure 6 shows the heat transfer principle from the drive heatsink plate to the heatsink ambient air.

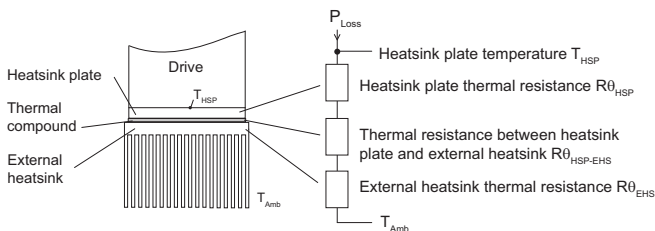


Figure 6 Thermal Equivalent Circuit

For a given ambient temperature the heatsink plate temperature must not exceed the maximum allowable value. As the $R\theta_{HSP}$ and $R\theta_{HSP-EHS}$ are essentially fixed, this condition must be satisfied with proper heatsink selection.

■ Select an External Heatsink by the Thermal Resistance

Use the formula below to calculate the maximum thermal resistance $R\theta_{EHS_max}$.

$$R\theta_{EHS_max} = \left(\frac{T_{HSP_max} - T_{Amb}}{P_{Loss}} - R\theta_{HSP} - R\theta_{HSP-EHS} \right)$$

Select a heatsink with a smaller thermal resistance than $R\theta_{EHS_max}$. The heatsink height and width should be close to the drive dimensions. If the selected heatsink has a thermal resistance that is too high, then choose a heatsink with a different shape (e.g. longer or more fins). Compare the actual mounting conditions with the ones mentioned for the $R\theta_{EHS}$ value in the heatsink specifications and apply reduction factors if necessary. Also remember that the heatsink cooling ability can reduce by time due to dirt.

NOTICE: If the heatsink height and width are much larger than the drive heatsink plate dimensions or if multiple drives are installed on one heatsink, it may be necessary to apply correction factors to the thermal resistance value given in the heatsink specification. Consult the heatsink manufacturer.

■ Check the Feasibility of a Given Heatsink

If a heatsink is given or the selection is limited by the installation conditions (space available etc.) use the formula below to calculate the actual heatsink plate temperature.

$$T_{HSP} = P_{Loss} \cdot (R\theta_{HSP} + R\theta_{HSP-EHS} + R\theta_{EHS}) + T_{Amb}$$

6 Selecting an External Heatsink

If T_{HSP} is smaller than the maximum allowable heatsink plate temperature, the selected heatsink can be used. For verification of temperature, refer to [Checking and Monitoring Heatsink Plate Temperature on page 8](#).

NOTICE: Due to uneven compound thickness, uneven heat generation across the heatsink plate or other factors, the actual heatsink plate temperature (monitored in U4-08) can be slightly different from the calculated value. An oH drive fault may occur if the heatsink plate temperature exceeds the maximum allowable value.

◆ Heatsink Selection Example

This example shows heatsink selection for a CIMR-J□2A0006 drive in Normal Duty (ND) mode. The data required are listed in the table below.

Item	Value	
P_{Loss}	27.5 W	
T_{HSP_max}	90°C	
T_{Amb}	40°C	
$R\theta_{HSP}$	0.05 K/W	
$R\theta_{HSP_EHS}$	A_{th}	H = 128 mm, D = 68 mm, $A_{th} = 0.7 \cdot 0.128 \text{ m} \cdot 0.068 \text{ m} = 6.1 \cdot 10^{-3} \text{ m}^2$
	λ_{Comp}	0.8 W/(m·K) Thermal conductivity of “Thermal Compound G746” (Shin-Etsu Chemical Co., Ltd)
	d_{Comp}	Recommended compound thickness: 100 μm
	$R\theta_{HSP_EHS} = \frac{100 \text{ μm}}{0.8 \text{ W/(m·K)} \times 6.1 \times 10^{-3} \text{ m}^2} = 0.02 \text{ K/W}$	

■ Heatsink Selection by Thermal Resistance

Substituting the example values into the formula gives:

$$R\theta_{\text{EHS,max}} = \left(\frac{90\text{ }^{\circ}\text{C} - 40\text{ }^{\circ}\text{C}}{27.5\text{ W}} - 0.05\text{ K/W} - 0.02\text{ K/W} \right) = \mathbf{1.74\text{ K/W}}$$

The heatsink must have a thermal resistance lower than 1.7 K/W. When selecting the heatsink apply a safety margin to the calculated value in order to ensure tripless drive operation, even if the installation conditions change (temporary higher temperature, loss of cooling ability of the external heatsink due to dust, etc.).

■ Feasibility Check of a Selected Heatsink

If for example a heatsink with $R\theta_{\text{EHS}} = 1.6\text{ K/W}$ is selected, the heatsink temperature will be:

$$T_{\text{HSP}} = 27.5\text{ W} \cdot (0.05\text{ K/W} + 0.02\text{ K/W} + 1.6\text{ K/W}) + 40\text{ }^{\circ}\text{C} = \mathbf{85.9\text{ }^{\circ}\text{C}}$$

The selected heatsink can be used, but considering that the heatsink area is probably larger than the drive footprint and the ambient conditions could change (reduced heatsink cooling ability by dirt, etc.), a heatsink with a lower $R\theta_{\text{EHS}}$ (e.g. $R\theta_{\text{EHS}} = 1.1\text{ K/W}$, resulting in $T_{\text{HSP}} = 72.2\text{ }^{\circ}\text{C}$) should be chosen.

7 Revision History

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Compact V/f Control Drive

Finless Type Installation Manual

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