MITSUBISHI ELECTRIC

INVERTER

TECHNICAL NOTE

No. 30

CAPACITY SELECTION II [DATA]

CONTENTS

CHAPTER 1 OUTLINE OF TECHNICAL NOTE No.30 [DATA]

1.1 Usage with the TECHNICAL NOTE No.31 [CALCULATION PROCEDURE]

This TECHNICAL NOTE presents characteristic data required to assess the power and regenerative operation with the selected capacity. This TECHNICAL NOTE presents characteristic data of when using the following motors with the Mitsubishi FR series inverter: the Mitsubishi standard motor (2, 4, and 6 poles), a standard-torque motor, a standard motor with encoder, and a dedicated motor.

[Applicable inverter and drive unit series]

FR-D700	FR-FP500J
FR-E700	FR-FP700
FR-F700	FR-F700P
FR-A700	

[Applicable motor series]

Standard motor SF-JR, SF-HR and SF-TH
Standard motor with encoder SF-JR
Constant-torque motor SF-HRCA and SF-TH
Geared motor GM-S, GM-D, GM-SSY, GM-SY, GM-SHY and GM-HY2
Vector dedicated motor SF-V5RU and SF-THY
IPM motor MM-EF

For the selection procedure of the inverter and the combined motor capacities, refer to the following technical note.

·TECHNICAL NOTE No.31[CALCULATION PROCEDURE]

1.2 How to read characteristic data

The following section describes the references and the terminology for the characteristic data in Chapter 2 or later.

(1) Combination of inverter capacity and motor capacity (for inverters only)

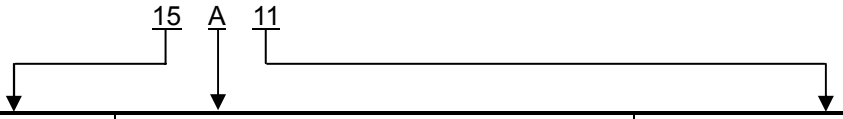
The inverter and motor capacity combinations are distinguished as follows:

1) Standard combination
   Combination of same capacities
   (Example: 1.5K inverter with a standard 1.5kW motor)
2) One-rank-higher combination
   Using the inverter capacity that is one rank higher than the motor capacity
   (Example: 2.2K inverter with a standard 1.5kW motor)

(2) Torque type

The maximum short-time torque during power/regenerative drive changes by the connected inverter (or drive unit) capacity, connected motor capacity, and inverter's (or drive unit's) control method. These differences are indicated with the following torque type.

[How to read a torque type]



Maximum torque at 60Hz (Note)	Torque	Control method
15:150% 16:160% 17:170% ⋮	A:Power driving torque (standard combination) U:Power driving torque (one-rank-higher combination) B:Regenerative driving torque (standard combination) V:Regenerative driving torque (one-rank-higher combination) B_1:Regenerative driving torque (standard combination with an IPM motor) V_1:Regenerative driving torque (one-rank-higher combination with an IPM motor)	11:V/F control (constant torque) 12:V/F control (variable torque) 13:V/F control (geared motor, constant torque) 31:Advanced magnetic flux vector control 32:General-purpose magnetic flux 33:Real sensorless vector control 34:Magnetic flux vector control (geared motor) 41:Vector control (dedicated motor) 44:Vector control (FR-A700 standard motor) 51:IPM high-efficiency control 52:IPM motor control Blank: available in all control methods

(Note) The rated torque at 60Hz is regarded as 100%.
The maximum torque is smaller when using the rated torque at 50Hz. (The absolute value of the torque is the same.)
The rated torque is 100% at 1500r/min for the dedicated motors SF-V5RU and SF-THY.
The rated torque is 100% at 1800r/min for the IPM motor MM-EF.

(3) Torque coefficient

Torque coefficient is the torque ratio to the rated motor torque at 60Hz, which is regarded as 1.0. "α" represents the torque coefficient of the power driving torque, and "β" represents the torque coefficient of the regenerative driving.

(Example) Continuous operation torque coefficient: α c
Maximum short-time torque: α m

(4) Reference torque

To fabricate a machine, design by using the generated motor torque (rated torque) as a reference.

The rated motor torque can be calculated from the rated speed at 50Hz or 60Hz. However, the rated torque is 1.2 times larger at 50Hz compared with the torque at 60Hz, and the current is also larger by the same rate.

In this capacitor selection, data for the "60Hz reference torque" is shown.

Figure 1.1 shows when the torque characteristic at 60Hz or higher differs by the input power to the inverter (200V (400V), 200V (400V)).

(Example) Data example of when the torque characteristic differs by the input power to the inverter

[SF-JR]

1) V/F control

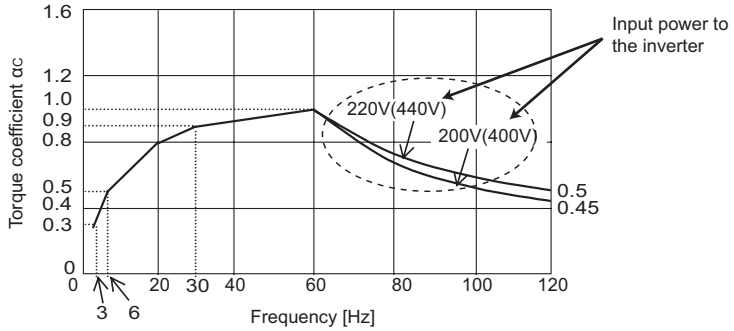


Figure 1.1 Torque characterstic example

(5) Output frequency and voltage (V/F control)

Characteristic data is created based on the following V/F pattern. The frequency at the reference torque is called base frequency.

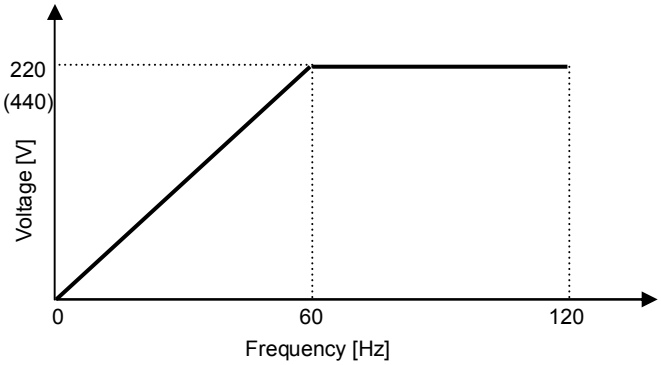


Figure 1.2 V/F pattern

(6) How to read driving torque and data

1) Continuous operation torque (continuous operation torque coefficient: αc)

When a motor with a load runs continuously, the motor heats up and the temperature rises. Continuous operation torque is the maximum generated torque when the temperature rise is within the specified value in the motor insulation level. The continuous operation torque at the rated voltage and frequency is called rated torque.

When the running speed of the motor is lowered by the inverter, rotation speed of the fan also decreases. When the fan rotates slower, the cooling effect reduces, so the motor torque must be reduced.

Continuous operation torque is determined by the motor capacity. It is unaffected by the inverter capacity.

2) Maximum short-time torque (maximum short-time torque coefficient: αm)

Maximum short-time torque is the torque where the motor can be driven within the overload current rating of the inverter (normally 150%).

In Figure 1.3, it is point A and point B.

Use the maximum short-time torque coefficient to assess for the maximum short-time operation.

Maximum short-time torque is determined by the inverter capacity. When a larger inverter capacity is used, the maximum short-time torque is increased.

Rated time of the maximum short-time torque is 1 minute.

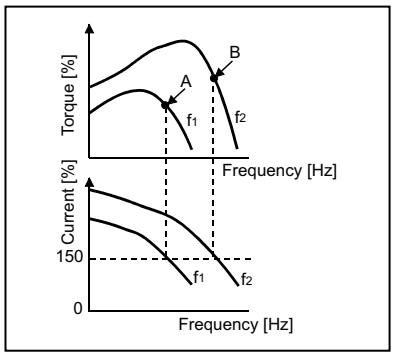


Figure 1.3 Maximum short-time torque

3) Maximum starting torque (maximum starting torque coefficient: αs)

Maximum starting torque is the maximum torque generated within the overload current rating of the inverter (normally 150%) while the load is in a stop (motor is locked) .

Use the maximum starting torque to assess for the start.

In Figure 1.4, the maximum frequency within the overload current rating of the inverter (normally 150%) is 6Hz. From this, the maximum torque at 6Hz is the maximum starting torque.

At the frequency less than 6Hz, locking the motor shaft does not trip the inverter by overcurrent (OC1). If the motor is locked for 1 minute or longer, the overload trip (THM) occurs.

Figure 1.5 shows when the voltage is increased by the torque boost setting.

(Refer to the next section 5) for the torque boost.)

In Figure 1.5, the current reaches the overload current rating (normally 150%) at the frequency lower than Figure 1.4 (4Hz in this example), and large starting torque is generated.

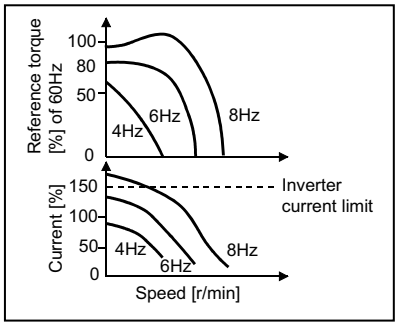


Figure 1.4 Output frequency, motor torque, and current example

4) Linear acceleration torque (linear acceleration torque coefficient: αa)

Linear acceleration torque is the maximum torque where the motor can be accelerated without activating the stall prevention function of the inverter. Use the linear acceleration torque to use an inverter for the machine requiring accurate operation time, to calculate the acceleration time, or to assess for the acceleration.

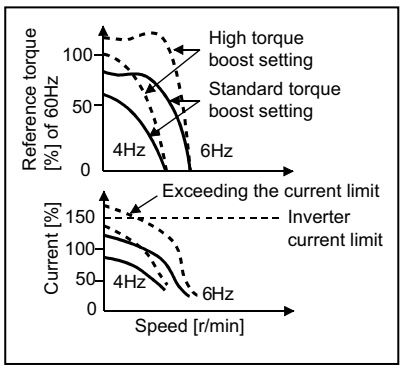


Figure 1.5 Torque boost, motor torque, and current example

5) Torque boost

When driving a motor by an inverter, the voltage changes in proportion to the output frequency. Because of this, voltage drop ratio increases at low-frequency range, and the generated torque becomes even smaller. Set higher voltage to compensate for the voltage drop for the operation in the low-frequency range to avoid torque shortage. The voltage set here is called torque boost. The initial torque boost settings are shown in Table 1.1.

Table 1.1 Torque boost

[Initial torque boost setting: standard motor]

Inverter model		Capacity (□□K)																
200V	400V	0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
FR-A720	FR-A740	-	-	6%	6%	4%	4%	4%	3%	3%	2%	2%	2%	2%	2%	2%	2%	2%
FR-F720	FR-F740	-	-	-	6%	4%	4%	4%	3%	3%	2%	2%	2%	2%	2%	2%	1.5%	1.5%
FR-E720		6%	6%	6%	6%	4%	4%	4%	3%	3%	2%	2%	-	-	-	-	-	-
	FR-E740	-	-	6%	6%	4%	4%	4%	3%	3%	2%	2%	-	-	-	-	-	-
FR-D720		6%	6%	6%	6%	4%	4%	4%	3%	3%	2%	2%	-	-	-	-	-	-
	FR-D740	-	-	6%	6%	4%	4%	4%	3%	3%	2%	2%	-	-	-	-	-	-
FR-F720P	FR-F740P	-	-	-	6%	4%	4%	4%	3%	3%	2%	2%	2%	2%	2%	2%	1.5%	1.5%

75K or more

Inverter model		Capacity (□□K)														
200V	400V	75	90	110	132	160	185	220	250	280	315	355	400	450	500	560
FR-F720		1%	1%	1%	-	-	-	-	-	-	-	-	-	-	-	-
	FR-F740	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
FR-F720P		1%	1%	1%	-	-	-	-	-	-	-	-	-	-	-	-
	FR-F740P	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%

[Initial torque boost setting: constant-torque motor]

Inverter model		Capacity (□□K)																
200V	400V	0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
FR-A720	FR-A740	-	-	6%	6%	4%	4%	4%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
FR-F720	FR-F740	-	-	-	6%	4%	4%	4%	2%	2%	2%	2%	2%	2%	2%	2%	1.5%	1.5%
FR-E720		6%	6%	6%	6%	4%	4%	4%	2%	2%	2%	2%	-	-	-	-	-	-
	FR-E740	-	-	6%	6%	4%	4%	4%	2%	2%	2%	2%	-	-	-	-	-	-
FR-D720		6%	6%	6%	6%	4%	4%	4%	2%	2%	2%	2%	-	-	-	-	-	-
	FR-D740	-	-	6%	6%	4%	4%	4%	2%	2%	2%	2%	-	-	-	-	-	-
FR-F720P	FR-F740P	-	-	-	6%	4%	4%	4%	2%	2%	2%	2%	2%	2%	2%	2%	1.5%	1.5%

75K or more

Inverter model		Capacity (□□K)													
200V	400V	75	90	110	132	160	185	220	250	280	315	355	400	450	500
FR-A720		1%	1%	-	-	-	-	-	-	-	-	-	-	-	-
	FR-A740	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%

[High torque boost setting: standard motor]

For a standard motor, select a high torque boost setting based on the initial torque setting as shown in the table below.

Initial torque boost setting	High torque boost setting
6%	10%
5%	8%
4%	7%
3%	5%
2%	4%
1.5%	2%
1%	1.5%

[High torque boost setting: constant-torque motor]

Take caution when using a constant-torque motor. Higher torque boost setting may increase the current and heats up the motor.

6) Hot coefficient (δ)

When the motor is hot (the motor coil temperature is increased), the torque decreases at 20Hz or less. The rate of torque decrease is indicated by the hot coefficient δ, and the decreased torque is compensated. The following table indicates the hot coefficients.

Table 1.2 Hot coefficient

Motor model	Capacity	δ	
		20Hz or less	Higher than 20Hz
SF-JR SF-HR SF-HRCA GM-S, GM-D GM-SSY, GM-SY, GM-SHY, GM-HY2 SF-TH	7.5kW or less	0.85	1.00
	11kW to 560kW	0.94	1.00
SF-V5RU, SF-THY	All capacities	1.00	1.00
MM-EF	All capacities	1.00	1.00

Each driving torque coefficient is assuming a cold motor (the motor coil is in room temperature). To assess for the start and the short-time operation at 20Hz or less, consider the hot coefficient.

(7) How to read the torque type and combination table

(Example) Torque type when driving the motor 0.75kW4P with the inverter FR-A740-0.75K (V/F control)

Standard inverter combination

One-rank-higher inverter combination

0.75kW motor

0.75K inverter

Select the torque type "15A11"

Motor capacity	Inverter capacity	V/F control		
		150% constant-torque current	120% constant-torque current	120% variable-torque current
		FR-A700 FR-E700 FR-D700	FR-F700	
0.1kW	0.1K	15A11	12A11	12A12
	0.2K	22U11	17U11	17U12
0.2kW	0.2K	15A11	12A11	12A12
	0.4K	22U11	17U11	17U12
0.4kW	0.4K	15A11	12A11	12A12
	0.75K	22U11	17U11	17U12
0.75kW	0.75K	15A11	12A11	12A12
	1.5K	22U11	17U11	17U12
1.5kW	1.5K	15A11	12A11	12A12
	2.2K	22U11	17U11	17U12
2.2kW	2.2K	15A11	12A11	12A12
	3.7K	22U11	17U11	17U12

Figure 1.3 Torque type combination table

CHAPTER 2 POWER DRIVING PERFORMANCE DATA

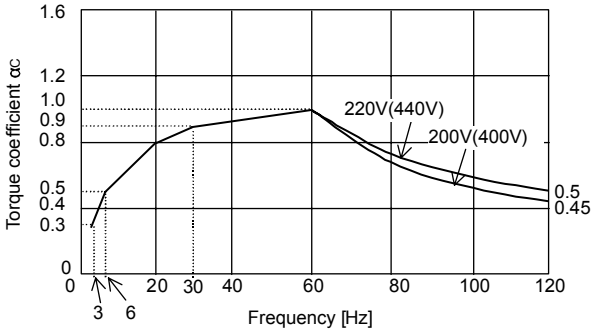
The following diagrams show the power driving performance of the FR series inverters with a standard motor, a constant-torque motor, and a dedicated motor.

2.1 [Standard motor]

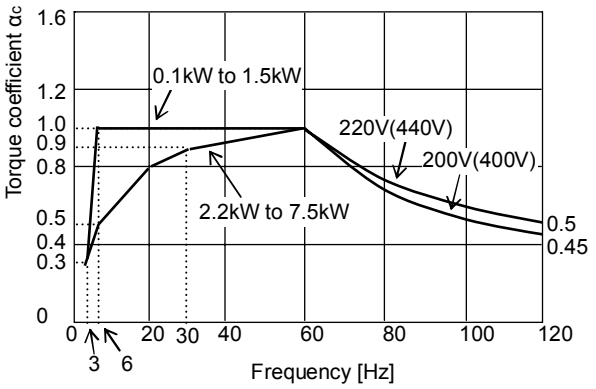
(1) Continuous operation torque coefficient α_C

[SF-JR]

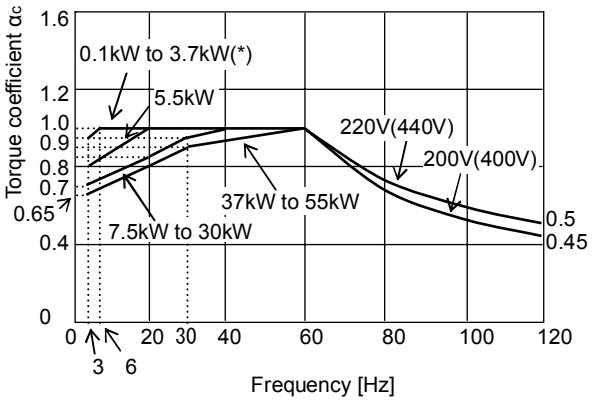
1) V/F control



2) General-purpose magnetic flux vector control



3) Advanced magnetic flux vector control
Real sensorless vector control
Vector control: FR-A700 standard motor



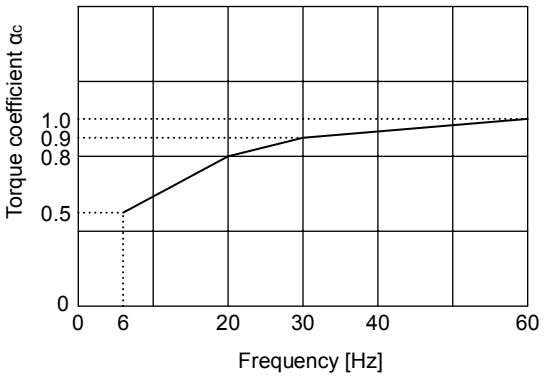
* 0.4kW to 3.7kW under Real sensorless vector control and vector control.

[SF-TH (Standard motor)]

1) V/F control

Advanced magnetic flux vector control

Real sensorless vector control

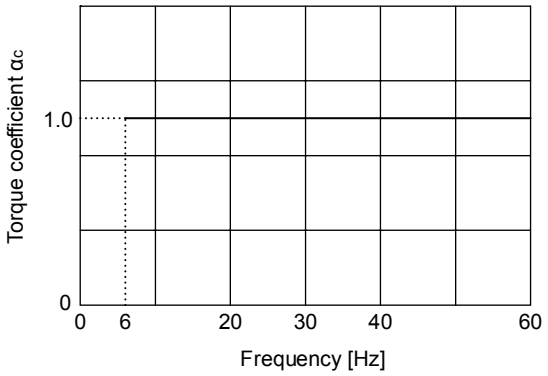


[SF-TH (Constant-torque motor)]

1) V/F control

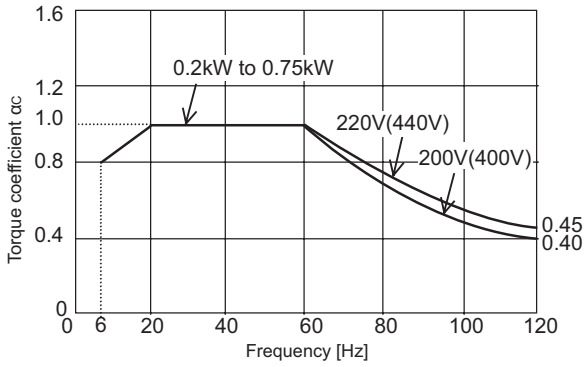
Advanced magnetic flux vector control

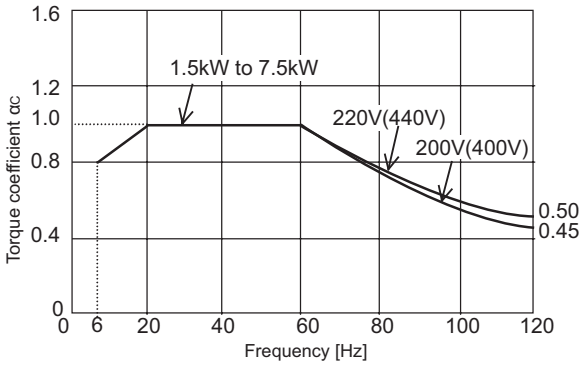
Real sensorless vector control

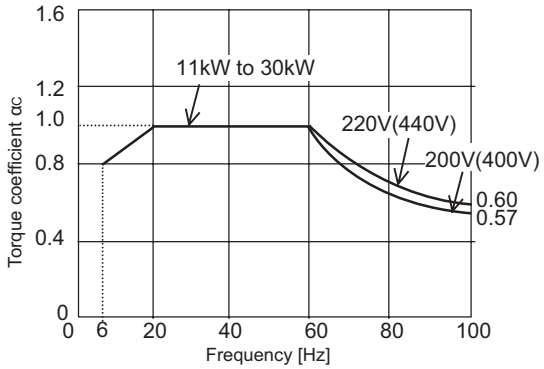


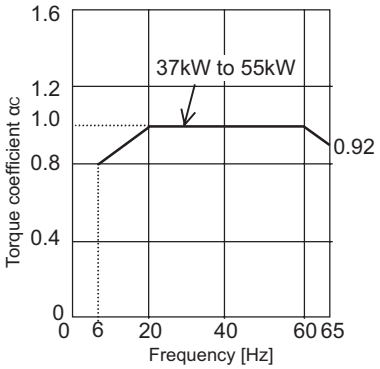
[SF-HR]

1) V/F control

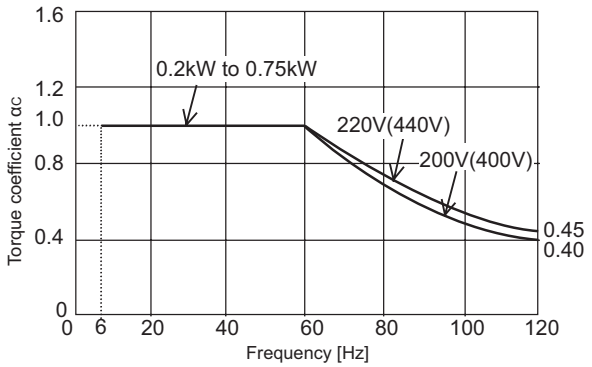


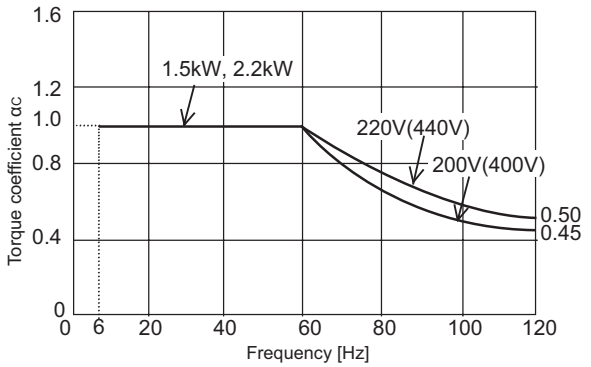


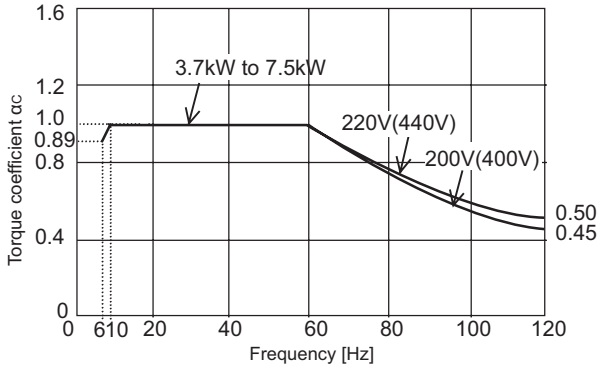




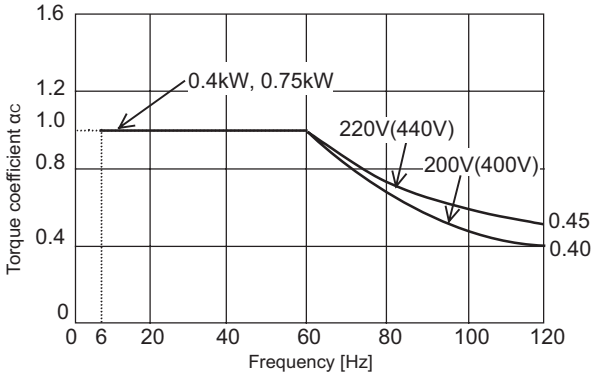
2) General-purpose magnetic flux vector control

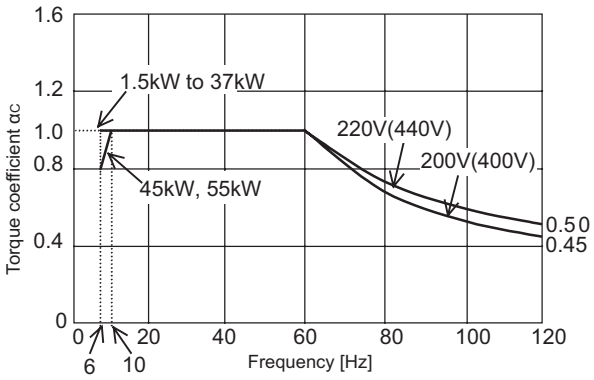






3) Advanced magnetic flux vector control

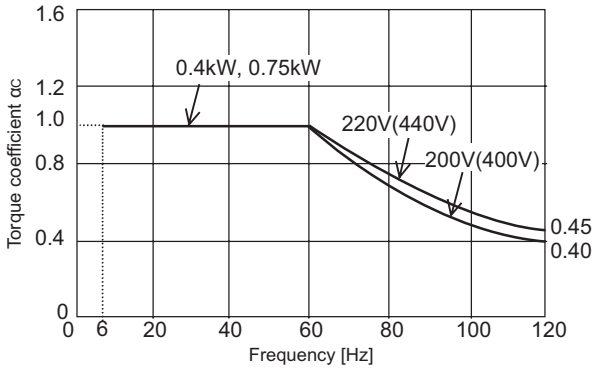


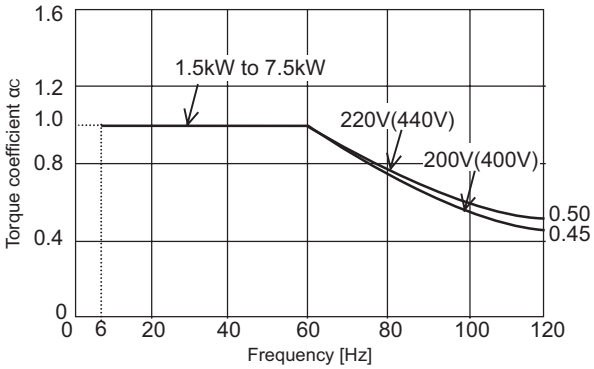


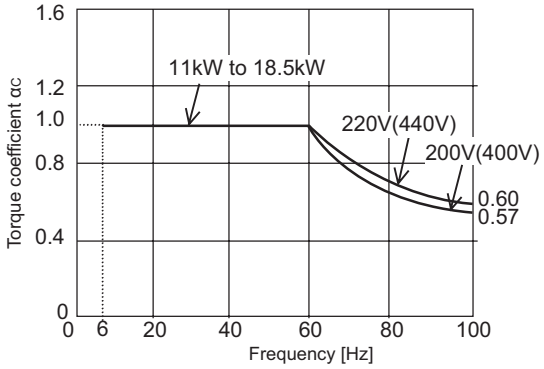
*1 11kW to 30kW inverters can operate up to 100Hz.

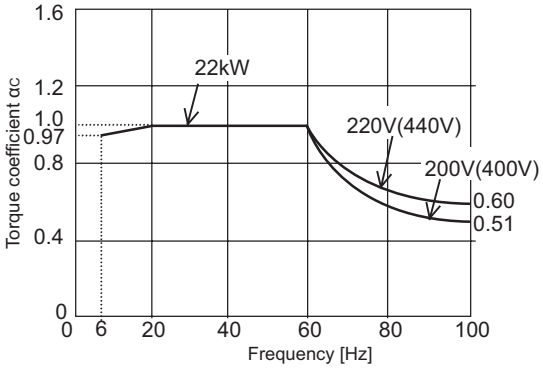
*2 37kW to 55kW inverters can operate up to 65Hz.

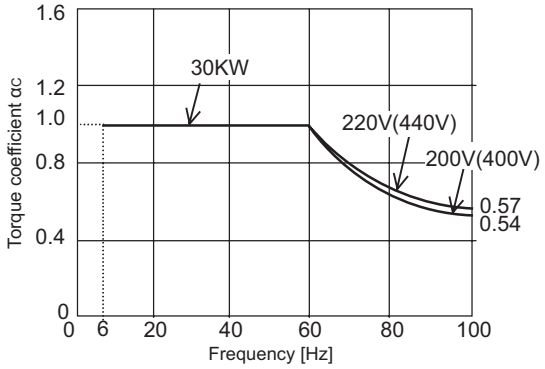
4) Real sensorless vector control

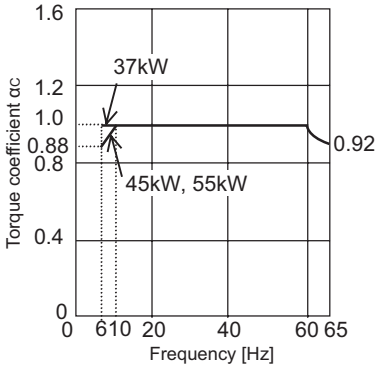






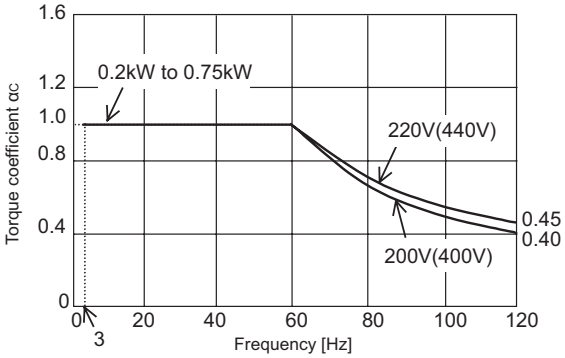


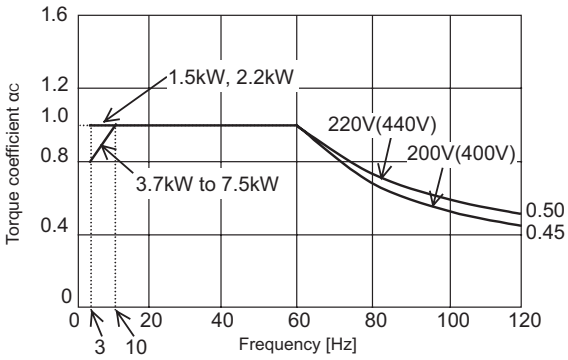




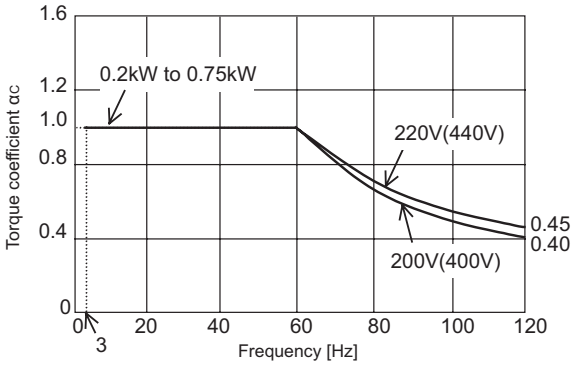
[SF-HRCA (constant-torque motor)]

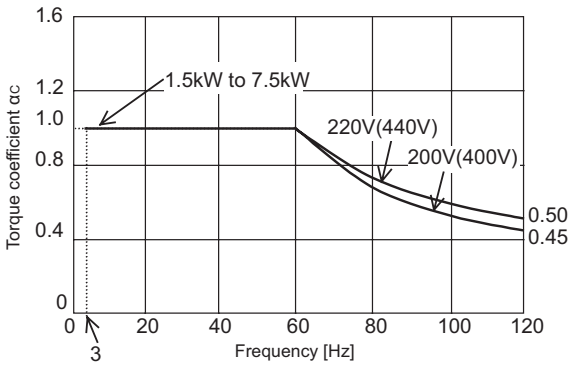
1) General-purpose magnetic flux vector control

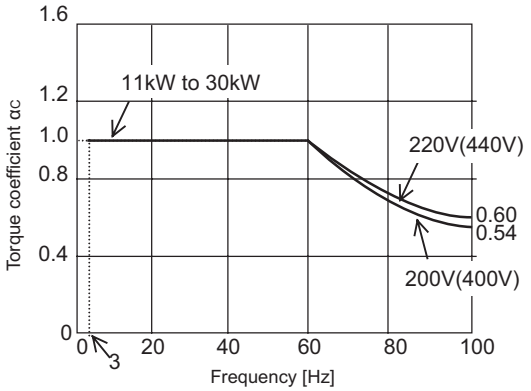


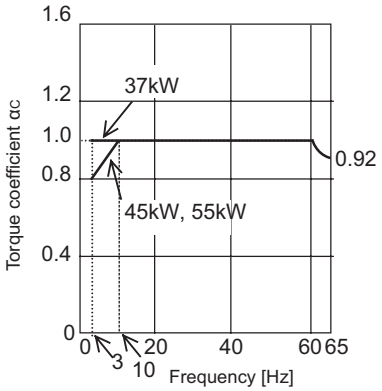


2) Advanced magnetic flux vector control

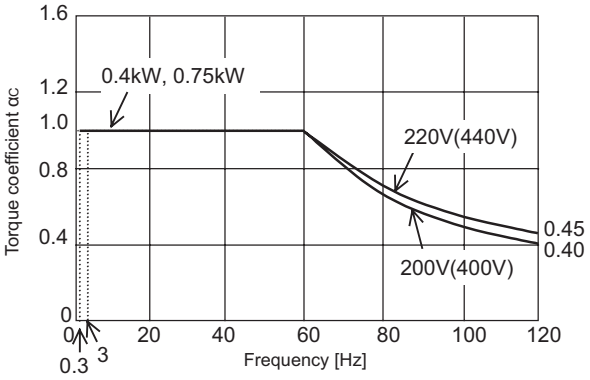


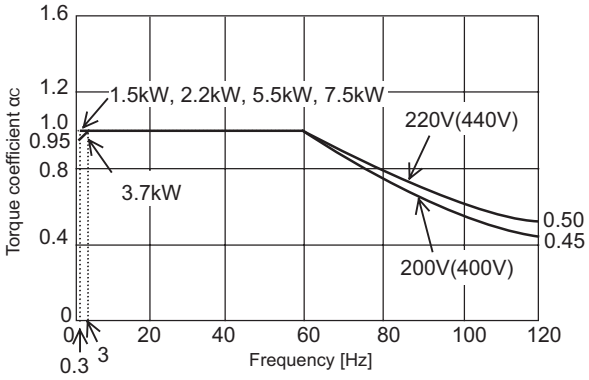


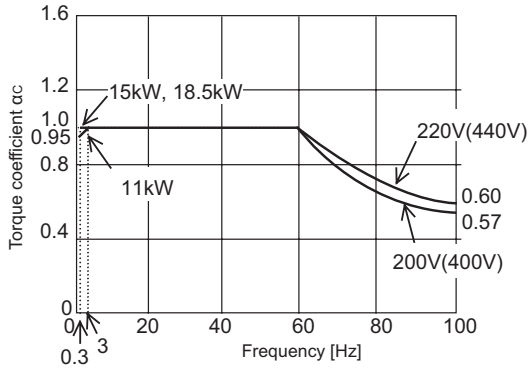


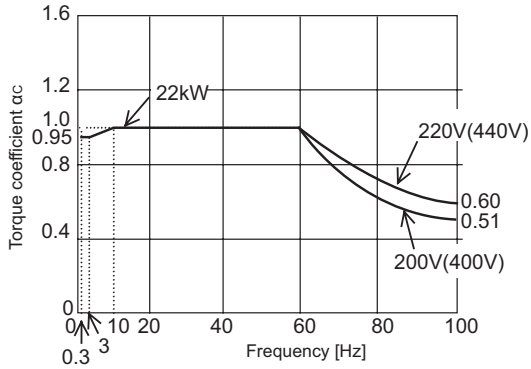


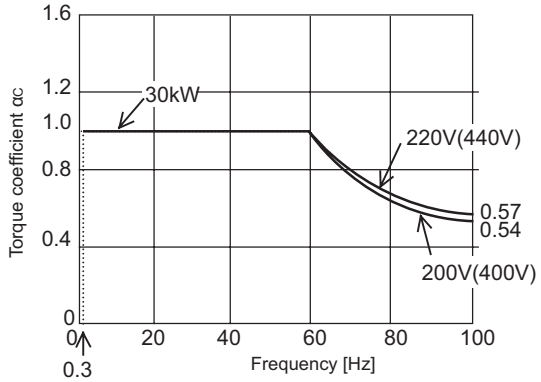
3) Real sensorless vector control

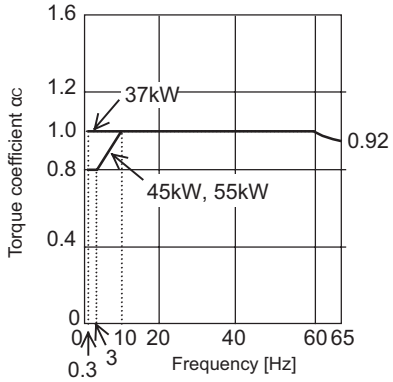












(2) Maximum short-time torque α_m, maximum starting torque α_s, maximum acceleration torque α_a

Motor capacity	Inverter capacity	V/F control			Magnetic flux vector control		Real sensorless vector control	Vector control (*2)
		Constant-torque 150% current (*1)	Constant-torque 120% current (*1)	Variable-torque 120% current (*1)	General-purpose	Advanced		
		FR-A700 FR-E700 FR-D700	FR-F700 FR-F700P		FR-E700 FR-D700	FR-A700 FR-E700	FR-A700	FR-A700
0.1kW	0.1K	15A11	12A11	12A12	20A32	20A31	—	—
	0.2K	22U11	17U11	17U12	22U32	22U31	—	—
0.2kW	0.2K	15A11	12A11	12A12	20A32	20A31	—	—
	0.4K	22U11	17U11	17U12	22U32	22U31	—	—
0.4kW	0.4K	15A11	12A11	12A12	20A32	20A31	20A33	20A44
	0.75K	22U11	17U11	17U12	22U32	22U31	22U33	22U44
0.75kW	0.75K	15A11	12A11	12A12	20A32	20A31	20A33	20A44
	1.5K	22U11	17U11	17U12	22U32	22U31	22U33	22U44
1.5kW	1.5K	15A11	12A11	12A12	20A32	20A31	20A33	20A44
	2.2K	22U11	17U11	17U12	22U32	22U31	22U33	22U44
2.2kW	2.2K	15A11	12A11	12A12	20A32	20A31	20A33	20A44
	3.7K	22U11	17U11	17U12	22U32	22U31	22U33	22U44
3.7kW	3.7K	15A11	12A11	12A12	20A32	20A31	20A33	20A44
	5.5K	22U11	17U11	17U12	22U32	22U31	22U33	22U44
5.5kW	5.5K	15A11	12A11	12A12	15A32	15A31	15A33	15A44
	7.5K	20U11	16U11	16U12	20U32	20U31	20U33	20U44
7.5kW	7.5K	15A11	12A11	12A12	15A32	15A31	15A33	15A44
	11K	20U11	16U11	16U12	20U32	20U31	20U33	20U44
11kW	11K	15A11	12A11	12A12	15A32	15A31	15A33	15A44
	15K	18U11	15U11	15U12	20U32	20U31	20U33	20U44
15kW	15K	15A11	12A11	12A12	15A32	15A31	15A33	15A44
	18.5K	18U11	15U11	15U12	—	18U31	18U33	18U44
18.5kW	18.5K	15A11	12A11	12A12	—	15A31	15A33	15A44
	22K	18U11	15U11	15U12	—	18U31	18U33	18U44
22kW	22K	15A11	12A11	12A12	—	15A31	15A33	15A44
	30K	18U11	15U11	15U12	—	18U31	18U33	18U44
30kW	30K	15A11	12A11	12A12	—	15A31	15A33	15A44
	37K	18U11	15U11	15U12	—	18U31	18U33	18U44
37kW	37K	15A11	12A11	12A12	—	15A31	15A33	15A44
	45K	18U11	15U11	15U12	—	18U31	18U33	18U44
45kW	45K	15A11	12A11	12A12	—	15A31	15A33	15A44
	55K	18U11	15U11	15U12	—	18U31	18U33	18U44
55kW	55K	15A11	12A11	12A12	—	15A31	15A33	15A44

*1 The current levels written after the V/F control types are the overload current ratings of the inverters when the inverters are operated for 60s.

*2 An encoder is required to perform vector control. For FR-A700, a plug-in option (FR-A7AP/FR-A7AL) is required.

Maximum short-time torque α_m, maximum starting torque α_s, maximum acceleration torque α_a

Motor capacity	Inverter capacity	V/F control (Note 1)			Advanced magnetic flux vector control	Real sensorless vector control
		Constant-torque 150% current (*1)	Constant-torque 120% current (*1)	Variable-torque 120% current (*1)		
		FR-A700	FR-F700 FR-F700P		FR-A700	
		SF-TH Constant-torque motor	SF-TH Standard motor		SF-TH Constant-torque motor	
55kW(*2)	75K	20U11	16U11	16U12	20U31	20U33
75kW	75K	15A11	12A11	12A12	15A31	15A33
	90K	18U11	14U11	14U12	18U31	18U33
90kW	90K	15A11	12A11	12A12	15A31	15A33
	110K	18U11	15U11	15U12	18U31	18U33
110kW	110K	15A11	12A11	12A12	15A31	15A33
	132K	18U11	15U11	15U12	18U31	18U33
132kW	132K	15A11	12A11	12A12	15A31	15A33
	160K	18U11	15U11	15U12	18U31	18U33
150kW	160K	16A11	13A11	13A12	16A31	16A33
	185K	18U11	15U11	15U12	18U31	18U33
160kW	160K	15A11	12A11	12A12	15A31	15A33
	185K	17U11	14U11	14U12	17U31	17U33
185kW	185K	15A11	12A11	12A12	15A31	15A33
	220K	18U11	15U11	15U12	18U31	18U33
200kW	220K	17A11	13A11	13A12	17A31	17A33
	250K	19U11	15U11	15U12	19U31	19U33
220kW	220K	15A11	12A11	12A12	15A31	15A33
	250K	17U11	14U11	14U12	17U31	17U33
250kW	250K	15A11	12A11	12A12	15A31	15A33
	280K	17U11	14U11	14U12	17U31	17U33
280kW	280K	15A11	12A11	12A12	15A31	15A33
	315K	17U11	14U11	14U12	17U31	17U33
300kW	315K	15A11	13A11	13A12	15A31	15A33
	355K	17U11	14U11	14U12	17U31	17U33
315kW	315K	15A11	12A11	12A12	15A31	15A33
	355K	17U11	14U11	14U12	17U31	17U33
355kW	355K	15A11	12A11	12A12	15A31	15A33
	400K	17U11	14U11	14U12	17U31	17U33
400kW	400K	–	12A11	12A12	–	–
	450K	–	13U11	13U12	–	–
450kW	450K	–	12A11	12A12	–	–
	500K	–	13U11	13U12	–	–

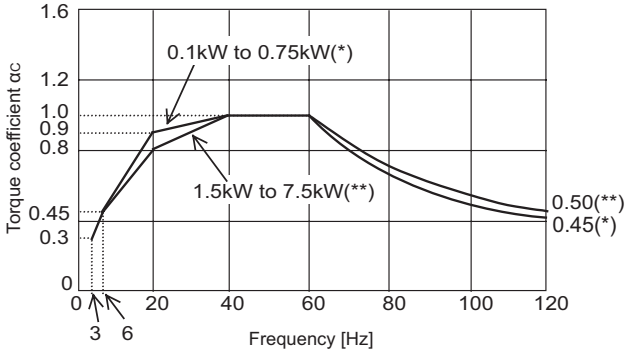
*1 The current levels written after the V/F control types are the overload current ratings of the inverters when the inverters are operated for 60s.

*2 The characteristics for the 55kW motor is applicable when using the SF-JR motor.

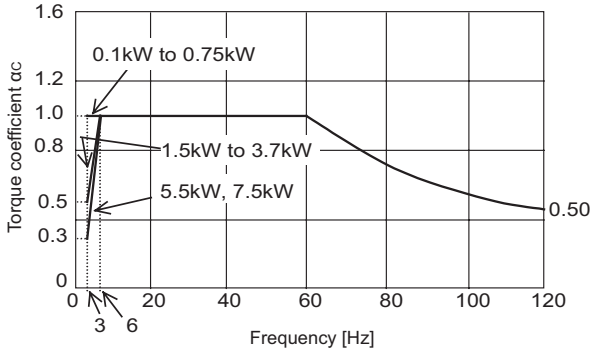
2.2 [Geared motor GM-S, GM-D, GM-SSY, GM-SY, GM-SHY, GM-HY2]

(1) Continuous operation torque coefficient α_c

1) V/F control



2) General-purpose magnetic flux vector control
Advanced magnetic flux vector control



(2) Maximum short-time torque α_m, maximum starting torque α_s, maximum acceleration torque α_a

Motor capacity	Inverter capacity	V/F control			Magnetic flux vector control	
		Current at 150% constant torque (*1)	Current at 120% constant torque (*1)	Current at 120% variable torque (*1)	General-purpose	Advanced
		FR-A700 FR-E700 FR-D700	FR-F700 FR-F700P		FR-E700 FR-D700	FR-A700 FR-E700
0.1kW	0.1K	15A13	12A11	12A12	20A34	
	0.2K	21U13	15U11	15U12	21U34	
0.2kW	0.2K	15A13	12A11	12A12	20A34	
	0.4K	21U13	15U11	15U12	21U34	
0.4kW	0.4K	15A13	12A11	12A12	20A34	
	0.75K	21U13	15U11	15U12	21U34	
0.75kW	0.75K	15A13	12A11	12A12	20A34	
	1.5K	21U13	15U11	15U12	21U34	
1.5kW	1.5K	15A13	12A11	12A12	20A34	
	2.2K	21U13	15U11	15U12	21U34	
2.2kW	2.2K	15A13	12A11	12A12	20A34	
	3.7K	21U13	15U11	15U12	21U34	
3.7kW	3.7K	15A13	12A11	12A12	20A34	
	5.5K	21U13	15U11	15U12	21U34	
5.5kW	5.5K	15A13	12A11	12A12	15A34	
	7.5K	16U13	15U11	15U12	16U34	
7.5kW	7.5K	15A13	12A11	12A12	15A34	
	11K	16U13	15U11	15U12	16U34 (*3)	

*1 The current levels written after the V/F control types are the overload current ratings of the inverters when the inverters are operated for 60s.

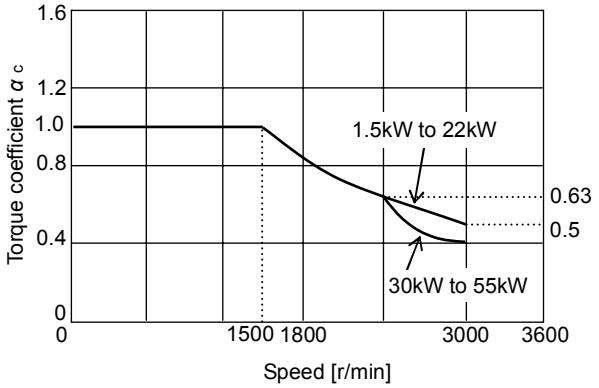
*2 Real sensorless vector control is not indicated here as it is not recommended for the combination.

*3 Applicable for FR-A700 and FR-E700.

2.3 [Vector control dedicated motor SF-V5RU] (Note) 1500r/min torque reference

(1) Continuous operation torque coefficient α_c

1) Vector control



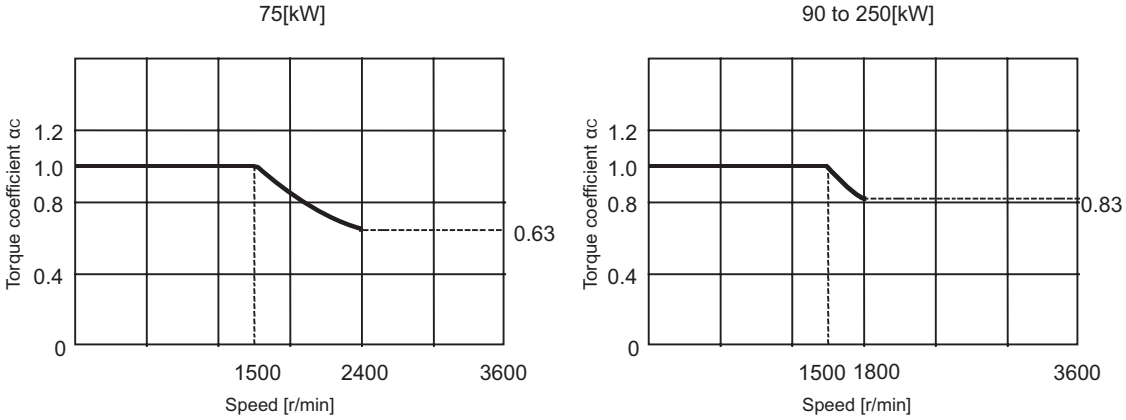
(2) Maximum short-time torque α_m, maximum starting torque α_s, maximum acceleration torque α_a

Motor capacity	Inverter capacity	Vector control	
		FR-A700	
		200V	400V
1.5kW	1.5K	-	-
	2.2K	20U41	20U41
2.2kW	2.2K	-	20A41
	3.7K	20U41	-
3.7kW	3.7K	-	20A41
	5.5K	20U41(*)	-
5.5kW	5.5K	-	-
	7.5K	15U41	15U41
7.5kW	7.5K	-	-
	11K	15U41	15U41
11kW	11K	-	-
	15K	15U41	15U41
15kW	15K	-	-
	18.5K	15U41	15U41
18.5kW	18.5K	-	-
	22K	15U41	15U41
22kW	22K	-	-
	30K	15U41	15U41
30kW	30K	-	-
	37K	15U41	15U41
37kW	37K	-	-
	45K	15U41	15U41
45kW	45K	-	-
	55K	15U41	15U41
55kW	55K	-	-
	75K	15U41	15U41

* Change the torque limit level (Pr.22) to 200%.

2.4 [Vector control dedicated motor SF-THY] (Note) 1500r/min torque reference

(1) Continuous operation torque coefficient *α* c

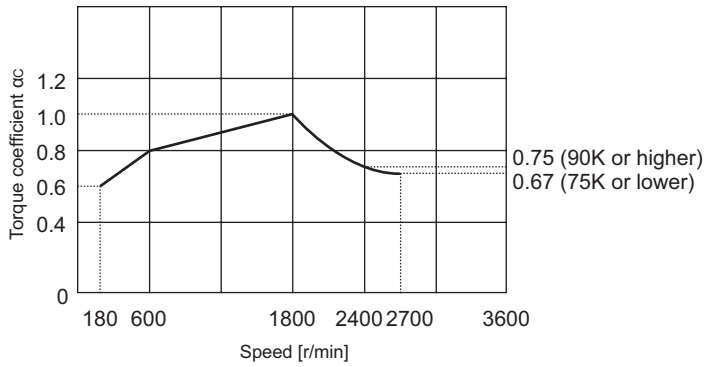


(2) Maximum short-time torque *α* m, maximum starting torque *α* s, maximum acceleration torque *α* a

Motor capacity	Inverter capacity	Vector control	
		FR-A700	
		200V	400V
75kW	90K	15U41	15U41
90kW	110K	-	15U41
110kW	132K	-	15U41
132kW	160K	-	15U41
160kW	185K	-	15U41
200kW	220K	-	15U41
250kW	280K	-	15U41

2.5 [IPM motor MM-EF] (Note) 1800r/min torque reference

(1) Continuous operation torque coefficient *α* c



* The maximum speed for 90kW or higher is 2400r/min.

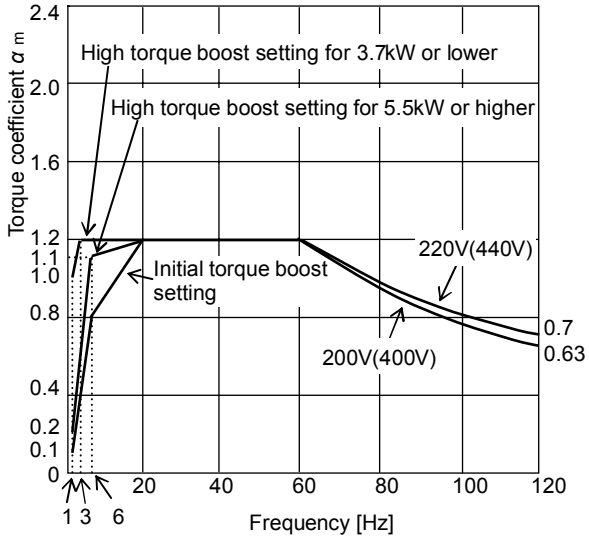
(2) Maximum short-time torque *α* m, maximum starting torque *α* s, maximum acceleration torque *α* a

Motor capacity	Drive unit capacity	IPM high-efficiency control			IPM motor control	
		FR-FP500J	FR-FP700		FR-F700P	
			200V	400V	200V	400V
0.4kW	0.4K	12A51	-	-	-	-
	0.75K	-	-	-	12U52	12U52
0.75kW	0.75K	12A51	12A51	12A51	12A52	12A52
1.5kW	1.5K	12A51	12A51	12A51	12A52	12A52
2.2kW	2.2K	12A51	12A51	12A51	12A52	12A52
3.7kW	3.7K	12A51	12A51	12A51	12A52	12A52
5.5kW	5.5K	12A51	12A51	12A51	12A52	12A52
7.5kW	7.5K	12A51	12A51	12A51	12A52	12A52
11kW	11K	12A51	12A51	12A51	12A52	12A52
15kW	15K	12A51	12A51	12A51	12A52	12A52
18.5kW	18.5K	-	12A51	12A51	12A52	12A52
22kW	22K	-	12A51	12A51	12A52	12A52
30kW	30K	-	12A51	12A51	12A52	12A52
37kW	37K	-	12A51	12A51	12A52	12A52
45kW	45K	-	12A51	12A51	12A52	12A52
55kW	55K	-	12A51	12A51	12A52	12A52
75kW	75K	-	12A51	12A51	12A52	12A52
90kW	90K	-	-	12A51	-	12A52
110kW	110K	-	-	12A51	-	12A52

2.6 Torque type data

[12A11]

1) Maximum short-time torque coefficient α_m



* A geared motor can be driven at 3Hz or higher.

2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 450kW	0.1 to 450kW
Initial value	0.80	0.90	0.75	6
High setting	1.00	0.95	0.90	5

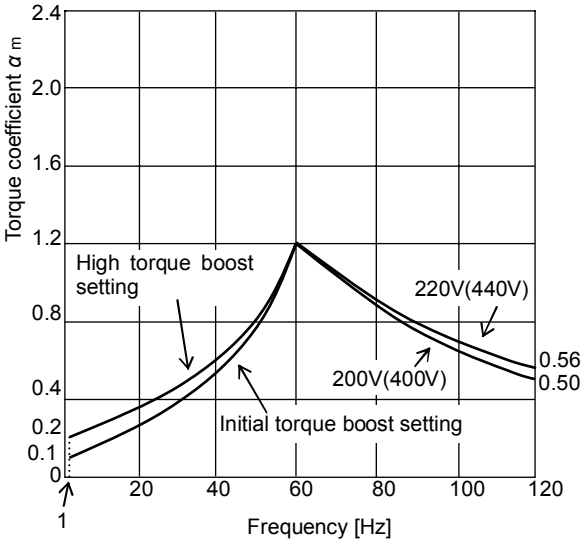
3) Linear acceleration torque coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	0.80	0.63	0.63	0.90	0.63	0.63
High setting	1.00	0.63	0.63	0.95	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 450kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	0.75	0.74	0.74	0.75	-	-
High setting	0.90	0.74	0.74	0.90	-	-

[12A12]

1) Maximum short-time torque coefficient α_m



* A geared motor can be driven at 3Hz or higher.

2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity	Maximum frequency [Hz]
	0.1 to 450kW	0.1 to 450kW
Initial value	0.16	15
High setting	0.26	15

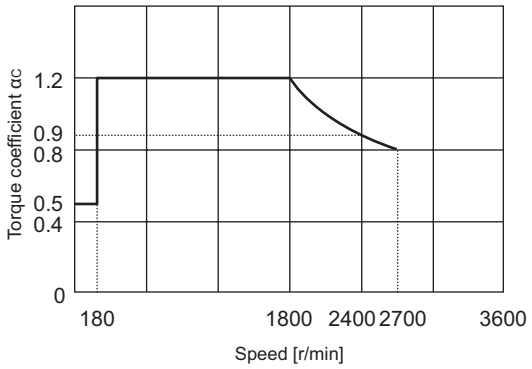
3) Acceleration torque (average acceleration torque*) coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 7.5kW			11 to 30kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
Initial value	0.65*	0.65*	0.50	0.65*	0.65*	0.65
High setting	0.70*	0.70*	0.50	0.70*	0.70*	0.65

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	37 to 450kW			-		
	0 to 60	0 to 100	60 to 100	-	-	-
Initial value	0.65*	-	-	-	-	-
High setting	0.70*	-	-	-	-	-

[12A51] [12A52] [12U52]

1) Maximum short-time torque coefficient αm



* The maximum speed for 90kW or higher is 2400r/min.

2) Maximum starting torque coefficient αs

Motor capacity	Maximum number of rotations [r/min]
0.4 to 110kW	0.4 to 110kW
0.5	1

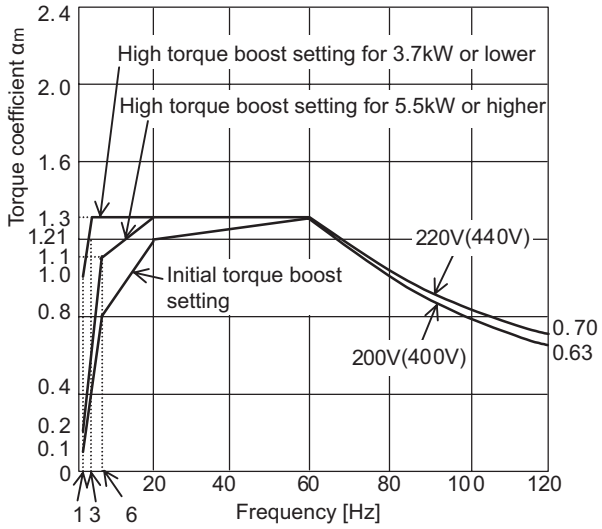
3) Linear acceleration torque coefficient αa

Motor capacity [kW] / Speed range [r/min]			
0.4 to 75kW			
0 to 180	180 to 1800	180 to 2700	1800 to 2700
0.5	1.2	0.8	0.8

Motor capacity [kW] / Speed range [r/min]			
90 to 110kW			
0 to 180	180 to 1800	180 to 2400	1800 to 2400
0.5	1.2	0.9	0.9

[13A11]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 450kW	0.1 to 450kW
Initial value	0.80	0.90	0.75	6
High setting	1.05	1.00	0.90	5

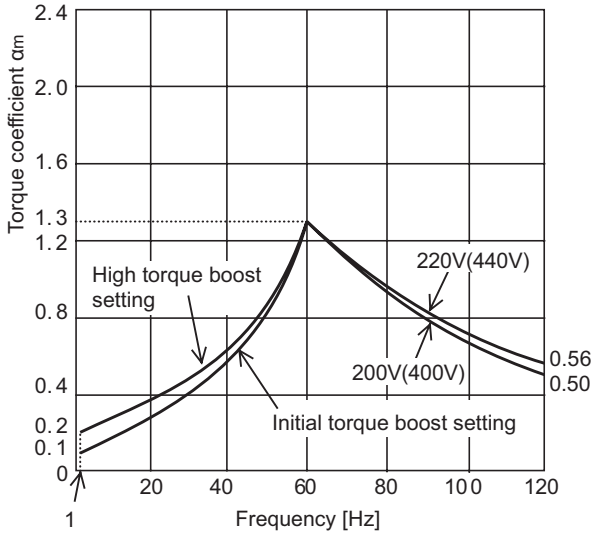
3) Linear acceleration torque coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	0.80	0.63	0.63	0.90	0.63	0.63
High setting	1.05	0.63	0.63	1.00	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 450kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	0.75	0.75	0.76	0.75	-	-
High setting	0.90	0.76	0.76	0.90	-	-

[13A12] [13U12]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity	Maximum frequency [Hz]
	0.1 to 450kW	0.1 to 450kW
Initial value	0.17	15
High setting	0.26	15

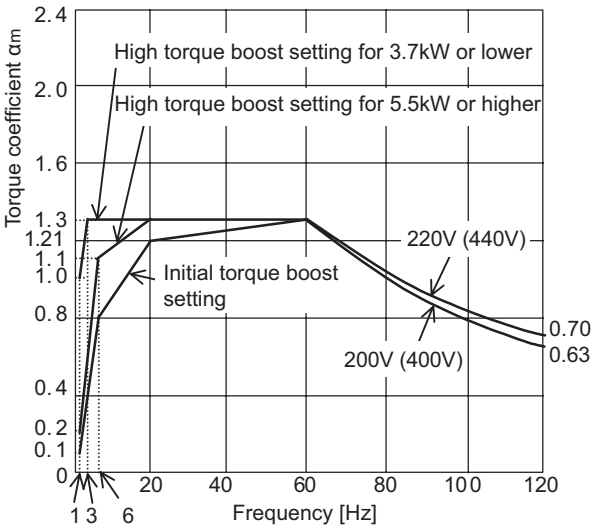
3) Acceleration torque (average acceleration torque*) coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 7.5kW			11 to 30kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
Initial value	0.70*	0.70*	0.50	0.70*	0.70*	0.68
High setting	0.75*	0.75*	0.50	0.75*	0.75*	0.68

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	37 to 450kW			-		
	0 to 60	0 to 100	60 to 100	-	-	-
Initial value	0.70*	-	-	-	-	-
High setting	0.75*	-	-	-	-	-

[13U11]

1) Maximum short-time torque coefficient αm



2) Maximum starting torque coefficient αs

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 450kW	0.1 to 450kW
Initial value	0.90	1.00	0.80	15
High setting	1.20	1.15	0.90	12

3) Linear acceleration torque coefficient αa

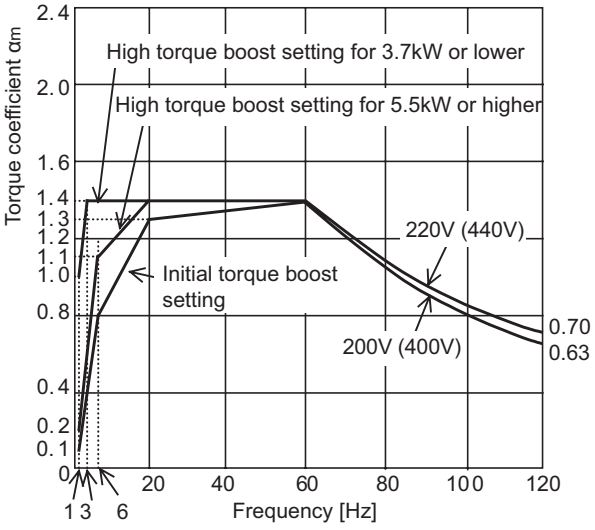
Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	0.90	0.63	0.63	1.00	0.63	0.63
High setting	1.20	0.63	0.63	1.15	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 450kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	0.80	0.76	0.76	0.80	-	-
High setting	0.90	0.76	0.76	0.90	-	-

[13U12]→Refer to [13A12]

[14U11]

1) Maximum short-time torque coefficient αm



2) Maximum starting torque coefficient αs

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 450kW	0.1 to 450kW
Initial value	0.95	1.05	0.85	15
High setting	1.25	1.20	0.95	12

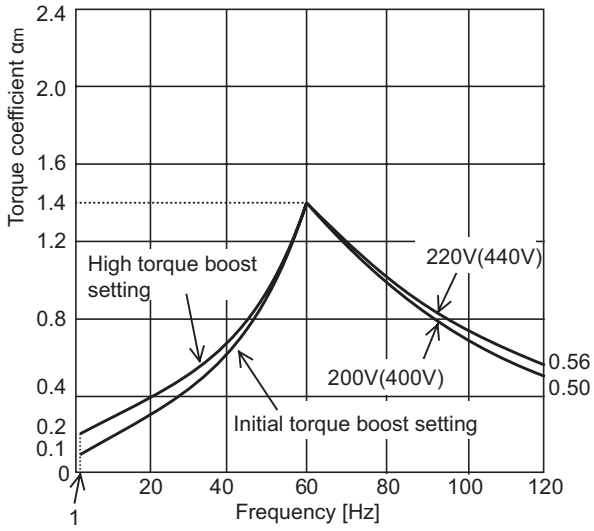
3) Linear acceleration torque coefficient αa

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	0.95	0.63	0.63	1.05	0.63	0.63
High setting	1.25	0.63	0.63	1.20	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 450kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	0.85	0.79	0.79	0.85	-	-
High setting	0.95	0.79	0.79	0.95	-	-

[14U12]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity	Maximum frequency [Hz]
	0.1 to 450kW	0.1 to 450kW
Initial value	0.18	15
High setting	0.27	15

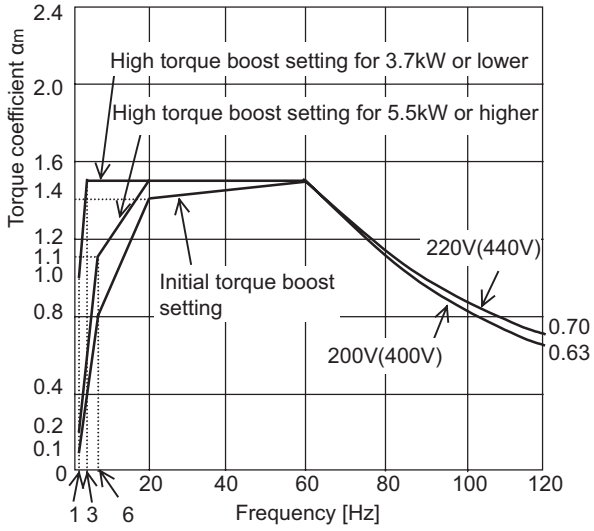
3) Linear acceleration torque (average acceleration torque*) coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 7.5kW			11 to 30kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
Initial value	0.75*	0.75*	0.50	0.75*	0.75*	0.70
High setting	0.80*	0.80*	0.50	0.80*	0.80*	0.70

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	37 to 450kW			-		
	0 to 60	0 to 100	60 to 100	-	-	-
Initial value	0.75*	-	-	-	-	-
High setting	0.80*	-	-	-	-	-

[15A11]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 450kW	0.1 to 450kW
Initial value	0.80	0.90	0.75	6
High setting	1.15	1.10	0.90	5

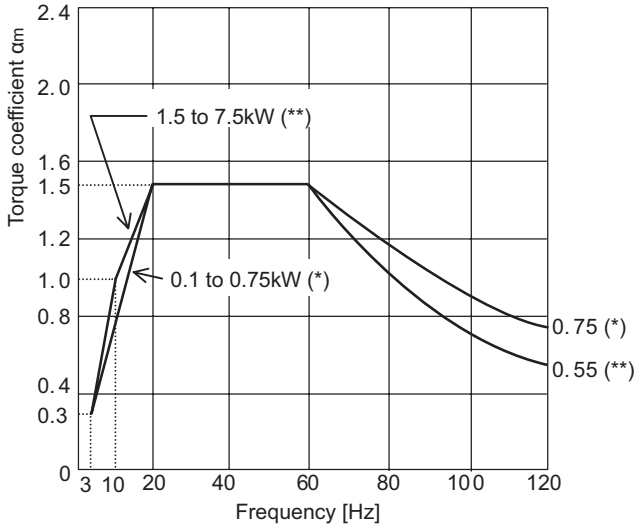
3) Linear acceleration torque coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	0.80	0.63	0.63	0.90	0.63	0.63
High setting	1.15	0.63	0.63	1.10	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 450kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	0.75	0.75	0.82	0.75	-	-
High setting	0.90	0.82	0.82	0.90	-	-

[15A13]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

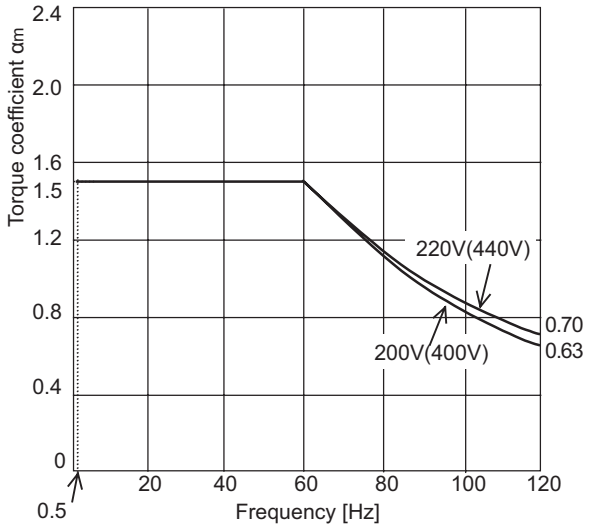
Motor capacity		Maximum frequency [Hz]
0.1 to 0.75kW	1.5 to 7.5kW	0.1 to 7.5kW
0.5	0.6	6

3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.1 to 0.75kW			1.5 to 7.5kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
0.5	0.75	0.75	0.6	0.55	0.55

[15A31]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.1 to 355kW	0.1 to 355kW
1.50	1

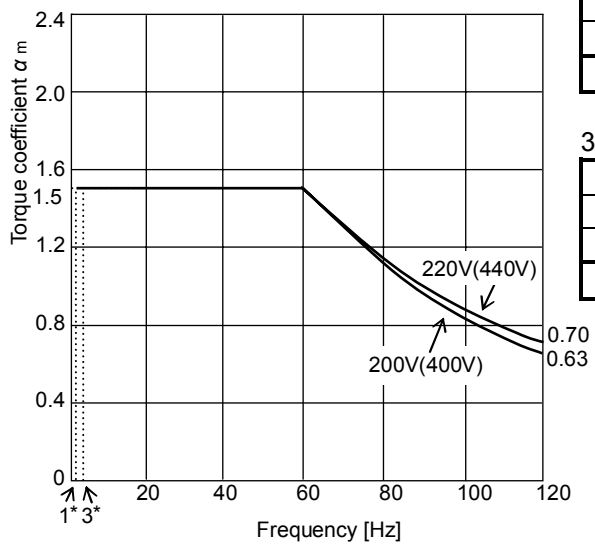
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.1 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.40	0.63	0.63	1.40	0.82	0.82

Motor capacity [kW] / Frequency range [Hz]					
37 to 355kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.40	-	-	-	-	-

[15A32]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.1 to 7.5kW	0.1 to 7.5kW
1.50	3

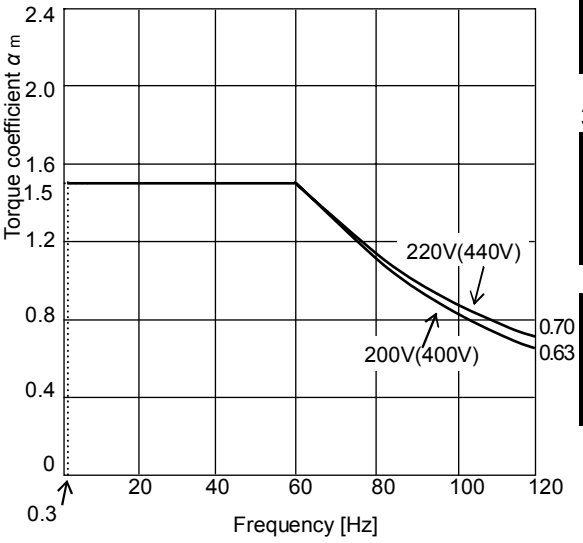
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]		
0.1 to 7.5kW		
0 to 60	0 to 120	60 to 120
1.40	0.63	0.63

* When the slip compensation setting is active, the motor can be driven at 1Hz or higher.
When the slip compensation setting is inactive, the motor can be driven at 3Hz or higher.

[15A33]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.4 to 355kW	0.4 to 355kW
1.50	1

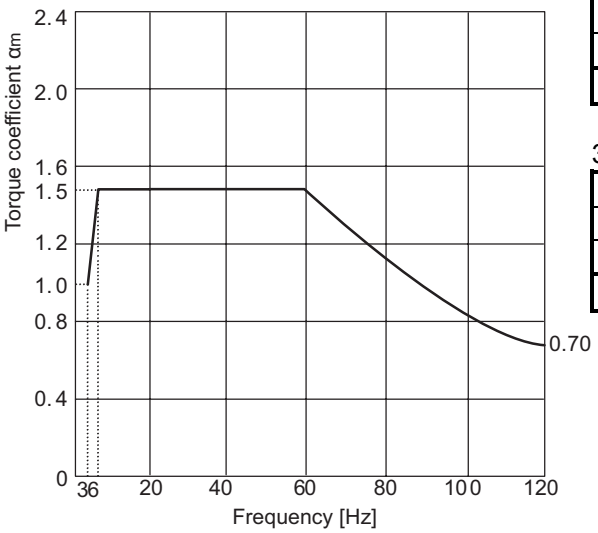
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.4 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.40	0.63	0.63	1.40	0.82	0.82

Motor capacity [kW] / Frequency range [Hz]					
37 to 355kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.40	-	-	-	-	-

[15A34]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

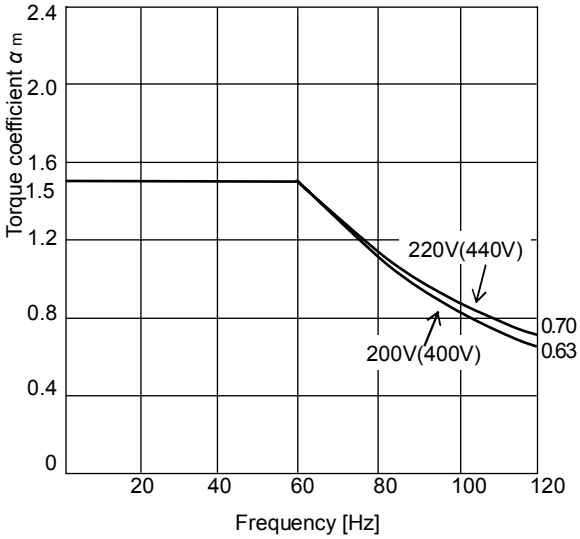
Motor capacity	Maximum frequency [Hz]
5.5, 7.5kW	5.5, 7.5kW
1.50	6

3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]		
5.5, 7.5kW		
0 to 60	0 to 120	60 to 120
1.40	0.70	0.70

[15A44]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.4 to 55kW	0.4 to 55kW
1.50	1

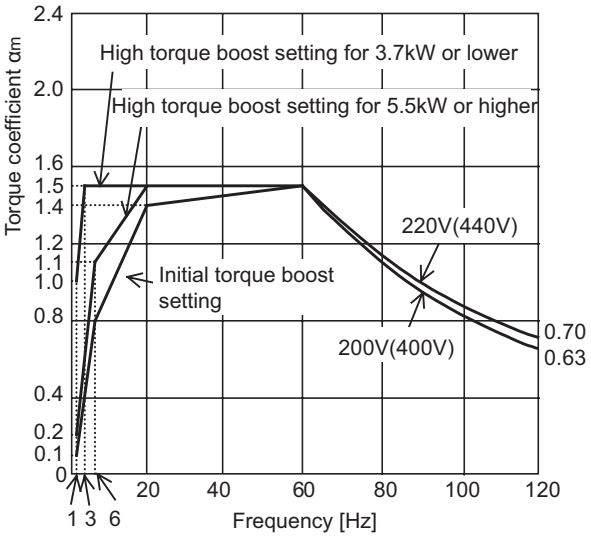
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.4 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.40	0.63	0.63	1.40	0.82	0.82

Motor capacity [kW] / Frequency range [Hz]					
37 to 55kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.40	-	-	-	-	-

[15U11]

1) Maximum short-time torque coefficient α_m



* A geared motor can be driven at 3Hz or higher.

2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 450kW	0.1 to 450kW
Initial value	1.00	1.10	0.90	15
High setting	1.30	1.25	1.00	12

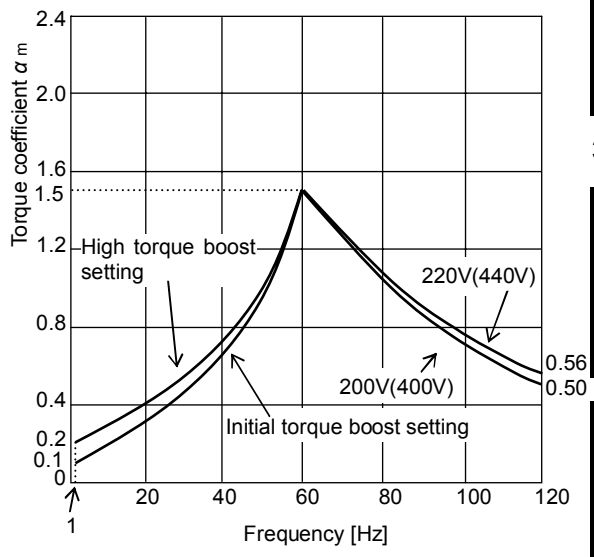
3) Linear acceleration torque coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	1.00	0.63	0.63	1.10	0.63	0.63
High setting	1.30	0.63	0.63	1.25	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 450kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	0.90	0.82	0.82	0.90	-	-
High setting	1.00	0.82	0.82	1.00	-	-

[15U12]

1) Maximum short-time torque coefficient α_m



* A geared motor can be driven at 3Hz or higher.

2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity	Maximum frequency [Hz]
	0.1 to 450kW	0.1 to 450kW
Initial value	0.18	15
High setting	0.28	15

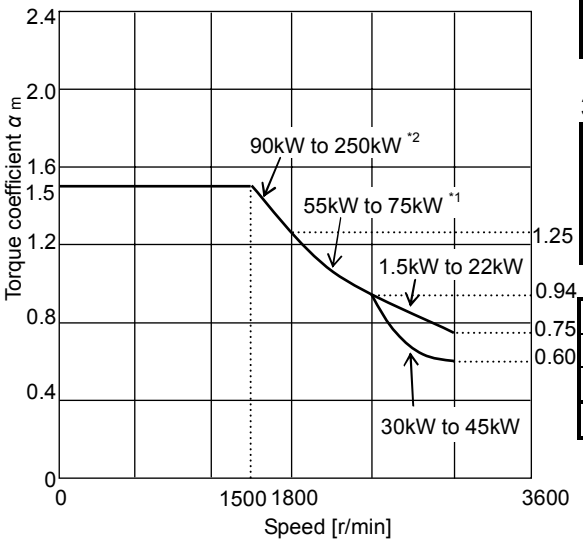
3) Linear acceleration torque (average acceleration torque*) coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 7.5kW			11 to 30kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
Initial value	0.80*	0.80*	0.50	0.80*	0.80*	0.73
High setting	0.85*	0.85*	0.50	0.85*	0.85*	0.73

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	37 to 450kW			-		
	0 to 60	0 to 100	60 to 100	-	-	-
Initial value	0.80*	-	-	-	-	-
High setting	0.85*	-	-	-	-	-

[15U41]

1) Maximum short-time torque coefficient α_m



* 1 The maximum speed for 55 to 75kW is 2400r/min.
* 2 The maximum speed for 90 to 250kW is 1800r/min.

2) Maximum starting torque coefficient α_s

Motor capacity	Maximum speed [r/min]
1.5 to 250kW	1.5 to 250kW
1.50	1

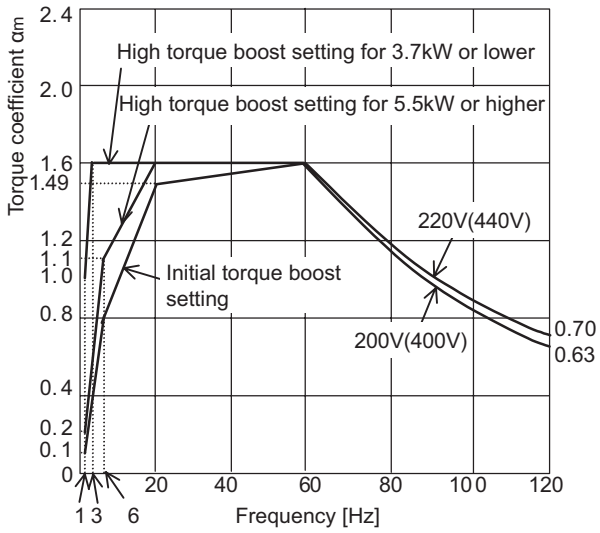
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Speed range [r/min]					
1.5 to 22kW			30 to 45kW		
0 to 1500	0 to 3000	1500 to 3000	0 to 1500	0 to 3000	1500 to 3000
1.50	0.75	0.75	1.50	0.60	0.60

Motor capacity [kW] / Speed range [r/min]					
55 to 75kW			90 to 250kW		
0 to 1500	0 to 2400	1500 to 2400	0 to 1500	0 to 1800	1500 to 1800
1.50	0.94	0.94	1.50	1.25	1.25

[16A11]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 450kW	0.1 to 450kW
Initial value	0.80	0.90	0.75	6
High setting	1.20	1.15	0.90	5

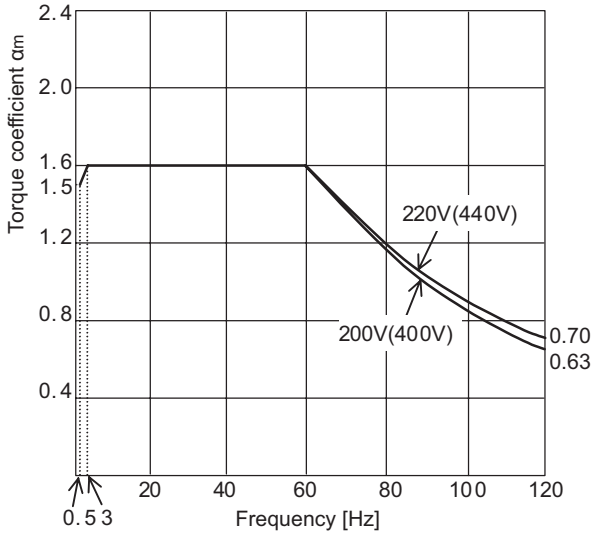
3) Linear acceleration torque coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	0.80	0.63	0.63	0.90	0.63	0.63
High setting	1.20	0.63	0.63	1.15	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 450kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	0.75	0.75	0.84	0.75	-	-
High setting	0.90	0.84	0.84	0.90	-	-

[16A31]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.1 to 355kW	0.1 to 355kW
1.60	3

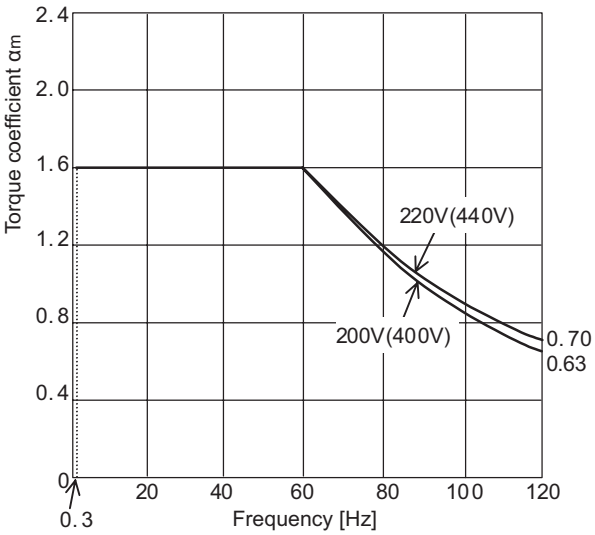
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.1 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.49	0.63	0.63	1.49	0.84	0.84

Motor capacity [kW] / Frequency range [Hz]					
37 to 355kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.49	-	-	-	-	-

[16A33]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.4 to 355kW	0.4 to 355kW
1.6	1

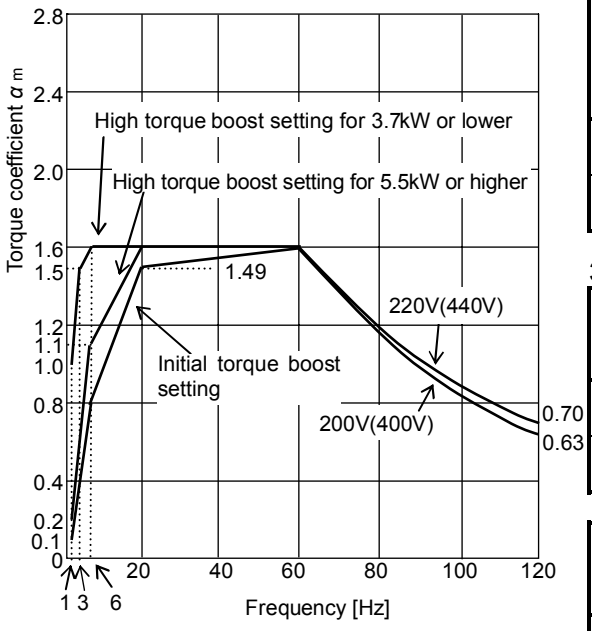
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.4 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.49	0.63	0.63	1.49	0.84	0.84

Motor capacity [kW] / Frequency range [Hz]					
37 to 355kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.49	-	-	-	-	-

[16U11]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 450kW	0.1 to 450kW
Initial value	1.05	1.15	0.95	15
High setting	1.35	1.30	1.05	12

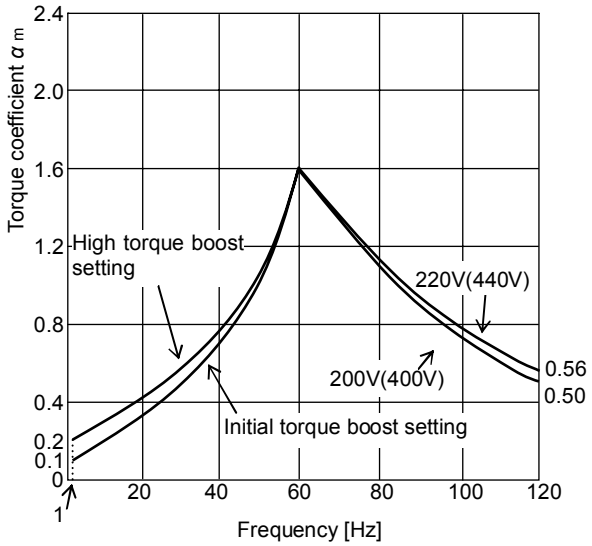
3) Linear acceleration torque coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	1.05	0.63	0.63	1.15	0.63	0.63
High setting	1.35	0.63	0.63	1.30	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 450kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	0.95	0.84	0.84	0.95	-	-
High setting	1.05	0.84	0.84	1.05	-	-

[16U12]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity	Maximum frequency [Hz]
	0.1 to 450kW	0.1 to 450kW
Initial value	0.19	15
High setting	0.28	15

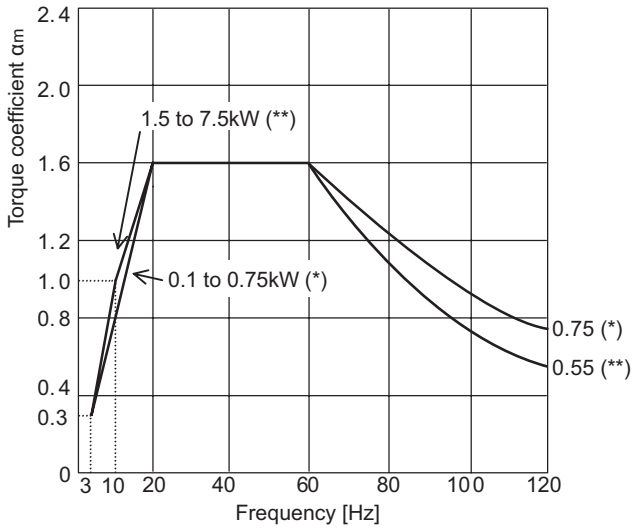
3) Linear acceleration torque (average acceleration torque*) coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 7.5kW			11 to 30kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
Initial value	0.85*	0.85*	0.50	0.85*	0.85*	0.76
High setting	0.90*	0.90*	0.50	0.90*	0.90*	0.76

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	37 to 450kW			-		
	0 to 60	0 to 100	60 to 100	-	-	-
Initial value	0.85*	-	-	-	-	-
High setting	0.90*	-	-	-	-	-

[16U13]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

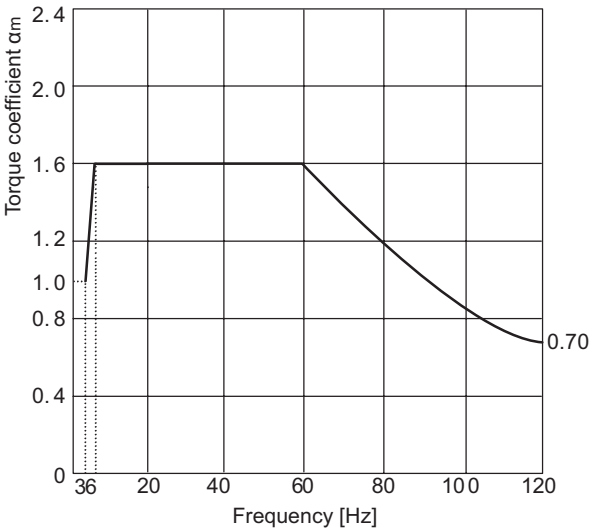
Motor capacity		Maximum frequency [Hz]
0.1 to 0.75kW	1.5 to 7.5kW	0.1 to 7.5kW
1.20	1.30	15

3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.1 to 0.75kW			1.5 to 7.5kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
1.20	0.75	0.75	1.30	0.55	0.55

[16U34]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

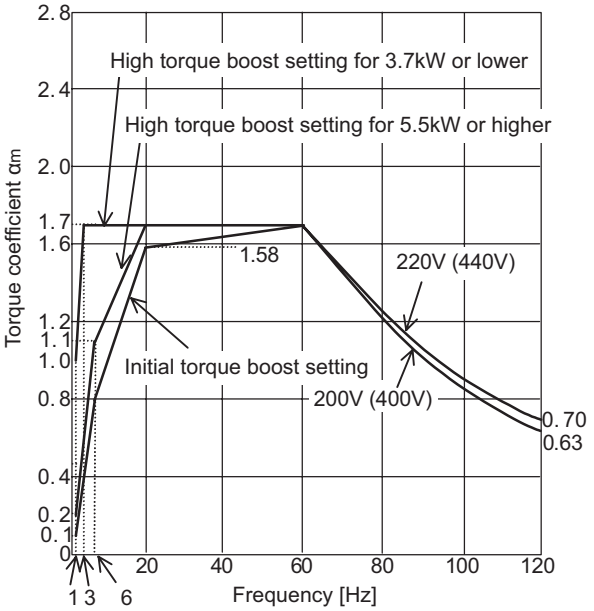
Motor capacity	Maximum frequency [Hz]
5.5, 7.5kW	5.5, 7.5kW
1.6	6

3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]		
5.5, 7.5kW		
0 to 60	0 to 120	60 to 120
1.49	0.70	0.70

[17A11]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 450kW	0.1 to 450kW
Initial value	0.80	0.90	0.75	6
High setting	1.25	1.20	0.90	5

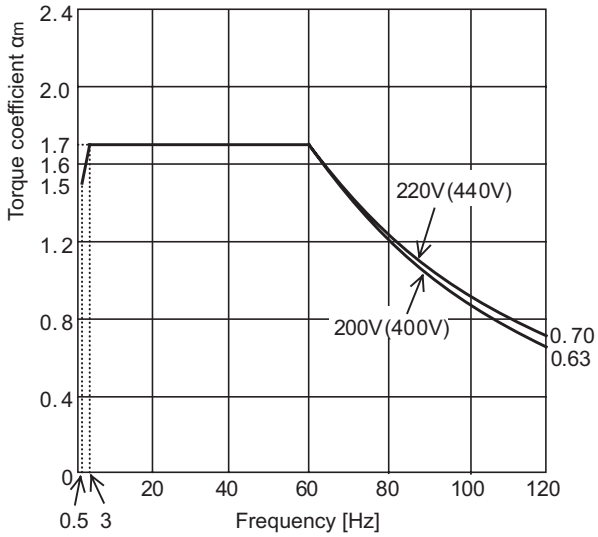
3) Linear acceleration torque coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	0.80	0.63	0.63	0.90	0.63	0.63
High setting	1.25	0.63	0.63	1.20	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 450kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	0.75	0.75	0.87	0.75	-	-
High setting	0.90	0.87	0.87	0.90	-	-

[17A31] [17U31]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.1 to 355kW	0.1 to 355kW
1.7	3

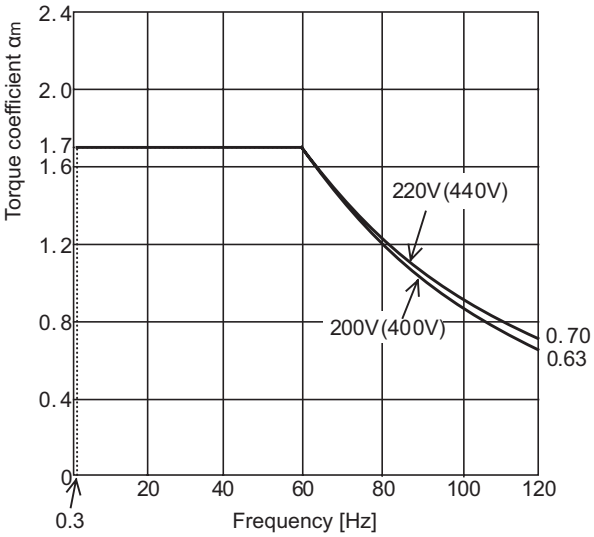
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.1 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.58	0.63	0.63	1.58	0.87	0.87

Motor capacity [kW] / Frequency range [Hz]					
37 to 355kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.58	-	-	-	-	-

[17A33] [17U33]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.4 to 355kW	0.4 to 355kW
1.7	1

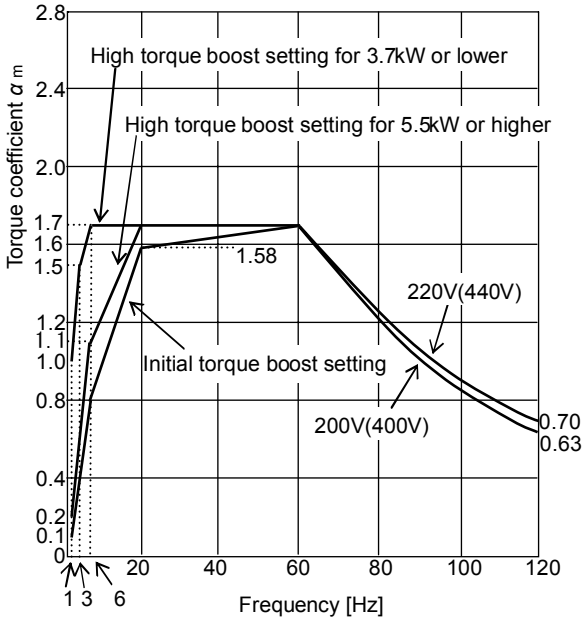
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.4 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.58	0.63	0.63	1.58	0.87	0.87

Motor capacity [kW] / Frequency range [Hz]					
37 to 355kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.58	-	-	-	-	-

[17U11]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 450kW	0.1 to 450kW
Initial value	1.10	1.20	1.00	15
High setting	1.40	1.35	1.10	12

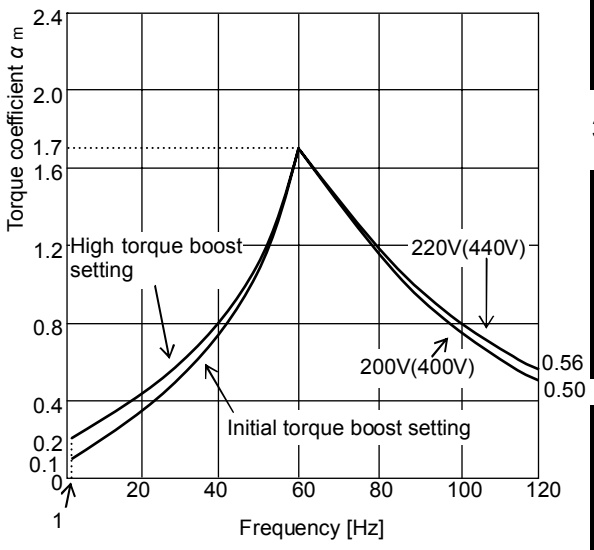
3) Linear acceleration torque coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	1.10	0.63	0.63	1.20	0.63	0.63
High setting	1.40	0.63	0.63	1.35	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 450kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	1.00	0.87	0.87	1.00	-	-
High setting	1.10	0.87	0.87	1.10	-	-

[17U12]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity	Maximum frequency [Hz]
	0.1 to 450kW	0.1 to 450kW
Initial value	0.20	15
High setting	0.29	15

3) Linear acceleration torque (average acceleration torque*) coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 7.5kW			11 to 30kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
Initial value	0.90*	0.90*	0.50	0.90*	0.90*	0.78
High setting	0.95*	0.95*	0.50	0.95*	0.95*	0.78

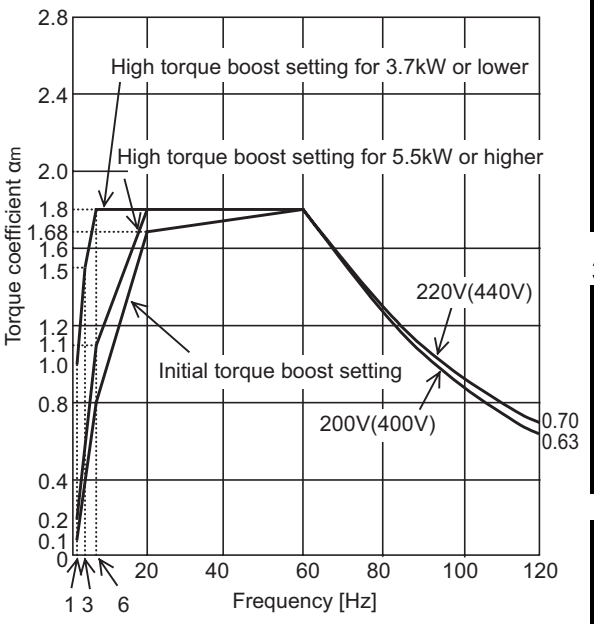
Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	37 to 450kW			-		
	0 to 60	0 to 100	60 to 100	-	-	-
Initial value	0.90*	-	-	-	-	-
High setting	0.95*	-	-	-	-	-

[17U31]→Refer to [17A31]

[17U33]→Refer to [17A33]

[18U11]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 450kW	0.1 to 450kW
Initial value	1.15	1.25	1.05	15
High setting	1.45	1.40	1.15	12

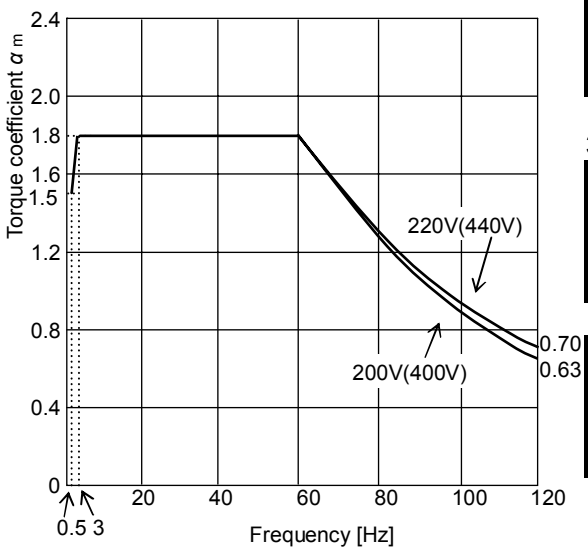
3) Linear acceleration torque coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	1.15	0.63	0.63	1.25	0.63	0.63
High setting	1.45	0.63	0.63	1.40	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 450kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	1.05	0.90	0.90	1.05	-	-
High setting	1.15	0.90	0.90	1.15	-	-

[18U31]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.1 to 355kW	0.1 to 355kW
1.80	3

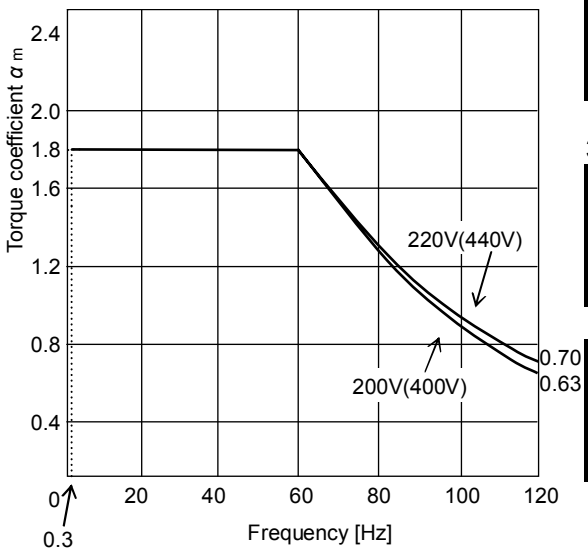
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.1 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.68	0.63	0.63	1.68	0.90	0.90

Motor capacity [kW] / Frequency range [Hz]					
37 to 355kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.68	-	-	-	-	-

[18U33]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.4 to 355kW	0.4 to 355kW
1.80	1

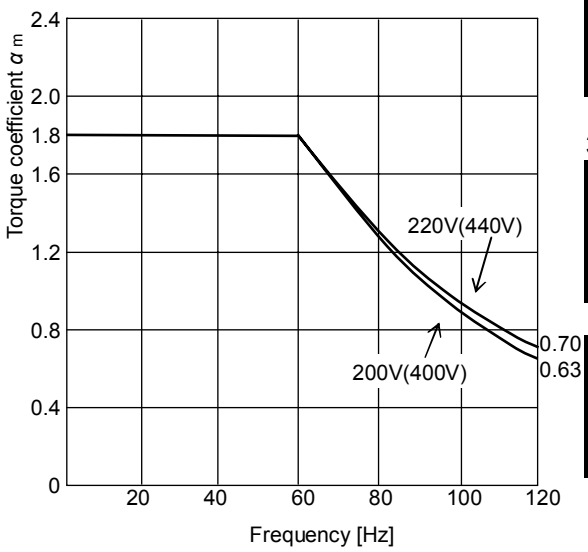
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.4 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.68	0.63	0.63	1.68	0.90	0.90

Motor capacity [kW] / Frequency range [Hz]					
37 to 355kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.68	-	-	-	-	-

[18U44]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.4 to 45kW	0.4 to 45kW
1.80	1

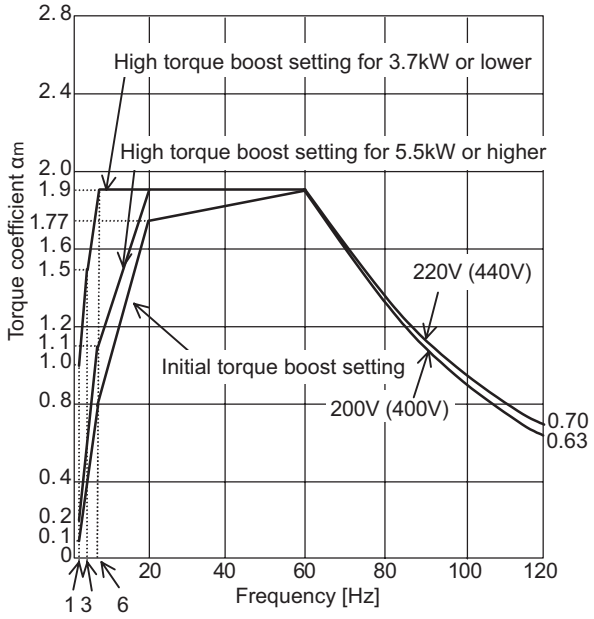
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.4 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.68	0.63	0.63	1.68	0.90	0.90

Motor capacity [kW] / Frequency range [Hz]					
37 to 55kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.68	-	-	-	-	-

[19U11]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 450kW	0.1 to 450kW
Initial value	1.20	1.30	1.10	15
High setting	1.50	1.45	1.20	12

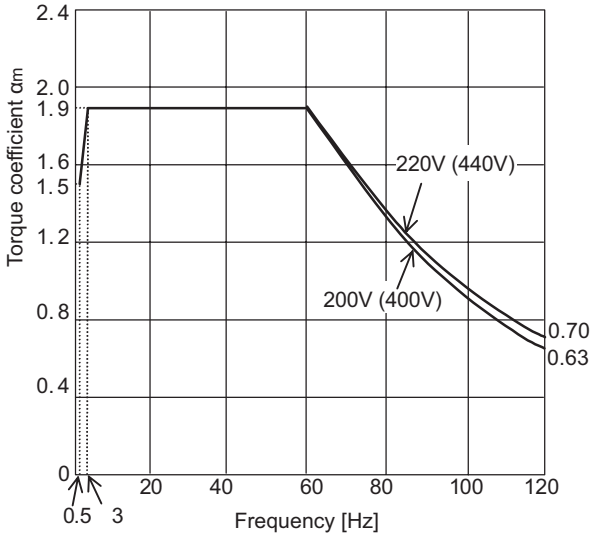
3) Linear acceleration torque coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	1.20	0.63	0.63	1.30	0.63	0.63
High setting	1.50	0.63	0.63	1.45	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 450kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	1.10	0.92	0.92	1.10	-	-
High setting	1.20	0.92	0.92	1.20	-	-

[19U31]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.1 to 355kW	0.1 to 355kW
1.9	3

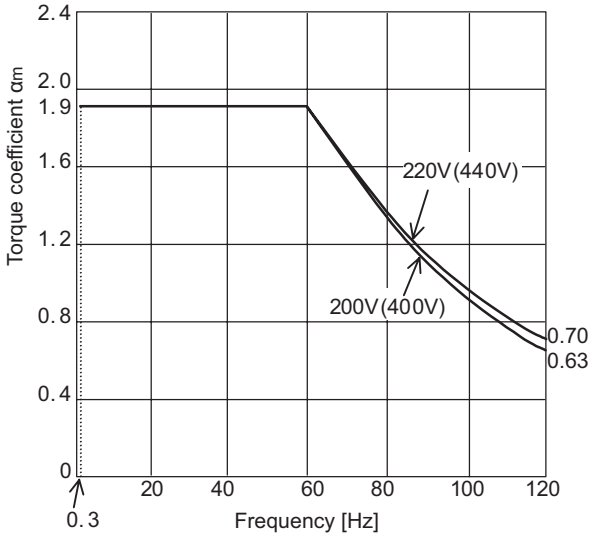
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.1 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.77	0.63	0.63	1.77	0.92	0.92

Motor capacity [kW] / Frequency range [Hz]					
37 to 355kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.77	-	-	-	-	-

[19U33]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.4 to 355kW	0.4 to 355kW
1.9	1

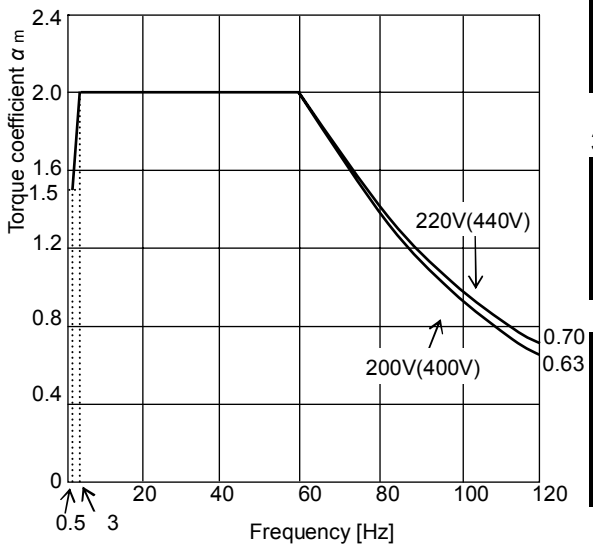
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.4 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.77	0.63	0.63	1.77	0.92	0.92

Motor capacity [kW] / Frequency range [Hz]					
37 to 355kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.77	-	-	-	-	-

[20A31] [20U31]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.1 to 355kW	0.1 to 355kW
2.00	3

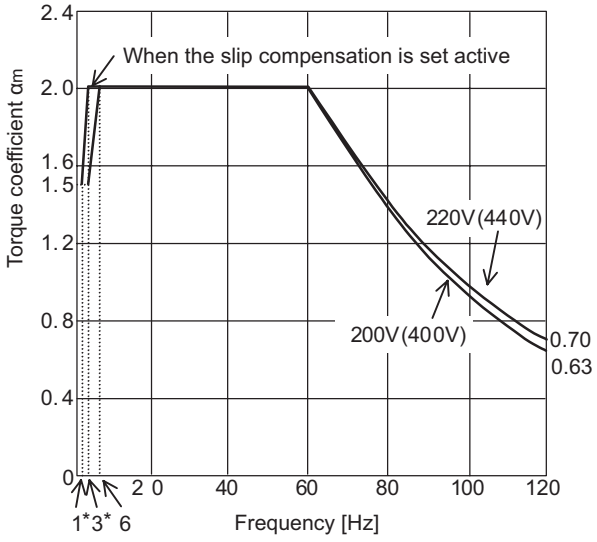
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.1 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.86	0.63	0.63	1.86	0.95	0.95

Motor capacity [kW] / Frequency range [Hz]					
37 to 355kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.86	-	-	-	-	-

[20A32] [20U32]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.1 to 7.5kW	0.1 to 7.5kW
2.00	6

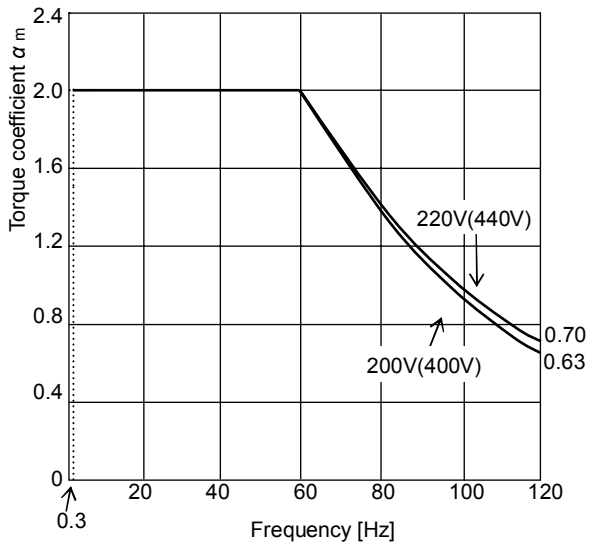
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]		
0.1 to 7.5kW		
0 to 60	0 to 120	60 to 120
1.86	0.63	0.63

* When the slip compensation setting is active, the motor can be driven at 1Hz or higher.
When the slip compensation setting is inactive, the motor can be driven at 3Hz or higher.

[20A33] [20U33]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.4 to 355kW	0.4 to 355kW
2.00	1

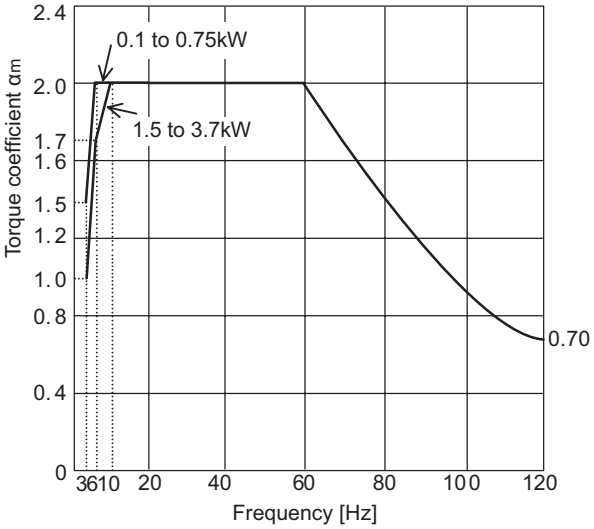
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.4 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.86	0.63	0.63	1.86	0.95	0.95

Motor capacity [kW] / Frequency range [Hz]					
37 to 355kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.86	-	-	-	-	-

[20A34]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

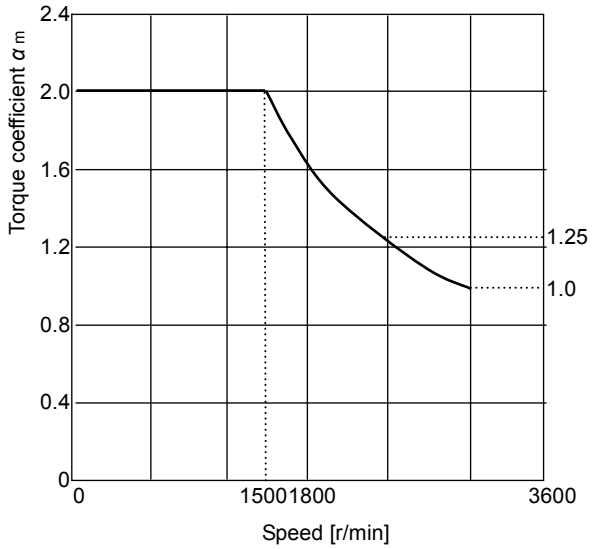
Motor capacity		Maximum frequency [Hz]
0.1 to 0.75kW	1.5 to 3.7kW	0.1 to 3.7kW
2.0	1.7	6

3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.1 to 0.75kW			1.5 to 3.7kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
1.86	0.70	0.70	1.84	0.70	0.70

[20A41] [20U41]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

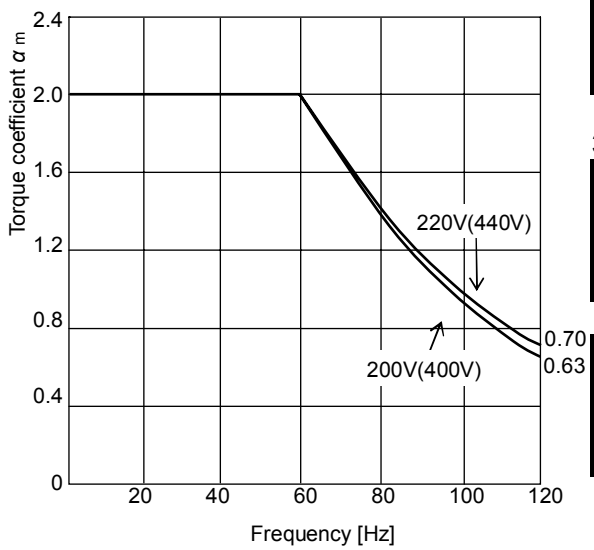
Motor capacity	Maximum Speed [r/min]
1.5 to 45kW	1.5 to 45kW
2.0	1

3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Speed range [r/min]					
1.5 to 3.7kW			-		
0 to 1500	0 to 3000	1500 to 3000	-	-	-
2.0	1.0	1.0	-	-	-

[20A44] [20U44]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.4 to 55kW	0.4 to 55kW
2.00	1

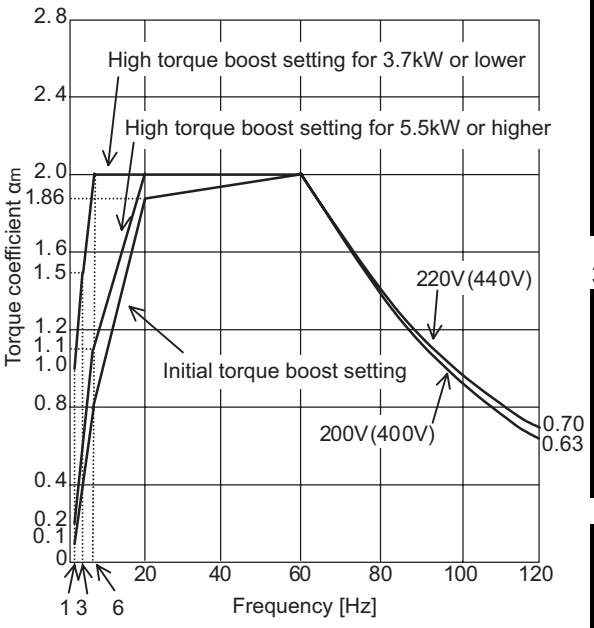
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.4 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
1.86	0.63	0.63	1.86	0.95	0.95

Motor capacity [kW] / Frequency range [Hz]					
37 to 55kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
1.86	-	-	-	-	-

[20U11]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 55kW	0.1 to 55kW
Initial value	1.25	1.40	1.15	15
High setting	1.55	1.50	1.20	12

3) Linear acceleration torque coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	1.25	0.63	0.63	1.40	0.63	0.63
High setting	1.55	0.63	0.63	1.50	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 55kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	1.15	0.95	0.95	1.15	-	-
High setting	1.20	0.95	0.95	1.20	-	-

[20U31]→Refer to [20A31]

[20U32]→Refer to [20A32]

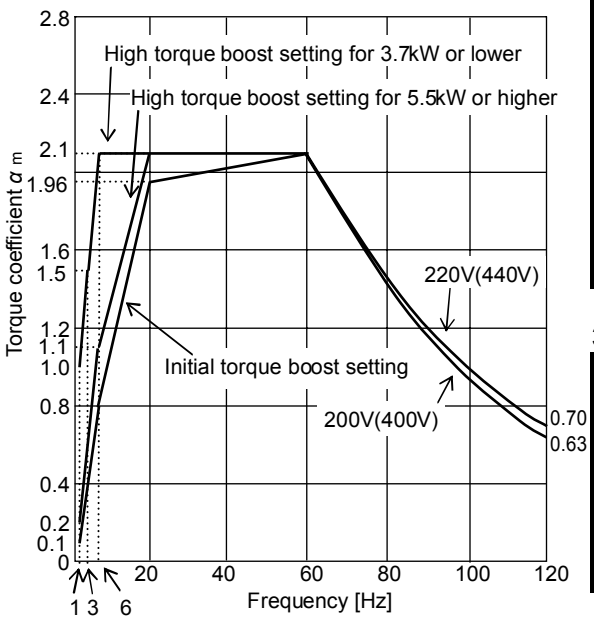
[20U33]→Refer to [20A33]

[20U41]→Refer to [20A41]

[20U44]→Refer to [20A44]

[21U11]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 55kW	0.1 to 55kW
Initial value	1.27	1.42	1.17	15
High setting	1.60	1.55	1.25	12

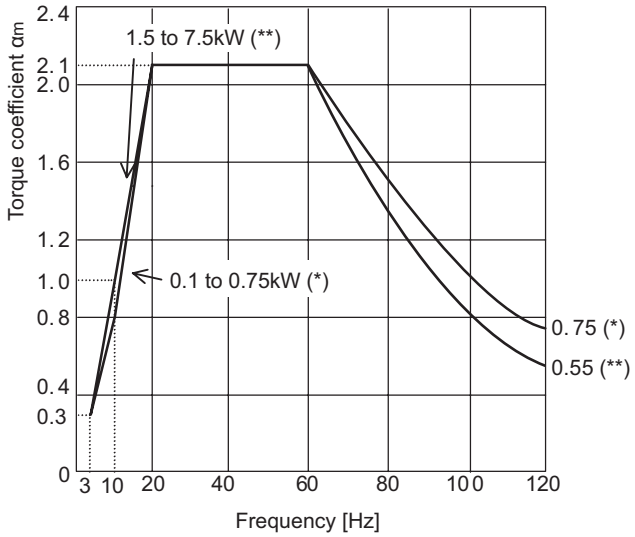
3) Linear acceleration torque coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	1.27	0.63	0.63	1.42	0.63	0.63
High setting	1.60	0.63	0.63	1.55	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 55kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	1.17	0.98	0.98	1.17	-	-
High setting	1.25	0.98	0.98	1.25	-	-

[21U13]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

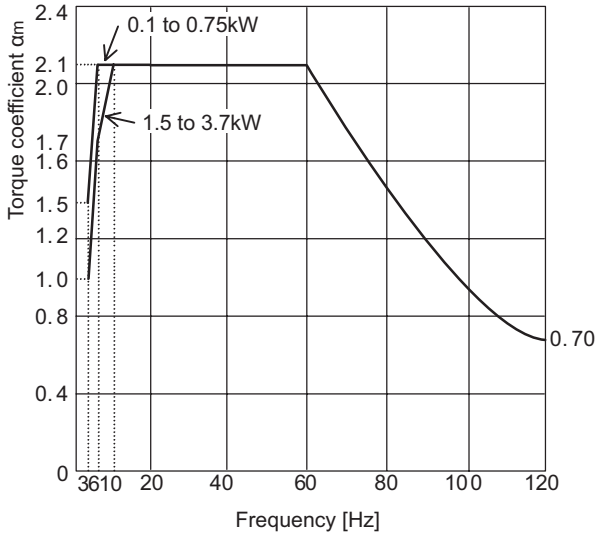
Motor capacity		Maximum frequency [Hz]
0.1 to 0.75kW	1.5 to 7.5kW	0.1 to 7.5kW
1.45	1.55	15

3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.1 to 0.75kW			1.5 to 7.5kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
1.45	0.75	0.75	1.55	0.55	0.55

[21U34]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

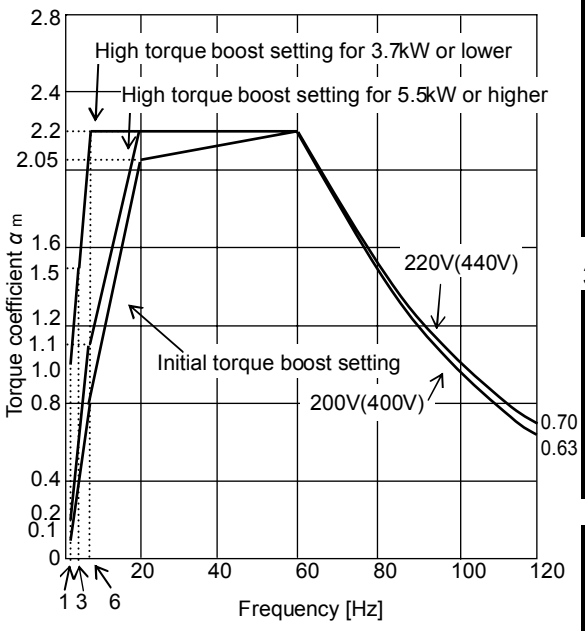
Motor capacity		Maximum frequency [Hz]
0.1 to 0.75kW	1.5 to 3.7kW	0.1 to 3.7kW
2.1	1.7	6

3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.1 to 0.75kW			1.5 to 3.7kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
1.96	0.70	0.70	1.94	0.70	0.70

[22U11]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Manual torque boost	Motor capacity			Maximum frequency [Hz]
	0.1 to 3.7kW	5.5 to 7.5kW	11 to 55kW	0.1 to 55kW
Initial value	1.30	1.45	1.20	15
High setting	1.65	1.60	1.30	12

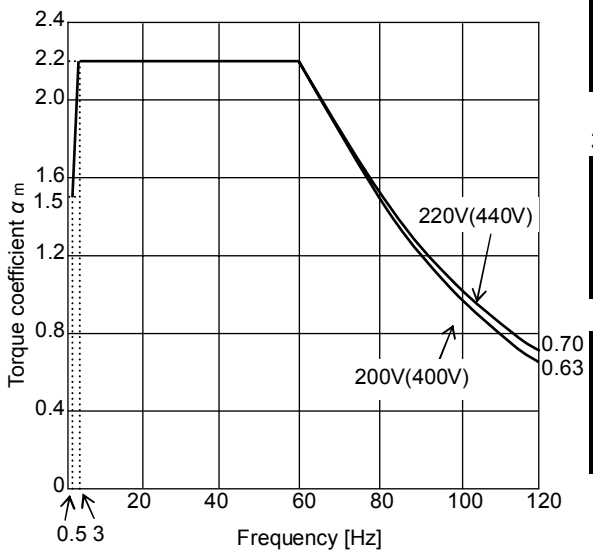
3) Linear acceleration torque coefficient α_a

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	0.1 to 3.7kW			5.5 to 7.5kW		
	0 to 60	0 to 120	60 to 120	0 to 60	0 to 120	60 to 120
Initial value	1.30	0.63	0.63	1.45	0.63	0.63
High setting	1.65	0.63	0.63	1.60	0.63	0.63

Manual torque boost	Motor capacity [kW] / Frequency range [Hz]					
	11 to 30kW			37 to 55kW		
	0 to 60	0 to 100	60 to 100	0 to 60	0 to 100	60 to 100
Initial value	1.20	1.00	1.00	1.20	-	-
High setting	1.30	1.00	1.00	1.30	-	-

[22U31]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.1 to 55kW	0.1 to 55kW
2.20	3

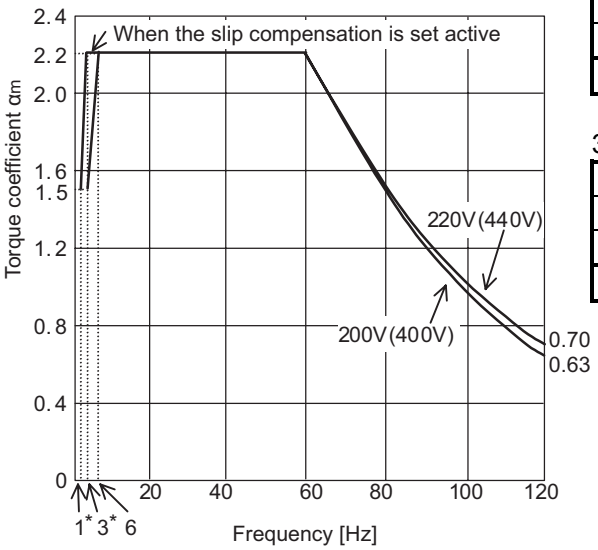
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.1 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
2.05	0.63	0.63	2.05	1.00	1.00

Motor capacity [kW] / Frequency range [Hz]					
37 to 55kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
2.05	-	-	-	-	-

[22U32]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.1 to 7.5kW	0.1 to 7.5kW
2.20	6

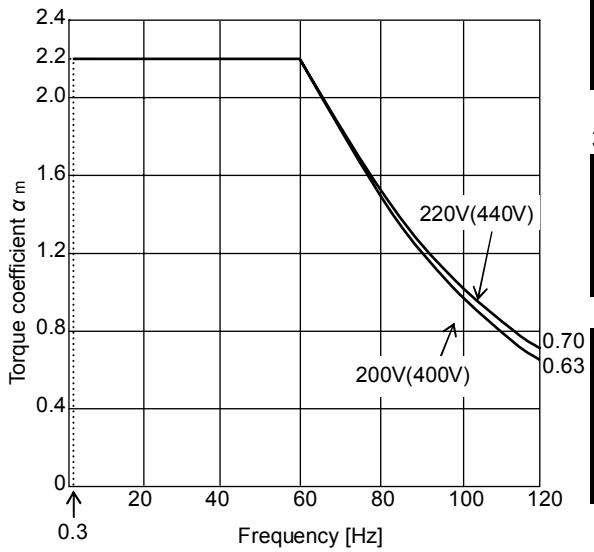
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]		
0.1 to 7.5kW		
0 to 60	0 to 120	60 to 120
2.05	0.63	0.63

* When the slip compensation setting is active, the motor can be driven at 1Hz or higher.
When the slip compensation setting is inactive, the motor can be driven at 3Hz or higher.

[22U33]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.4 to 55kW	0.4 to 55kW
2.20	1

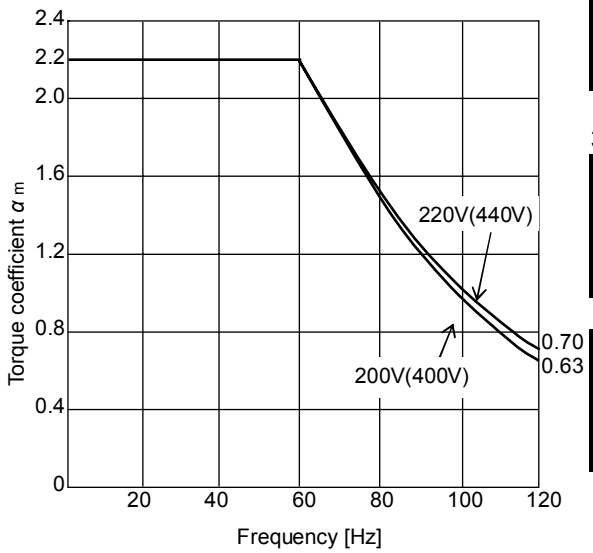
3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.4 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
2.05	0.63	0.63	2.05	1.00	1.00

Motor capacity [kW] / Frequency range [Hz]					
37 to 55kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
2.05	-	-	-	-	-

[22U44]

1) Maximum short-time torque coefficient α_m



2) Maximum starting torque coefficient α_s

Motor capacity	Maximum frequency [Hz]
0.4 to 55kW	0.4 to 55kW
2.20	1

3) Linear acceleration torque coefficient α_a

Motor capacity [kW] / Frequency range [Hz]					
0.4 to 7.5kW			11 to 30kW		
0 to 60	0 to 120	60 to 120	0 to 60	0 to 100	60 to 100
2.05	0.63	0.63	2.05	1.00	1.00

Motor capacity [kW] / Frequency range [Hz]					
37 to 55kW			-		
0 to 60	0 to 100	60 to 100	-	-	-
2.05	-	-	-	-	-

CHAPTER 3 REGENERATION PERFORMANCE DATA

3.1 Connectable braking option

(1) Inverter

Voltage	Braking option		Inverter model				
	Type	Model	FR-D700	FR-E700	FR-F700	FR-A700	FR-F700P
200V	Built-in brake resistor	-	Not required (capacitor regeneration)	Not required (capacitor regeneration)	Not required (capacitor regeneration)	0.4K to 7.5K: Built-in 11K to 55K: Not required (capacitor regeneration)	Not required (capacitor regeneration)
	External brake resistor	MYS	3.7K	3.7K	-	-	-
		MRS	0.4K to 3.7K	0.4K to 3.7K	-	-	-
		FR-ABR	0.4K to 15K	0.4K to 15K	-	0.4K to 22K	-
	Brake unit	FR-BU2/GZG, GRZG	0.1K to 15K	0.1K to 15K	0.75K to 45K	0.4K to 45K	0.75K to 45K
		FR-BU2/FR-BR	5.5K to 15K	5.5K to 15K	7.5K to 55K	5.5K to 55K	7.5K to 55K
	Power regeneration converter	FR-RC	7.5K to 15K	7.5K to 15K	7.5K to 55K	7.5K to 55K	7.5K to 55K
	Power regeneration common converter	FR-CV	0.1K to 15K	0.1K to 15K	0.75K to 55K	0.4K to 55K	0.75K to 55K
	High power factor converter	FR-HC	0.1K to 15K	0.1K to 15K	0.75K to 55K	0.4K to 55K	0.75K to 55K
400V	Built-in brake resistor	-	Not required (capacitor regeneration)	Not required (capacitor regeneration)	Not required (capacitor regeneration)	0.4K to 7.5K: Built-in 11K to 55K: Not required (capacitor regeneration)	Not required (capacitor regeneration)
	External brake resistor	FR-ABR	0.4K to 15K	0.4K to 15K	-	0.4K to 22K	-
	Brake unit	FR-BU2/GZG, GRZG	2.2K to 15K	2.2K to 15K	3.7K to 55K	2.2K to 55K	3.7K to 55K
		FR-BU2/FR-BR	5.5K to 15K	5.5K to 15K	7.5K to 55K	5.5K to 55K	7.5K to 55K
	Power regeneration converter	FR-RC	7.5K to 15K	7.5K to 15K	7.5K to 55K	7.5K to 55K	7.5K to 55K
	Power regeneration common converter	FR-CV	0.4K to 15K	0.4K to 15K	0.75K to 55K	0.4K to 55K	0.75K to 55K
	High power factor converter	FR-HC	0.4K to 15K	0.4K to 15K	0.75K to 55K	0.4K to 55K	0.75K to 55K

75K or more

Voltage	Braking option		Inverter model		
	Type	Model	FR-F700	FR-A700	FR-F700P
200V	Built-in brake resistor	-	Not required (capacitor regeneration)	Not required (capacitor regeneration)	Not required (capacitor regeneration)
	Brake unit	FR-BU2/MT-BR5	75K to 110K	75K, 90K	75K to 110K
400V	Built-in resistor	-	Not required (capacitor regeneration)	Not required (capacitor regeneration)	Not required (capacitor regeneration)
	Brake unit	FR-BU2/MT-BR5	75K to 400K	75K to 400K	75K to 400K
	Power regeneration converter	MT-RC	75K to 315K	75K to 315K	75K to 315K
	High power factor converter	MT-HC-S	75K to 220K	75K to 220K	75K to 220K

(2) IPM drive unit

Voltage	Braking option		Drive unit model		
	Type	Model	FR-FP500J	FR-FP700	FR-F700P
200V	Built-in brake resistor	-	Not required (capacitor regeneration)	Not required (capacitor regeneration)	Not required (capacitor regeneration)
	Brake unit	FR-BU2/GZG,GRZG	1.5K to 15K	0.75K to 45K	0.75K to 45K
		FR-BU2/FR-BR	7.5K to 15K	7.5K to 55K	7.5K to 55K
	Power regeneration converter	FR-RC	7.5K to 15K	7.5K to 55K	7.5K to 55K
	Power regeneration common converter	FR-CV	0.4K to 15K	0.75K to 55K	0.75K to 55K
	High power factor converter	FR-HC	0.4K to 15K	0.75K to 55K	0.75K to 55K
400V	Built-in brake resistor	-	Not required (capacitor regeneration)	Not required (capacitor regeneration)	Not required (capacitor regeneration)
	Brake unit	FR-BU2/GZG,GRZG	3.7K to 15K	3.7K to 55K	3.7K to 55K
		FR-BU2/FR-BR	7.5K to 15K	7.5K to 55K	7.5K to 55K
	Power regeneration converter	FR-RC	7.5K to 15K	7.5K to 55K	7.5K to 55K
	Power regeneration common converter	FR-CV	0.4K to 15K	0.75K to 55K	0.75K to 55K
	High power factor converter	FR-HC	0.4K to 15K	0.75K to 55K	0.75K to 55K

75K or more

Voltage	Braking option		Drive unit model	
	Type	Model	FR-FP700	FR-F700P
200V	Built-in brake resistor	-	Not required (capacitor regeneration)	Not required (capacitor regeneration)
	Brake unit	FR-BU2/MT-BR5	75K	75K
400V	Built-in brake resistor	-	Not required (capacitor regeneration)	Not required (capacitor regeneration)
	Brake unit	FR-BU2/MT-BR5	75K to 110K	75K to 110K
	Power regeneration converter	MT-RC	75K to 110K	75K to 110K
	High power factor converter	MT-HC-S	75K to 110K	75K to 110K

3.2 Brake torque combination table

(1) FR-D720

Motor capacity	INV capacity	Built-in brake	MRS MYS		FR-ABR	FR-BU2				FR-RC	FR-CV	FR-HC	
						GZG/GRZG		FR-BR					
0.1kW	0.1K	Capacitor regeneration [07B]	-	-	-	FR-BU2-1.5K GZG300W50Ω [15B]	-	-	-	-	7.5K [15B]	7.5K [15B]	-
	0.2K	Capacitor regeneration [07V]	-	-	-	FR-BU2-1.5K GZG300W50Ω [20V]	-	-	-	-	7.5K [20V]	7.5K [20V]	-
0.2kW	0.2K	Capacitor regeneration [07B]	-	-	-	FR-BU2-1.5K GZG300W50Ω [15B]	-	-	-	-	7.5K [15B]	7.5K [15B]	-
	0.4K	Capacitor regeneration [07V]	MRS120W200 [20V]	-	0.4K [20V]	FR-BU2-1.5K GZG300W50Ω [20V]	-	-	-	-	7.5K [20V]	7.5K [20V]	-
0.4kW	0.4K	Capacitor regeneration [05B]	MRS120W200 [15B]	-	0.4K [15B]	FR-BU2-1.5K GZG300W50Ω [15B]	-	-	-	-	7.5K [15B]	7.5K [15B]	-
	0.75K	Capacitor regeneration [05V]	MRS120W100 [20V]	-	0.75K [20V]	FR-BU2-1.5K GZG300W50Ω [20V]	-	-	-	-	7.5K [20V]	7.5K [20V]	-
0.75kW	0.75K	Capacitor regeneration [05B]	MRS120W100 [15B]	-	0.75K [15B]	FR-BU2-1.5K GZG300W50Ω [15B]	-	-	-	-	7.5K [15B]	7.5K [15B]	-
	1.5K	Capacitor regeneration [05V]	MRS120W60 [20V]	-	2.2K [20V]	FR-BU2-1.5K GZG300W50Ω [20V]	FR-BU2-3.7K Three GRZG200-10Ω in series [20V]	-	-	-	7.5K [20V]	7.5K [20V]	-
1.5kW	1.5K	Capacitor regeneration [02B]	MRS120W60 [15B]	-	2.2K [15B]	FR-BU2-1.5K GZG300W50Ω [15B]	FR-BU2-3.7K Three GRZG200-10Ω in series [15B]	-	-	-	7.5K [15B]	7.5K [15B]	-
	2.2K	Capacitor regeneration [02V]	MRS120W60 [15V]	MRS120W40 [20V]	2.2K [15V]	FR-BU2-3.7K Three GRZG200-10Ω in series [20V]	FR-BU2-7.5K Four GRZG300-5Ω in series [20V]	-	-	-	7.5K [20V]	7.5K [20V]	-
2.2kW	2.2K	Capacitor regeneration [02B]	MRS120W60 [10B]	MRS120W40 [15B]	2.2K [10B]	FR-BU2-3.7K Three GRZG200-10Ω in series [15B]	FR-BU2-7.5K Four GRZG300-5Ω in series [15B]	-	-	-	7.5K [15B]	7.5K [15B]	-
	3.7K	Capacitor regeneration [02V]	MRS120W40 [15V]	2×MYS220W50 [20V]	3.7K [15V]	FR-BU2-3.7K Three GRZG200-10Ω in series [20V]	FR-BU2-7.5K Four GRZG300-5Ω in series [20V]	-	-	-	7.5K [20V]	7.5K [20V]	-
3.7kW	3.7K	Capacitor regeneration [02B]	MRS120W40 [10B]	2×MYS220W50 [15B]	3.7K [10B]	FR-BU2-3.7K Three GRZG200-10Ω in series [12B]	FR-BU2-7.5K Four GRZG300-5Ω in series [15B]	-	-	-	7.5K [15B]	7.5K [15B]	-
	5.5K	Capacitor regeneration [02V]	-	-	5.5K [15V]	FR-BU2-7.5K Four GRZG300-5Ω in series [18V]	FR-BU2-15K Six GRZG400-2Ω in series [20V]	FR-BU2-15K FR-BR-15K [20V]	-	-	7.5K [20V]	7.5K [20V]	-
5.5kW	5.5K	Capacitor regeneration [02B]	-	-	5.5K [10B]	FR-BU2-7.5K Four GRZG300-5Ω in series [12B]	FR-BU2-15K Six GRZG400-2Ω in series [15B]	FR-BU2-15K FR-BR-15K [15B]	-	-	7.5K [15B]	7.5K [15B]	-
	7.5K	Capacitor regeneration [02V]	-	-	7.5K [12V]	FR-BU2-7.5K Four GRZG300-5Ω in series [12V]	FR-BU2-15K Six GRZG400-2Ω in series [20V]	FR-BU2-15K FR-BR-15K [20V]	-	15K [20V]	7.5K [20V]	7.5K [20V]	15K [20V]
7.5kW	7.5K	Capacitor regeneration [02B]	-	-	7.5K [10B]	FR-BU2-7.5K Four GRZG300-5Ω in series [10B]	FR-BU2-15K Six GRZG400-2Ω in series [15B]	FR-BU2-15K FR-BR-15K [15B]	-	15K [15B]	7.5K [15B]	7.5K [15B]	15K [15B]
	11K	Capacitor regeneration [02V]	-	-	11K [14V]	FR-BU2-15K Six GRZG400-2Ω in series [15V]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [20V]	FR-BU2-15K FR-BR-15K [20V]	FR-BU2-30K FR-BR-30K [20V]	15K [20V]	11K [20V]	15K [20V]	-
11kW	11K	Capacitor regeneration [02B]	-	-	11K [10B]	FR-BU2-15K Six GRZG400-2Ω in series [10B]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [15B]	FR-BU2-15K FR-BR-15K [15B]	FR-BU2-30K FR-BR-30K [15B]	15K [15B]	11K [15B]	15K [15B]	-
	15K	Capacitor regeneration [02V]	-	-	Two 15K in parallel [14V]	FR-BU2-15K Six GRZG400-2Ω in series [10V]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [20V]	FR-BU2-15K FR-BR-15K [15V]	FR-BU2-30K FR-BR-30K [20V]	15K [20V]	15K [20V]	15K [20V]	30K [20V]
15kW	15K	Capacitor regeneration [02B]	-	-	Two 15K in parallel [10B]	FR-BU2-15K Six GRZG400-2Ω in series [07B]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [15B]	FR-BU2-15K FR-BR-15K [10B]	FR-BU2-30K FR-BR-30K [15B]	15K [15B]	15K [15B]	15K [15B]	30K [15B]

(2) FR-E720

Motor capacity	INV capacity	Built-in brake	MRS MYS		FR-ABR	FR-BU2 GZG/GRZG		FR-BU2 FR-BR		FR-RC	FR-CV	FR-HC	
0.1kW	0.1K	Capacitor regeneration [07B]	-	-	-	FR-BU2-1.5K GZG300W50Ω [15B]	-	-	-	-	7.5K [15B]	7.5K [15B]	-
	0.2K	Capacitor regeneration [07V]	-	-	-	FR-BU2-1.5K GZG300W50Ω [20V]	-	-	-	-	7.5K [20V]	7.5K [20V]	-
0.2kW	0.2K	Capacitor regeneration [07B]	-	-	-	FR-BU2-1.5K GZG300W50Ω [15B]	-	-	-	-	7.5K [15B]	7.5K [15B]	-
	0.4K	Capacitor regeneration [07V]	MRS120W200 [20V]	-	0.4K [20V]	FR-BU2-1.5K GZG300W50Ω [20V]	-	-	-	-	7.5K [20V]	7.5K [20V]	-
0.4kW	0.4K	Capacitor regeneration [05B]	MRS120W200 [15B]	-	0.4K [15B]	FR-BU2-1.5K GZG300W50Ω [15B]	-	-	-	-	7.5K [15B]	7.5K [15B]	-
	0.75K	Capacitor regeneration [05V]	MRS120W100 [20V]	-	0.75K [20V]	FR-BU2-1.5K GZG300W50Ω [20V]	-	-	-	-	7.5K [20V]	7.5K [20V]	-
0.75kW	0.75K	Capacitor regeneration [05B]	MRS120W100 [15B]	-	0.75K [15B]	FR-BU2-1.5K GZG300W50Ω [15B]	-	-	-	-	7.5K [15B]	7.5K [15B]	-
	1.5K	Capacitor regeneration [05V]	MRS120W60 [20V]	-	2.2K [20V]	FR-BU2-1.5K GZG300W50Ω [20V]	FR-BU2-3.7K Three GRZG200-10Ω in series [20V]	-	-	-	7.5K [20V]	7.5K [20V]	-
1.5kW	1.5K	Capacitor regeneration [02B]	MRS120W60 [15B]	-	2.2K [15B]	FR-BU2-1.5K GZG300W50Ω [15B]	FR-BU2-3.7K Three GRZG200-10Ω in series [15B]	-	-	-	7.5K [15B]	7.5K [15B]	-
	2.2K	Capacitor regeneration [02V]	MRS120W60 [15V]	MRS120W40 [20V]	2.2K [15V]	FR-BU2-3.7K Three GRZG200-10Ω in series [20V]	FR-BU2-7.5K Four GRZG300-5Ω in series [20V]	-	-	-	7.5K [20V]	7.5K [20V]	-
2.2kW	2.2K	Capacitor regeneration [02B]	MRS120W60 [10B]	MRS120W40 [15B]	2.2K [10B]	FR-BU2-3.7K Three GRZG200-10Ω in series [15B]	FR-BU2-7.5K Four GRZG300-5Ω in series [15B]	-	-	-	7.5K [15B]	7.5K [15B]	-
	3.7K	Capacitor regeneration [02V]	MRS120W40 [15V]	2×MYS220W50 [20V]	3.7K [15V]	FR-BU2-3.7K Three GRZG200-10Ω in series [20V]	FR-BU2-7.5K Four GRZG300-5Ω in series [20V]	-	-	-	7.5K [20V]	7.5K [20V]	-
3.7kW	3.7K	Capacitor regeneration [02B]	MRS120W40 [10B]	2×MYS220W50 [15B]	3.7K [10B]	FR-BU2-3.7K Three GRZG200-10Ω in series [12B]	FR-BU2-7.5K Four GRZG300-5Ω in series [15B]	-	-	-	7.5K [15B]	7.5K [15B]	-
	5.5K	Capacitor regeneration [02V]	-	-	5.5K [15V]	FR-BU2-7.5K Four GRZG300-5Ω in series [18V]	FR-BU2-15K Six GRZG400-2Ω in series [20V]	FR-BU2-15K FR-BR-15K [20V]	-	-	7.5K [20V]	7.5K [20V]	-
5.5kW	5.5K	Capacitor regeneration [02B]	-	-	5.5K [10B]	FR-BU2-7.5K Four GRZG300-5Ω in series [12B]	FR-BU2-15K Six GRZG400-2Ω in series [15B]	FR-BU2-15K FR-BR-15K [15B]	-	-	7.5K [15B]	7.5K [15B]	-
	7.5K	Capacitor regeneration [02V]	-	-	7.5K [12V]	FR-BU2-7.5K Four GRZG300-5Ω in series [12V]	FR-BU2-15K Six GRZG400-2Ω in series [20V]	FR-BU2-15K FR-BR-15K [20V]	-	15K [20V]	7.5K [20V]	7.5K [20V]	15K [20V]

Motor capacity	INV capacity	Built-in brake	MRS MYS		FR-ABR	FR-BU2				FR-RC	FR-CV	FR-HC	
						GZG/GRZG		FR-BR					
7.5kW	7.5K	Capacitor regeneration [02B]	-	-	7.5K [10B]	FR-BU2-7.5K Four GRZG300-5Ω in series [10B]	FR-BU2-15K Six GRZG400-2Ω in series [15B]	FR-BU2-15K FR-BR-15K [15B]	-	15K [15B]	7.5K [15B]	7.5K [15B]	15K [15B]
	11K	Capacitor regeneration [02V]	-	-	11K [14V]	FR-BU2-15K Six GRZG400-2Ω in series [15V]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [20V]	FR-BU2-15K FR-BR-15K [20V]	FR-BU2-30K FR-BR-30K [20V]	15K [20V]	11K [20V]	15K [20V]	-
11kW	11K	Capacitor regeneration [02B]	-	-	11K [10B]	FR-BU2-15K Six GRZG400-2Ω in series [10B]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [15B]	FR-BU2-15K FR-BR-15K [15B]	FR-BU2-30K FR-BR-30K [15B]	15K [15B]	11K [15B]	15K [15B]	-
	15K	Capacitor regeneration [02V]	-	-	Two 15K in parallel [14V]	FR-BU2-15K Six GRZG400-2Ω in series [10V]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [20V]	FR-BU2-15K FR-BR-15K [15V]	FR-BU2-30K FR-BR-30K [20V]	15K [20V]	15K [20V]	15K [20V]	30K [20V]
15kW	15K	Capacitor regeneration [02B]	-	-	Two 15K in parallel [10B]	FR-BU2-15K Six GRZG400-2Ω in series [07B]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [15B]	FR-BU2-15K FR-BR-15K [10B]	FR-BU2-30K FR-BR-30K [15B]	15K [15B]	15K [15B]	15K [15B]	30K [15B]

(3) FR-F720 and FR-F720P（when connected with a standard or geared motor）

Motor capacity	INV capacity	Built-in brake	FR-BU2				FR-RC	FR-CV	FR-HC	
			GZG/GRZG		FR-BR					
0.75kW	0.75K	Capacitor regeneration [02B]	FR-BU2-1.5K GZG300W50Ω [12B]	-	-	-	-	7.5K [12B]	7.5K [12B]	-
	1.5K	Capacitor regeneration [02V]	FR-BU2-1.5K GZG300W50Ω [17V]	-	-	-	-	7.5K [17V]	7.5K [17V]	-
1.5kW	1.5K	Capacitor regeneration [02B]	FR-BU2-1.5K GZG300W50Ω [12B]	-	-	-	-	7.5K [12B]	7.5K [12B]	-
	2.2K	Capacitor regeneration [02V]	FR-BU2-3.7K Three GRZG200-10Ω in series [17V]	-	-	-	-	7.5K [17V]	7.5K [17V]	-
2.2kW	2.2K	Capacitor regeneration [02B]	FR-BU2-3.7K Three GRZG200-10Ω in series [12B]	-	-	-	-	7.5K [12B]	7.5K [12B]	-
	3.7K	Capacitor regeneration [02V]	FR-BU2-3.7K Three GRZG200-10Ω in series [17V]	FR-BU2-7.5K Four GRZG300-5Ω in series [17V]	-	-	-	7.5K [17V]	7.5K [17V]	-
3.7kW	3.7K	Capacitor regeneration [02B]	FR-BU2-3.7K Three GRZG200-10Ω in series [12B]	FR-BU2-7.5K Four GRZG300-5Ω in series [12B]	-	-	-	7.5K [12B]	7.5K [12B]	-
	5.5K	Capacitor regeneration [02V]	FR-BU2-7.5K Four GRZG300-5Ω in series [17V]	FR-BU2-15K Six GRZG400-2Ω in series [17V]	-	-	-	7.5K [17V]	7.5K [17V]	-
5.5kW	5.5K	Capacitor regeneration [02B]	FR-BU2-7.5K Four GRZG300-5Ω in series [12B]	FR-BU2-15K Six GRZG400-2Ω in series [12B]	-	-	-	7.5K [12B]	7.5K [12B]	-
	7.5K	Capacitor regeneration [02V]	FR-BU2-7.5K Four GRZG300-5Ω in series [12V]	FR-BU2-15K Six GRZG400-2Ω in series[16V]	FR-BU2-15K FR-BR-15K [16V]	-	15K [16V]	7.5K [16V]	7.5K [16V]	15K [16V]
7.5kW	7.5K	Capacitor regeneration [02B]	FR-BU2-7.5K Four GRZG300-5Ω in series [10B]	FR-BU2-15K Six GRZG400-2Ω in series [12B]	FR-BU2-15K FR-BR-15K [12B]	-	15K [12B]	7.5K [12B]	7.5K [12B]	15K [12B]
	11K	Capacitor regeneration [02V]	FR-BU2-15K Six GRZG400-2Ω in series [15V]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [16V]	FR-BU2-15K FR-BR-15K [16V]	-	15K [16V]	11K [16V]	15K [16V]	-
11kW	11K	Capacitor regeneration [02B]	FR-BU2-15K Six GRZG400-2Ω in series [10B]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12B]	FR-BU2-15K FR-BR-15K [12B]	-	15K [12B]	11K [12B]	15K [12B]	-
	15K	Capacitor regeneration [02V]	FR-BU2-15K Six GRZG400-2Ω in series [10V]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [15V]	FR-BU2-15K FR-BR-15K [15V]	FR-BU2-30K FR-BR-30K [15V]	15K [15V]	15K [15V]	15K [15V]	30K [15V]

Motor capacity	INV capacity	Built-in brake	FR-BU2				FR-RC	FR-CV	FR-HC	
			GZG/GRZG		FR-BR					
15kW	15K	Capacitor regeneration [02B]	FR-BU2-15K Six GRZG400-2Ω in series [07B]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12B]	FR-BU2-15K FR-BR-15K [10B]	FR-BU2-30K FR-BR-30K [12B]	15K [12B]	15K [12B]	15K [12B]	30K [12B]
	18.5K	Capacitor regeneration [02V]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [15V]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [15V]	FR-BU2-30K FR-BR-30K [15V]	-	30K [15V]	22K [15V]	30K [15V]	-
18.5kW	18.5K	Capacitor regeneration [02B]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12B]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [12B]	FR-BU2-30K FR-BR-30K [12B]	-	30K [12B]	22K [12B]	30K [12B]	-
	22K	Capacitor regeneration [02V]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12V]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [15V]	FR-BU2-30K FR-BR-30K [15V]	-	30K [15V]	22K [15V]	30K [15V]	-
22kW	22K	Capacitor regeneration [02B]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [10B]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [12B]	FR-BU2-30K FR-BR-30K [12B]	-	30K [12B]	22K [12B]	30K [12B]	-
	30K	Capacitor regeneration [02V]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [10V]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [15V]	FR-BU2-30K FR-BR-30K [15V]	FR-BU2-55K FR-BR-55K [15V]	30K [15V]	30K [15V]	30K [15V]	55K [15V]
30kW	30K	Capacitor regeneration [02B]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [07B]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [10B]	FR-BU2-30K FR-BR-30K [10B]	FR-BU2-55K FR-BR-55K [12B]	30K [12B]	30K [12B]	30K [12B]	55K [12B]
	37K	Capacitor regeneration [02V]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [10V]	-	FR-BU2-55K FR-BR-55K [15V]	-	55K [15V]	37K [15V]	55K [15V]	-
37kW	37K	Capacitor regeneration [02B]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [09B]	-	FR-BU2-55K FR-BR-55K [12B]	-	55K [12B]	37K [12B]	55K [12B]	-
	45K	Capacitor regeneration [02V]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [09V]	-	FR-BU2-55K FR-BR-55K [15V]	-	55K [15V]	55K [15V]	55K [15V]	-
45kW	45K	Capacitor regeneration [02B]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [07B]	-	FR-BU2-55K FR-BR-55K [12B]	-	55K [12B]	55K [12B]	55K [12B]	-
	55K	Capacitor regeneration [02V]	-	-	FR-BU2-55K FR-BR-55K [15V]	-	55K [15V]	55K [15V]	55K [15V]	-
55kW	55K	Capacitor regeneration [02B]	-	-	FR-BU2-55K FR-BR-55K [12B]	-	55K [12B]	55K [12B]	55K [12B]	-

75K or more

Motor capacity	INV capacity	Built-in brake	FR-BU2	
			MT-BR5	
55kW	75K	Capacitor regeneration [01V]	FR-BU2-55K MT-BR5-55K [12V]	2×FR-BU2-55K 2×MT-BR5-55K [17V]
75kW	75K	Capacitor regeneration [01B]	FR-BU2-55K MT-BR5-55K [09B]	2×FR-BU2-55K 2×MT-BR5-55K [13B]
	90K	Capacitor regeneration [01V]	FR-BU2-55K MT-BR5-55K [09V]	2×FR-BU2-55K 2×MT-BR5-55K [16V]
90kW	90K	Capacitor regeneration [01B]	FR-BU2-55K MT-BR5-55K [07B]	2×FR-BU2-55K 2×MT-BR5-55K [13B]
	110K	Capacitor regeneration [01V]	FR-BU2-55K MT-BR5-55K [07V]	2×FR-BU2-55K 2×MT-BR5-55K [15V]
110kW	110K	Capacitor regeneration [01B]	FR-BU2-55K MT-BR5-55K [06B]	2×FR-BU2-55K 2×MT-BR5-55K [12B]

(4) FR-A720

Motor capacity	INV capacity	Built-in brake	FR-ABR	FR-BU2				FR-RC	FR-CV	FR-HC	
				GZG/GRZG		FR-BR					
0.4kW	0.4K	2A type [15B]	0.4K [15B]	FR-BU2-1.5K GZG300W50Ω [15B]	-	-	-	-	7.5K [15B]	7.5K [15B]	-
	0.75K	2B type [20V]	0.75K [20V]	FR-BU2-1.5K GZG300W50Ω [20V]	-	-	-	-	7.5K [20V]	7.5K [20V]	-
0.75kW	0.75K	2B type [15B]	0.75K [15B]	FR-BU2-1.5K GZG300W50Ω [15B]	-	-	-	-	7.5K [15B]	7.5K [15B]	-
	1.5K	2C type [20V]	2.2K [20V]	FR-BU2-1.5K GZG300W50Ω [20V]	FR-BU2-3.7K Three GRZG200-10Ω in series [20V]	-	-	-	7.5K [20V]	7.5K [20V]	-
1.5kW	1.5K	2C type [15B]	2.2K [15B]	FR-BU2-1.5K GZG300W50Ω [15B]	FR-BU2-3.7K Three GRZG200-10Ω in series [15B]	-	-	-	7.5K [15B]	7.5K [15B]	-
	2.2K	2C type [15V]	2.2K [15V]	FR-BU2-3.7K Three GRZG200-10Ω in series [20V]	FR-BU2-7.5K Four GRZG300-5Ω in series [20V]	-	-	-	7.5K [20V]	7.5K [20V]	-
2.2kW	2.2K	2C type [10B]	2.2K [10B]	FR-BU2-3.7K Three GRZG200-10Ω in series [15B]	FR-BU2-7.5K Four GRZG300-5Ω in series [15B]	-	-	-	7.5K [15B]	7.5K [15B]	-
	3.7K	2D type [15V]	3.7K [15V]	FR-BU2-3.7K Three GRZG200-10Ω in series [20V]	FR-BU2-7.5K Four GRZG300-5Ω in series [20V]	-	-	-	7.5K [20V]	7.5K [20V]	-
3.7kW	3.7K	2D type [10B]	3.7K [10B]	FR-BU2-3.7K Three GRZG200-10Ω in series [12B]	FR-BU2-7.5K Four GRZG300-5Ω in series [15B]	-	-	-	7.5K [15B]	7.5K [15B]	-
	5.5K	2E type [15V]	5.5K [15V]	FR-BU2-7.5K Four GRZG300-5Ω in series [18V]	FR-BU2-15K Six GRZG400-2Ω in series [20V]	FR-BU2-15K FR-BR-15K [20V]	-	-	7.5K [20V]	7.5K [20V]	-
5.5kW	5.5K	2E type [10B]	5.5K [10B]	FR-BU2-7.5K Four GRZG300-5Ω in series [12B]	FR-BU2-15K Six GRZG400-2Ω in series [15B]	FR-BU2-15K FR-BR-15K [15B]	-	-	7.5K [15B]	7.5K [15B]	-
	7.5K	2F type [12V]	7.5K [12V]	FR-BU2-7.5K Four GRZG300-5Ω in series [12V]	FR-BU2-15K Six GRZG400-2Ω in series [20V]	FR-BU2-15K FR-BR-15K [20V]	-	15K [20V]	7.5K [20V]	7.5K [20V]	15K [20V]
7.5kW	7.5K	2F type [10B]	7.5K [10B]	FR-BU2-7.5K Four GRZG300-5Ω in series [10B]	FR-BU2-15K Six GRZG400-2Ω in series [15B]	FR-BU2-15K FR-BR-15K [15B]	-	15K [15B]	7.5K [15B]	7.5K [15B]	15K [15B]
	11K	Capacitor regeneration [02V]	11K [14V]	FR-BU2-15K Six GRZG400-2Ω in series [15V]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [20V]	FR-BU2-15K FR-BR-15K [20V]	FR-BU2-30K FR-BR-30K [20V]	15K [20V]	11K [20V]	15K [20V]	-

Motor capacity	INV capacity	Built-in brake	FR-ABR	FR-BU2				FR-RC	FR-CV	FR-HC	
				GZG/GRZG		FR-BR					
11kW	11K	Capacitor regeneration [02B]	11K [10B]	FR-BU2-15K Six GRZG400-2Ω in series [10B]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [15B]	FR-BU2-15K FR-BR-15K [15B]	FR-BU2-30K FR-BR-30K [15B]	15K [15B]	11K [15B]	15K [15B]	-
	15K	Capacitor regeneration [02V]	Two 15K in parallel [14V]	FR-BU2-15K Six GRZG400-2Ω in series [10V]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [20V]	FR-BU2-15K FR-BR-15K [15V]	FR-BU2-30K FR-BR-30K [20V]	15K [20V]	15K [20V]	15K [20V]	30K [20V]
15kW	15K	Capacitor regeneration [02B]	Two 15K in parallel [10B]	FR-BU2-15K Six GRZG400-2Ω in series [07B]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [15B]	FR-BU2-15K FR-BR-15K [10B]	FR-BU2-30K FR-BR-30K [15B]	15K [15B]	15K [15B]	15K [15B]	30K [15B]
	18.5K	Capacitor regeneration [02V]	Two 22K in parallel [14V]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [15V]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [20V]	FR-BU2-30K FR-BR-30K [20V]	-	30K [20V]	22K [20V]	30K [20V]	-
18.5kW	18.5K	Capacitor regeneration [02B]	Two 22K in parallel [11B]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12B]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [15B]	FR-BU2-30K FR-BR-30K [15B]	-	30K [15B]	22K [15B]	30K [15B]	-
	22K	Capacitor regeneration [02V]	Two 22K in parallel [11V]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12V]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [18V]	FR-BU2-30K FR-BR-30K [18V]	FR-BU2-55K FR-BR-55K [20V]	30K [20V]	22K [17V]	30K [20V]	-
22kW	22K	Capacitor regeneration [02B]	Two 22K in parallel [10B]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [10B]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [15B]	FR-BU2-30K FR-BR-30K [15B]	FR-BU2-55K FR-BR-55K [15B]	30K [15B]	22K [15B]	30K [15B]	-
	30K	Capacitor regeneration [02V]	-	2×FR-BU2-15K 2×six GRZG400-2Ω in series [10V]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [15V]	FR-BU2-30K FR-BR-30K [15V]	FR-BU2-55K FR-BR-55K [20V]	30K [20V]	30K [20V]	30K [20V]	55K [20V]
30kW	30K	Capacitor regeneration [02B]	-	2×FR-BU2-15K 2×six GRZG400-2Ω in series [07B]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [10B]	FR-BU2-30K FR-BR-30K [10B]	FR-BU2-55K FR-BR-55K [15B]	30K [15B]	30K [15B]	30K [15B]	55K [15B]
	37K	Capacitor regeneration [02V]	-	3×FR-BU2-15K 3×six GRZG400-2Ω in series [10V]	-	FR-BU2-55K FR-BR-55K [20V]	-	55K [20V]	37K [18V]	55K [20V]	-
37kW	37K	Capacitor regeneration [02B]	-	3×FR-BU2-15K 3×six GRZG400-2Ω in series [09B]	-	FR-BU2-55K FR-BR-55K [15B]	-	55K [15B]	37K [15B]	55K [15B]	-
	45K	Capacitor regeneration [02V]	-	3×FR-BU2-15K 3×six GRZG400-2Ω in series [09V]	-	FR-BU2-55K FR-BR-55K [18V]	-	55K [20V]	55K [20V]	55K [20V]	-
45kW	45K	Capacitor regeneration [02B]	-	3×FR-BU2-15K 3×six GRZG400-2Ω in series [07B]	-	FR-BU2-55K FR-BR-55K [15B]	-	55K [15B]	55K [15B]	55K [15B]	-
	55K	Capacitor regeneration [02V]	-	-	-	FR-BU2-55K FR-BR-55K [15V]	-	55K [18V]	55K [18V]	55K [18V]	-
55kW	55K	Capacitor regeneration [02B]	-	-	-	FR-BU2-55K FR-BR-55K [12B]	-	55K [15B]	55K [15B]	55K [15B]	-

75K or more

Motor capacity	INV capacity	Built-in brake	FR-BU2 / MT-BR5	
55kW	75K	Capacitor regeneration [01V]	FR-BU2-55K MT-BR5-55K [12V]	2×FR-BU2-55K 2×MT-BR5-55K [20V]
75kW	75K	Capacitor regeneration [01B]	FR-BU2-55K MT-BR5-55K [09B]	2×FR-BU2-55K 2×MT-BR5-55K [15B]
	90K	Capacitor regeneration [01V]	FR-BU2-55K MT-BR5-55K [09V]	2×FR-BU2-55K 2×MT-BR5-55K [18V]
90kW	90K	Capacitor regeneration [01B]	FR-BU2-55K MT-BR5-55K [07B]	2×FR-BU2-55K 2×MT-BR5-55K [15B]

(5) FR-D740

Motor capacity	INV capacity	Built-in brake	FR-ABR	FR-BU2				FR-RC	FR-CV	FR-HC	
				GZG/GRZG		FR-BR					
0.4kW	0.4K	Capacitor regeneration [05B]	H0.4K [10B]	-	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	0.75K	Capacitor regeneration [05V]	H0.75K [18V]	-	-	-	-	-	H7.5K [20V]	H7.5K [20V]	-
0.75kW	0.75K	Capacitor regeneration [05B]	H0.75K [10B]	-	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	1.5K	Capacitor regeneration [05V]	H1.5K [20V]	-	-	-	-	-	H7.5K [20V]	H7.5K [20V]	-
1.5kW	1.5K	Capacitor regeneration [02B]	H1.5K [10B]	-	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	2.2K	Capacitor regeneration [02V]	H2.2K [15V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [20V]	-	-	-	-	H7.5K [20V]	H7.5K [20V]	-
2.2kW	2.2K	Capacitor regeneration [02B]	H2.2K [10B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [15B]	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	3.7K	Capacitor regeneration [02V]	H3.7K [15V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [20V]	-	-	-	-	H7.5K [20V]	H7.5K [20V]	-
3.7kW	3.7K	Capacitor regeneration [02B]	H3.7K [10B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [15B]	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	5.5K	Capacitor regeneration [02V]	H5.5K [15V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [20V]	FR-BU2-H15K Eight GRZG300-5Ω in series [20V]	FR-BU2-H15K FR-BR-H15K [20V]	-	-	H7.5K [20V]	H7.5K [20V]	-
5.5kW	5.5K	Capacitor regeneration [02B]	H5.5K [10B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [15B]	FR-BU2-H15K Eight GRZG300-5Ω in series [15B]	FR-BU2-H15K FR-BR-H15K [15B]	-	-	H7.5K [15B]	H7.5K [15B]	-
	7.5K	Capacitor regeneration [02V]	H7.5K [15V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [15V]	FR-BU2-H15K Eight GRZG300-5Ω in series [20V]	FR-BU2-H15K FR-BR-H15K [20V]	-	H15K [20V]	H7.5K [20V]	H7.5K [20V]	H15K [20V]
7.5kW	7.5K	Capacitor regeneration [02B]	H7.5K [10B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [12B]	FR-BU2-H15K Eight GRZG300-5Ω in series [15B]	FR-BU2-H15K FR-BR-H15K [15B]	-	H15K [15B]	H7.5K [15B]	H7.5K [15B]	H15K [15B]
	11K	Capacitor regeneration [02V]	H11K [14V]	FR-BU2-H15K Eight GRZG300-5Ω in series [18V]	FR-BU2-H30K Twelve GRZG400-2Ω in series [20V]	FR-BU2-H15K FR-BR-H15K [20V]	FR-BU2-H30K FR-BR-H30K [20V]	H15K [20V]	H11K [20V]	H15K [20V]	-
11kW	11K	Capacitor regeneration [02B]	H11K [10B]	FR-BU2-H15K Eight GRZG300-5Ω in series [12B]	FR-BU2-H30K Twelve GRZG400-2Ω in series [15B]	FR-BU2-H15K FR-BR-H15K [15B]	FR-BU2-H30K FR-BR-H30K [15B]	H15K [15B]	H11K [15B]	H15K [15B]	-
	15K	Capacitor regeneration [02V]	Two H15K in series [14V]	FR-BU2-H15K Eight GRZG300-5Ω in series [12V]	FR-BU2-H30K Twelve GRZG400-2Ω in series [20V]	FR-BU2-H15K FR-BR-H15K [15V]	FR-BU2-H30K FR-BR-H30K [20V]	H15K [20V]	H15K [20V]	H15K [20V]	H30K [20V]
15kW	15K	Capacitor regeneration [02B]	Two H15K in series [10B]	FR-BU2-H15K Eight GRZG300-5Ω in series [09B]	FR-BU2-H30K Twelve GRZG400-2Ω in series [15B]	FR-BU2-H15K FR-BR-H15K [10B]	FR-BU2-H30K FR-BR-H30K [15B]	H15K [15B]	H15K [15B]	H15K [15B]	H30K [15B]

(6) FR-E740

Motor capacity	INV capacity	Built-in brake	FR-ABR	FR-BU2				FR-RC	FR-CV	FR-HC	
				GZG/GRZG		FR-BR					
0.4kW	0.4K	Capacitor regeneration [05B]	H0.4K [10B]	-	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	0.75K	Capacitor regeneration [05V]	H0.75K [18V]	-	-	-	-	-	H7.5K [20V]	H7.5K [20V]	-
0.75kW	0.75K	Capacitor regeneration [05B]	H0.75K [10B]	-	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	1.5K	Capacitor regeneration [05V]	H1.5K [20V]	-	-	-	-	-	H7.5K [20V]	H7.5K [20V]	-
1.5kW	1.5K	Capacitor regeneration [02B]	H1.5K [10B]	-	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	2.2K	Capacitor regeneration [02V]	H2.2K [15V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [20V]	-	-	-	-	H7.5K [20V]	H7.5K [20V]	-
2.2kW	2.2K	Capacitor regeneration [02B]	H2.2K [10B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [15B]	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	3.7K	Capacitor regeneration [02V]	H3.7K [15V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [20V]	-	-	-	-	H7.5K [20V]	H7.5K [20V]	-
3.7kW	3.7K	Capacitor regeneration [02B]	H3.7K [10B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [15B]	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	5.5K	Capacitor regeneration [02V]	H5.5K [15V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [20V]	FR-BU2-H15K Eight GRZG300-5Ω in series [20V]	FR-BU2-H15K FR-BR-H15K [20V]	-	-	H7.5K [20V]	H7.5K [20V]	-
5.5kW	5.5K	Capacitor regeneration [02B]	H5.5K [10B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [15B]	FR-BU2-H15K Eight GRZG300-5Ω in series [15B]	FR-BU2-H15K FR-BR-H15K [15B]	-	-	H7.5K [15B]	H7.5K [15B]	-
	7.5K	Capacitor regeneration [02V]	H7.5K [15V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [15V]	FR-BU2-H15K Eight GRZG300-5Ω in series [20V]	FR-BU2-H15K FR-BR-H15K [20V]	-	H15K [20V]	H7.5K [20V]	H7.5K [20V]	H15K [20V]
7.5kW	7.5K	Capacitor regeneration [02B]	H7.5K [10B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [12B]	FR-BU2-H15K Eight GRZG300-5Ω in series [15B]	FR-BU2-H15K FR-BR-H15K [15B]	-	H15K [15B]	H7.5K [15B]	H7.5K [15B]	H15K [15B]
	11K	Capacitor regeneration [02V]	H11K [14V]	FR-BU2-H15K Eight GRZG300-5Ω in series [18V]	FR-BU2-H30K Twelve GRZG400-2Ω in series [20V]	FR-BU2-H15K FR-BR-H15K [20V]	FR-BU2-H30K FR-BR-H30K [20V]	H15K [20V]	H11K [20V]	H15K [20V]	-
11kW	11K	Capacitor regeneration [02B]	H11K [10B]	FR-BU2-H15K Eight GRZG300-5Ω in series [12B]	FR-BU2-H30K Twelve GRZG400-2Ω in series [15B]	FR-BU2-H15K FR-BR-H15K [15B]	FR-BU2-H30K FR-BR-H30K [15B]	H15K [15B]	H11K [15B]	H15K [15B]	-
	15K	Capacitor regeneration [02V]	Two H15K in series [14V]	FR-BU2-H15K Eight GRZG300-5Ω in series [12V]	FR-BU2-H30K Twelve GRZG400-2Ω in series [20V]	FR-BU2-H15K FR-BR-H15K [15V]	FR-BU2-H30K FR-BR-H30K [20V]	H15K [20V]	H15K [20V]	H15K [20V]	H30K [20V]
15kW	15K	Capacitor regeneration [02B]	Two H15K in series [10B]	FR-BU2-H15K Eight GRZG300-5Ω in series [09B]	FR-BU2-H30K Twelve GRZG400-2Ω in series [15B]	FR-BU2-H15K FR-BR-H15K [10B]	FR-BU2-H30K FR-BR-H30K [15B]	H15K [15B]	H15K [15B]	H15K [15B]	H30K [15B]

(7) FR-F740 and FR-F740P（when connected with a standard or geared motor）

Motor capacity	INV capacity	Built-in brake	FR-BU2				FR-RC	FR-CV	FR-HC	
			GZG/GRZG		FR-BR					
0.75kW	0.75K	Capacitor regeneration [02B]	-	-	-	-	-	H7.5K [12B]	H7.5K [12B]	-
	1.5K	Capacitor regeneration [02V]	-	-	-	-	-	H7.5K [17V]	H7.5K [17V]	-
1.5kW	1.5K	Capacitor regeneration [02B]	-	-	-	-	-	H7.5K [12B]	H7.5K [12B]	-
	2.2K	Capacitor regeneration [02V]	-	-	-	-	-	H7.5K [17V]	H7.5K [17V]	-
2.2kW	2.2K	Capacitor regeneration [02B]	-	-	-	-	-	H7.5K [12B]	H7.5K [12B]	-
	3.7K	Capacitor regeneration [02V]	FR-BU2-H7.5K Six GRZG200-10Ω in series[17V]	-	-	-	-	H7.5K [17V]	H7.5K [17V]	-
3.7kW	3.7K	Capacitor regeneration [02B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [12B]	-	-	-	-	H7.5K [12B]	H7.5K [12B]	-
	5.5K	Capacitor regeneration [02V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [17V]	FR-BU2-H15K Eight GRZG300-5Ω in series [17V]	-	-	-	H7.5K [17V]	H7.5K [17V]	-
5.5kW	5.5K	Capacitor regeneration [02B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [12B]	FR-BU2-H15K Eight GRZG300-5Ω in series [12B]	-	-	-	H7.5K [12B]	H7.5K [12B]	-
	7.5K	Capacitor regeneration [02V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [15V]	FR-BU2-H15K Eight GRZG300-5Ω in series [16V]	FR-BU2-H15K FR-BR-H15K [16V]	-	H15K [16V]	H7.5K [16V]	H7.5K [16V]	H15K [16V]
7.5kW	7.5K	Capacitor regeneration [02B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [12B]	FR-BU2-H15K Eight GRZG300-5Ω in series [12B]	FR-BU2-H15K FR-BR-H15K [12B]	-	H15K [12B]	H7.5K [12B]	H7.5K [12B]	H15K [12B]
	11K	Capacitor regeneration [02V]	FR-BU2-H15K Eight GRZG300-5Ω in series [16V]	FR-BU2-H30K Twelve GRZG400-2Ω in series [16V]	FR-BU2-H15K FR-BR-H15K [16V]	-	H15K [16V]	H11K [16V]	H15K [16V]	-
11kW	11K	Capacitor regeneration [02B]	FR-BU2-H15K Eight GRZG300-5Ω in series [12B]	FR-BU2-H30K Twelve GRZG400-2Ω in series [12B]	FR-BU2-H15K FR-BR-H15K [12B]	-	H15K [12B]	H11K [12B]	H15K [12B]	-
	15K	Capacitor regeneration [02V]	FR-BU2-H15K Eight GRZG300-5Ω in series [12V]	FR-BU2-H30K Twelve GRZG400-2Ω in series [15V]	FR-BU2-H15K FR-BR-H15K [15V]	FR-BU2-H30K FR-BR-H30K [15V]	H15K [15V]	H15K [15V]	H15K [15V]	H30K [15V]

Motor capacity	INV capacity	Built-in brake	FR-BU2				FR-RC	FR-CV	FR-HC	
			GZG/GRZG		FR-BR					
15kW	15K	Capacitor regeneration [02B]	FR-BU2-H15K Eight GRZG300-5Ω in series [09B]	FR-BU2-H30K Twelve GRZG400-2Ω in series [12B]	FR-BU2-H15K FR-BR-H15K [10B]	FR-BU2-H30K FR-BR-H30K [12B]	H15K [12B]	H15K [12B]	H15K [12B]	H30K [12B]
	18.5K	Capacitor regeneration [02V]	FR-BU2-H30K Twelve GRZG400-2Ω in series [15V]	-	FR-BU2-H30K FR-BR-H30K [15V]	-	H30K [15V]	H22K [15V]	H30K [15V]	-
18.5kW	18.5K	Capacitor regeneration [02B]	FR-BU2-H30K Twelve GRZG400-2Ω in series [12B]	-	FR-BU2-H30K FR-BR-H30K [12B]	-	H30K [12B]	H22K [12B]	H30K [12B]	-
	22K	Capacitor regeneration [02V]	FR-BU2-H30K Twelve GRZG400-2Ω in series [12V]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [15V]	FR-BU2-H30K FR-BR-H30K [15V]	-	H30K [15V]	H22K [15V]	H30K [15V]	-
22kW	22K	Capacitor regeneration [02B]	FR-BU2-H30K Twelve GRZG400-2Ω in series [10B]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [12B]	FR-BU2-H30K FR-BR-H30K [12B]	-	H30K [12B]	H22K [12B]	H30K [12B]	-
	30K	Capacitor regeneration [02V]	FR-BU2-H30K Twelve GRZG400-2Ω in series [10V]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [15V]	FR-BU2-H30K FR-BR-H30K [15V]	FR-BU2-H55K FR-BR-H55K [15V]	H30K [15V]	H30K [15V]	H30K [15V]	H55K [15V]
30kW	30K	Capacitor regeneration [02B]	FR-BU2-H30K Twelve GRZG400-2Ω in series [07B]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [12B]	FR-BU2-H30K FR-BR-H30K [10B]	FR-BU2-H55K FR-BR-H55K [12B]	H30K [12B]	H30K [12B]	H30K [12B]	H55K [12B]
	37K	Capacitor regeneration [02V]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [15V]	3×FR-BU2-H30K 3×twelve GRZG400-2Ω in series [15V]	FR-BU2-H55K FR-BR-H55K [15V]	-	H55K [15V]	H37K [15V]	H55K [15V]	-
37kW	37K	Capacitor regeneration [02B]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [12B]	3×FR-BU2-H30K 3×twelve GRZG400-2Ω in series [12B]	FR-BU2-H55K FR-BR-H55K [12B]	-	H55K [12B]	H37K [12B]	H55K [12B]	-
	45K	Capacitor regeneration [02V]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [12V]	3×FR-BU2-H30K 3×twelve GRZG400-2Ω in series [15V]	FR-BU2-H55K FR-BR-H55K [15V]	-	H55K [15V]	H55K [15V]	H55K [15V]	-
45kW	45K	Capacitor regeneration [02B]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [10B]	3×FR-BU2-H30K 3×twelve GRZG400-2Ω in series [12B]	FR-BU2-H55K FR-BR-H55K [12B]	-	H55K [12B]	H55K [12B]	H55K [12B]	-
	55K	Capacitor regeneration [02V]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [10V]	-	FR-BU2-H55K FR-BR-H55K [15V]	-	H55K [15V]	H55K [15V]	H55K [15V]	-

Motor capacity	INV capacity	Built-in brake	FR-BU2				FR-RC	FR-CV	FR-HC	
			GZG/GRZG		FR-BR					
55kW	55K	Capacitor regeneration [02B]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [08B]	-	FR-BU2-H55K FR-BR-H55K [12B]	-	H55K [12B]	H55K [12B]	H55K [12B]	-

75K or more

Motor capacity	INV capacity	Built-in brake	FR-BU2					MT-RC				MT-HC-S
			MT-BR5									
55kW	75K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [17V]	2×FR-BU2-H75K 2×MT-BR5-H75K [17V]	-	-	-	H75K [17V]	-	-	-	H75K [17V]
75kW	75K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [12B]	2×FR-BU2-H75K 2×MT-BR5-H75K [13B]	-	-	-	H75K [13B]	-	-	-	H75K [13B]
	90K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [12V]	2×FR-BU2-H75K 2×MT-BR5-H75K [16V]	-	-	-	H75K [15V]	H160K [16V]	-	-	H110K [16V]
90kW	90K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [10B]	2×FR-BU2-H75K 2×MT-BR5-H75K [14B]	-	-	-	H75K [12B]	H160K [14B]	-	-	H110K [14B]
	110K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [10V]	2×FR-BU2-H75K 2×MT-BR5-H75K [17V]	-	-	-	H75K [12V]	H160K [17V]	-	-	H110K [17V]
110kW	110K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [08B]	2×FR-BU2-H75K 2×MT-BR5-H75K [14B]	3×FR-BU2-H75K 3×MT-BR5-H75K [14B]	-	-	H75K [10B]	H160K [14B]	-	-	H110K [14B]
	132K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [08V]	2×FR-BU2-H75K 2×MT-BR5-H75K [17V]	3×FR-BU2-H75K 3×MT-BR5-H75K [17V]	-	-	H75K [10V]	H160K [17V]	-	-	H150K [17V]
132kW	132K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [07B]	2×FR-BU2-H75K 2×MT-BR5-H75K [14B]	3×FR-BU2-H75K 3×MT-BR5-H75K [14B]	-	-	H75K [08B]	H160K [14B]	-	-	H150K [14B]
	160K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [07V]	2×FR-BU2-H75K 2×MT-BR5-H75K [14V]	3×FR-BU2-H75K 3×MT-BR5-H75K [17V]	-	-	H75K [08V]	H160K [17V]	-	-	H150K [17V]
150kW	160K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [06B]	2×FR-BU2-H75K 2×MT-BR5-H75K [12B]	3×FR-BU2-H75K 3×MT-BR5-H75K [16B]	4×FR-BU2-H75K 4×MT-BR5-H75K [16B]	-	H75K [07B]	H160K [16B]	-	-	H150K [15B]
	185K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [06V]	2×FR-BU2-H75K 2×MT-BR5-H75K [12V]	3×FR-BU2-H75K 3×MT-BR5-H75K [17V]	4×FR-BU2-H75K 4×MT-BR5-H75K [17V]	-	H75K [07V]	H160K [16V]	-	-	H220K [15V]
160kW	160K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [05B]	2×FR-BU2-H75K 2×MT-BR5-H75K [11B]	3×FR-BU2-H75K 3×MT-BR5-H75K [15B]	4×FR-BU2-H75K 4×MT-BR5-H75K [15B]	-	H75K [07B]	H160K [15B]	-	-	H220K [15B]
	185K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [05V]	2×FR-BU2-H75K 2×MT-BR5-H75K [11V]	3×FR-BU2-H75K 3×MT-BR5-H75K [16V]	4×FR-BU2-H75K 4×MT-BR5-H75K [16V]	-	H75K [07V]	H160K [15V]	-	-	H220K [16V]
185kW	185K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [05B]	2×FR-BU2-H75K 2×MT-BR5-H75K [10B]	3×FR-BU2-H75K 3×MT-BR5-H75K [14B]	4×FR-BU2-H75K 4×MT-BR5-H75K [14B]	-	H75K [06B]	H160K [13B]	H220K [14B]	-	H220K [14B]
	220K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [05V]	2×FR-BU2-H75K 2×MT-BR5-H75K [10V]	3×FR-BU2-H75K 3×MT-BR5-H75K [15V]	4×FR-BU2-H75K 4×MT-BR5-H75K [17V]	-	H75K [06V]	H160K [13V]	H220K [17V]	-	H220K [17V]
200kW	220K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [04B]	2×FR-BU2-H75K 2×MT-BR5-H75K [09B]	3×FR-BU2-H75K 3×MT-BR5-H75K [14B]	4×FR-BU2-H75K 4×MT-BR5-H75K [16B]	5×FR-BU2-H75K 5×MT-BR5-H75K [16B]	H75K [05B]	H160K [12B]	H220K [16B]	-	H220K [16B]
	250K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [04V]	2×FR-BU2-H75K 2×MT-BR5-H75K [09V]	3×FR-BU2-H75K 3×MT-BR5-H75K [14V]	4×FR-BU2-H75K 4×MT-BR5-H75K [17V]	5×FR-BU2-H75K 5×MT-BR5-H75K [17V]	H75K [05V]	H160K [12V]	H220K [16V]	-	-

Motor capacity	INV capacity	Built-in brake	FR-BU2 / MT-BR5					MT-RC				MT-HC-S
220kW	220K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [04B]	2×FR-BU2-H75K 2×MT-BR5-H75K [08B]	3×FR-BU2-H75K 3×MT-BR5-H75K [12B]	4×FR-BU2-H75K 4×MT-BR5-H75K [14B]	5×FR-BU2-H75K 5×MT-BR5-H75K [14B]	H75K [05B]	H160K [10B]	H220K [14B]	-	H220K [14B]
	250K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [04V]	2×FR-BU2-H75K 2×MT-BR5-H75K [08V]	3×FR-BU2-H75K 3×MT-BR5-H75K [12V]	4×FR-BU2-H75K 4×MT-BR5-H75K [16V]	5×FR-BU2-H75K 5×MT-BR5-H75K [16V]	H75K [05V]	H160K [10V]	H220K [15V]	-	-
250kW	250K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [03B]	2×FR-BU2-H75K 2×MT-BR5-H75K [07B]	3×FR-BU2-H75K 3×MT-BR5-H75K [11B]	4×FR-BU2-H75K 4×MT-BR5-H75K [14B]	5×FR-BU2-H75K 5×MT-BR5-H75K [14B]	H75K [04B]	H160K [09B]	H220K [13B]	H280K [14B]	-
	280K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [03V]	2×FR-BU2-H75K 2×MT-BR5-H75K [07V]	3×FR-BU2-H75K 3×MT-BR5-H75K [11V]	4×FR-BU2-H75K 4×MT-BR5-H75K [15V]	5×FR-BU2-H75K 5×MT-BR5-H75K [16V]	H75K [04V]	H160K [09V]	H220K [13V]	H280K [16V]	-
280kW	280K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [03B]	2×FR-BU2-H75K 2×MT-BR5-H75K [06B]	3×FR-BU2-H75K 3×MT-BR5-H75K [10B]	4×FR-BU2-H75K 4×MT-BR5-H75K [13B]	5×FR-BU2-H75K 5×MT-BR5-H75K [14B]	H75K [04B]	H160K [08B]	H220K [11B]	H280K [14B]	-
	315K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [03V]	2×FR-BU2-H75K 2×MT-BR5-H75K [06V]	3×FR-BU2-H75K 3×MT-BR5-H75K [10V]	4×FR-BU2-H75K 4×MT-BR5-H75K [13V]	5×FR-BU2-H75K 5×MT-BR5-H75K [16V]	H75K [04V]	H160K [08V]	H220K [11V]	H280K [15V]	-
300kW	315K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [03B]	2×FR-BU2-H75K 2×MT-BR5-H75K [06B]	3×FR-BU2-H75K 3×MT-BR5-H75K [09B]	4×FR-BU2-H75K 4×MT-BR5-H75K [12B]	5×FR-BU2-H75K 5×MT-BR5-H75K [15B]	-	-	-	-	-
	355K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [03V]	2×FR-BU2-H75K 2×MT-BR5-H75K [06V]	3×FR-BU2-H75K 3×MT-BR5-H75K [09V]	4×FR-BU2-H75K 4×MT-BR5-H75K [12V]	5×FR-BU2-H75K 5×MT-BR5-H75K [15V]	-	-	-	-	-
315kW	315K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [03B]	2×FR-BU2-H75K 2×MT-BR5-H75K [06B]	3×FR-BU2-H75K 3×MT-BR5-H75K [09B]	4×FR-BU2-H75K 4×MT-BR5-H75K [11B]	5×FR-BU2-H75K 5×MT-BR5-H75K [14B]	-	-	-	-	-
	355K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [03V]	2×FR-BU2-H75K 2×MT-BR5-H75K [06V]	3×FR-BU2-H75K 3×MT-BR5-H75K [09V]	4×FR-BU2-H75K 4×MT-BR5-H75K [11V]	5×FR-BU2-H75K 5×MT-BR5-H75K [14V]	-	-	-	-	-
355kW	355K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [02B]	2×FR-BU2-H75K 2×MT-BR5-H75K [05B]	3×FR-BU2-H75K 3×MT-BR5-H75K [07B]	4×FR-BU2-H75K 4×MT-BR5-H75K [10B]	5×FR-BU2-H75K 5×MT-BR5-H75K [13B]	-	-	-	-	-
	400K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [02V]	2×FR-BU2-H75K 2×MT-BR5-H75K [05V]	3×FR-BU2-H75K 3×MT-BR5-H75K [07V]	4×FR-BU2-H75K 4×MT-BR5-H75K [10V]	5×FR-BU2-H75K 5×MT-BR5-H75K [13V]	-	-	-	-	-
400kW	400K	Capacitor regeneration [01B]	-	-	-	-	-	-	-	-	-	-
	450K	Capacitor regeneration [01V]	-	-	-	-	-	-	-	-	-	-
450kW	450K	Capacitor regeneration [01B]	-	-	-	-	-	-	-	-	-	-
	500K	Capacitor regeneration [01V]	-	-	-	-	-	-	-	-	-	-
500kW	500K	Capacitor regeneration [01B]	-	-	-	-	-	-	-	-	-	-
	560K	Capacitor regeneration [01V]	-	-	-	-	-	-	-	-	-	-
560kW	560K	Capacitor regeneration [01B]	-	-	-	-	-	-	-	-	-	-

* Characteristic data of the inverter capacity 75K or higher are the ones when combined with the standard motor SF-TH.

(8) FR-A740

Motor capacity	INV capacity	Built-in brake	FR-ABR	FR-BU2				FR-RC	FR-CV	FR-HC	
				GZG/GRZG		FR-BR					
0.4kW	0.4K	4A type [10B]	H0.4K [10B]	-	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	0.75K	4B type [18V]	H0.75K [18V]	-	-	-	-	-	H7.5K [20V]	H7.5K [20V]	-
0.75kW	0.75K	4B type [10B]	H0.75K [10B]	-	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	1.5K	4C type [20V]	H1.5K [20V]	-	-	-	-	-	H7.5K [20V]	H7.5K [20V]	-
1.5kW	1.5K	4C type [10B]	H1.5K [10B]	-	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	2.2K	4D type [15V]	H2.2K [15V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [20V]	-	-	-	-	H7.5K [20V]	H7.5K [20V]	-
2.2kW	2.2K	4D type [10B]	H2.2K [10B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [15B]	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	3.7K	4E type [15V]	H3.7K [15V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [20V]	-	-	-	-	H7.5K [20V]	H7.5K [20V]	-
3.7kW	3.7K	4E type [10B]	H3.7K [10B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [15B]	-	-	-	-	H7.5K [15B]	H7.5K [15B]	-
	5.5K	4F type [15V]	H5.5K [15V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [20V]	FR-BU2-H15K Eight GRZG300-5Ω in series [20V]	FR-BU2-H15K FR-BR-H15K [20V]	-	-	H7.5K [20V]	H7.5K [20V]	-
5.5kW	5.5K	4F type [13B]	H5.5K [10B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [15B]	FR-BU2-H15K Eight GRZG300-5Ω in series [15B]	FR-BU2-H15K FR-BR-H15K [15B]	-	-	H7.5K [15B]	H7.5K [15B]	-
	7.5K	4F type [15V]	H7.5K [15V]	FR-BU2-H7.5K Six GRZG200-10Ω in series [15V]	FR-BU2-H15K Eight GRZG300-5Ω in series [20V]	FR-BU2-H15K FR-BR-H15K [20V]	-	H15K [20V]	H7.5K [20V]	H7.5K [20V]	H15K [20V]
7.5kW	7.5K	4F type [10B]	H7.5K [10B]	FR-BU2-H7.5K Six GRZG200-10Ω in series [12B]	FR-BU2-H15K Eight GRZG300-5Ω in series [15B]	FR-BU2-H15K FR-BR-H15K [15B]	-	H15K [15B]	H7.5K [15B]	H7.5K [15B]	H15K [15B]
	11K	Capacitor regeneration [02V]	H11K [14V]	FR-BU2-H15K Eight GRZG300-5Ω in series [18V]	FR-BU2-H30K Twelve GRZG400-2Ω in series [20V]	FR-BU2-H15K FR-BR-H15K [20V]	FR-BU2-H30K FR-BR-H30K [20V]	H15K [20V]	H11K [20V]	H15K [20V]	-

Motor capacity	INV capacity	Built-in brake	FR-ABR	FR-BU2				FR-RC	FR-CV	FR-HC	
				GZG/GRZG		FR-BR					
11kW	11K	Capacitor regeneration [02B]	H11K [10B]	FR-BU2-H15K Eight GRZG300-5Ω in series [12B]	FR-BU2-H30K Twelve GRZG400-2Ω in series [15B]	FR-BU2-H15K FR-BR-H15K [15B]	FR-BU2-H30K FR-BR-H30K [15B]	H15K [15B]	H11K [15B]	H15K [15B]	-
	15K	Capacitor regeneration [02V]	Two H15K in series [14V]	FR-BU2-H15K Eight GRZG300-5Ω in series [12V]	FR-BU2-H30K Twelve GRZG400-2Ω in series [20V]	FR-BU2-H15K FR-BR-H15K [15V]	FR-BU2-H30K FR-BR-H30K [20V]	H15K [20V]	H15K [20V]	H15K [20V]	H30K [20V]
15kW	15K	Capacitor regeneration [02B]	Two H15K in series [10B]	FR-BU2-H15K Eight GRZG300-5Ω in series [09B]	FR-BU2-H30K Twelve GRZG400-2Ω in series [15B]	FR-BU2-H15K FR-BR-H15K [10B]	FR-BU2-H30K FR-BR-H30K [15B]	H15K [15B]	H15K [15B]	H15K [15B]	H30K [15B]
	18.5K	Capacitor regeneration [02V]	Two H22K in parallel [14V]	FR-BU2-H30K Twelve GRZG400-2Ω in series [15V]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [20V]	FR-BU2-H30K FR-BR-H30K [20V]	-	H30K [20V]	H22K [20V]	H30K [20V]	-
18.5kW	18.5K	Capacitor regeneration [02B]	Two H22K in parallel [11B]	FR-BU2-H30K Twelve GRZG400-2Ω in series [12B]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [15B]	FR-BU2-H30K FR-BR-H30K [15B]	-	H30K [15B]	H22K [15B]	H30K [15B]	-
	22K	Capacitor regeneration [02V]	Two H22K in parallel [11V]	FR-BU2-H30K Twelve GRZG400-2Ω in series [12V]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [20V]	FR-BU2-H30K FR-BR-H30K [18V]	-	H30K [20V]	H22K [17V]	H30K [20V]	-
22kW	22K	Capacitor regeneration [02B]	Two H22K in parallel [10B]	FR-BU2-H30K Twelve GRZG400-2Ω in series [10B]	2×FR-BU2-H30K 2× twelve GRZG400-2Ω in series [15B]	FR-BU2-H30K FR-BR-H30K [15B]	-	H30K [15B]	H22K [15B]	H30K [15B]	-
	30K	Capacitor regeneration [02V]	-	FR-BU2-H30K Twelve GRZG400-2Ω in series [10V]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [20V]	FR-BU2-H30K FR-BR-H30K [15V]	FR-BU2-H55K FR-BR-H55K [20V]	H30K [20V]	H30K [20V]	H30K [20V]	H55K [20V]
30kW	30K	Capacitor regeneration [02B]	-	FR-BU2-H30K Twelve GRZG400-2Ω in series [07B]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [15B]	FR-BU2-H30K FR-BR-H30K [10B]	FR-BU2-H55K FR-BR-H55K [15B]	H30K [15B]	H30K [15B]	H30K [15B]	H55K [15B]
	37K	Capacitor regeneration [02V]	-	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [15V]	3×FR-BU2-H30K 3×twelve GRZG400-2Ω in series [20V]	FR-BU2-H55K FR-BR-H55K [20V]	-	H55K [20V]	H37K [18V]	H55K [20V]	-
37kW	37K	Capacitor regeneration [02B]	-	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [12B]	3×FR-BU2-H30K 3×twelve GRZG400-2Ω in series [15B]	FR-BU2-H55K FR-BR-H55K [15B]	-	H55K [15B]	H37K [15B]	H55K [15B]	-
	45K	Capacitor regeneration [02V]	-	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [12V]	3×FR-BU2-H30K 3×twelve GRZG400-2Ω in series [18V]	FR-BU2-H55K FR-BR-H55K [18V]	-	H55K [20V]	H55K [20V]	H55K [20V]	-

Motor capacity	INV capacity	Built-in brake	FR-ABR	FR-BU2				FR-RC	FR-CV	FR-HC	
				GZG/GRZG		FR-BR					
45kW	45K	Capacitor regeneration [02B]	-	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [10B]	3×FR-BU2-H30K 3×twelve GRZG400-2Ω in series [15B]	FR-BU2-H55K FR-BR-H55K [15B]	-	H55K [15B]	H55K [15B]	H55K [15B]	-
	55K	Capacitor regeneration [02V]	-	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [10V]	-	FR-BU2-H55K FR-BR-H55K [15V]	-	H55K [18V]	H55K [18V]	H55K [18V]	-
55kW	55K	Capacitor regeneration [02B]	-	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [08B]	-	FR-BU2-H55K FR-BR-H55K [12B]	-	H55K [15B]	H55K [15B]	H55K [15B]	-

75K or more

Motor capacity	INV capacity	Built-in brake	FR-BU2					MT-RC				MT-HC-S
			MT-BR5									
55kW	75K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [17V]	2×FR-BU2-H75K 2×MT-BR5-H75K [20V]	-	-	-	H75K [20V]	-	-	-	H75K [20V]
75kW	75K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [12B]	2×FR-BU2-H75K 2×MT-BR5-H75K [16B]	-	-	-	H75K [15B]	-	-	-	H75K [15B]
	90K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [12V]	2×FR-BU2-H75K 2×MT-BR5-H75K [20V]	-	-	-	H75K [15V]	-	-	-	H110K [20V]
90kW	90K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [10B]	2×FR-BU2-H75K 2×MT-BR5-H75K [17B]	-	-	-	H75K [12B]	H160K [17B]	-	-	H110K [17B]
	110K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [10V]	2×FR-BU2-H75K 2×MT-BR5-H75K [20V]	-	-	-	H75K [12V]	H160K [20V]	-	-	H110K [18V]
110kW	110K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [08B]	2×FR-BU2-H75K 2×MT-BR5-H75K [17B]	3×FR-BU2-H75K 3×MT-BR5-H75K [17B]	-	-	H75K [10B]	H160K [17B]	-	-	H110K [15B]
	132K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [08V]	2×FR-BU2-H75K 2×MT-BR5-H75K [17V]	3×FR-BU2-H75K 3×MT-BR5-H75K [20V]	-	-	H75K [10V]	H160K [20V]	-	-	H150K [20V]
132kW	132K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [07B]	2×FR-BU2-H75K 2×MT-BR5-H75K [14B]	3×FR-BU2-H75K 3×MT-BR5-H75K [17B]	-	-	H75K [08B]	H160K [17B]	-	-	H150K [17B]
	160K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [07V]	2×FR-BU2-H75K 2×MT-BR5-H75K [14V]	3×FR-BU2-H75K 3×MT-BR5-H75K [20V]	-	-	H75K [08V]	H160K [18V]	-	-	H150K [17V]
150kW	160K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [06B]	2×FR-BU2-H75K 2×MT-BR5-H75K [12B]	3×FR-BU2-H75K 3×MT-BR5-H75K [18B]	4×FR-BU2-H75K 4×MT-BR5-H75K [19B]	-	H75K [07B]	H160K [16B]	-	-	H150K [15B]
	185K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [06V]	2×FR-BU2-H75K 2×MT-BR5-H75K [12V]	3×FR-BU2-H75K 3×MT-BR5-H75K [18V]	4×FR-BU2-H75K 4×MT-BR5-H75K [20V]	-	H75K [07V]	H160K [16V]	-	-	H220K [15V]

Motor capacity	INV capacity	Built-in brake	FR-BU2 / MT-BR5					MT-RC				MT-HC-S
160kW	160K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [05B]	2×FR-BU2-H75K 2×MT-BR5-H75K [11B]	3×FR-BU2-H75K 3×MT-BR5-H75K [17B]	4×FR-BU2-H75K 4×MT-BR5-H75K [18B]	-	H75K [07B]	H160K [15B]	-	-	H220K [18B]
	185K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [05V]	2×FR-BU2-H75K 2×MT-BR5-H75K [011V]	3×FR-BU2-H75K 3×MT-BR5-H75K [17V]	4×FR-BU2-H75K 4×MT-BR5-H75K [20V]	-	H75K [07V]	H160K [15V]	-	-	H220K [20V]
185kW	185K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [05B]	2×FR-BU2-H75K 2×MT-BR5-H75K [10B]	3×FR-BU2-H75K 3×MT-BR5-H75K [15B]	4×FR-BU2-H75K 4×MT-BR5-H75K [17B]	-	H75K [06B]	H160K [13B]	H220K [17B]	-	H220K [17B]
	220K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [05V]	2×FR-BU2-H75K 2×MT-BR5-H75K [10V]	3×FR-BU2-H75K 3×MT-BR5-H75K [15V]	4×FR-BU2-H75K 4×MT-BR5-H75K [20V]	-	H75K [06V]	H160K [13V]	H220K [17V]	-	H220K [17V]
200kW	220K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [04B]	2×FR-BU2-H75K 2×MT-BR5-H75K [09B]	3×FR-BU2-H75K 3×MT-BR5-H75K [14B]	4×FR-BU2-H75K 4×MT-BR5-H75K [18B]	5×FR-BU2-H75K 5×MT-BR5-H75K [19B]	H75K [05B]	H160K [12B]	H220K [16B]	-	H220K [16B]
	250K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [04V]	2×FR-BU2-H75K 2×MT-BR5-H75K [09V]	3×FR-BU2-H75K 3×MT-BR5-H75K [14V]	4×FR-BU2-H75K 4×MT-BR5-H75K [18V]	5×FR-BU2-H75K 5×MT-BR5-H75K [20V]	H75K [05V]	H160K [12V]	H220K [16V]	-	-
220kW	220K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [04B]	2×FR-BU2-H75K 2×MT-BR5-H75K [08B]	3×FR-BU2-H75K 3×MT-BR5-H75K [12B]	4×FR-BU2-H75K 4×MT-BR5-H75K [17B]	5×FR-BU2-H75K 5×MT-BR5-H75K [17B]	H75K [05B]	H160K [10B]	H220K [15B]	-	H220K [15B]
	250K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [04V]	2×FR-BU2-H75K 2×MT-BR5-H75K [08V]	3×FR-BU2-H75K 3×MT-BR5-H75K [12V]	4×FR-BU2-H75K 4×MT-BR5-H75K [17V]	5×FR-BU2-H75K 5×MT-BR5-H75K [20V]	H75K [05V]	H160K [10V]	H220K [15V]	-	-
250kW	250K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [03B]	2×FR-BU2-H75K 2×MT-BR5-H75K [07B]	3×FR-BU2-H75K 3×MT-BR5-H75K [11B]	4×FR-BU2-H75K 4×MT-BR5-H75K [15B]	5×FR-BU2-H75K 5×MT-BR5-H75K [18B]	H75K [04B]	H160K [09B]	H220K [13B]	H280K [16B]	-
	280K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [03V]	2×FR-BU2-H75K 2×MT-BR5-H75K [07V]	3×FR-BU2-H75K 3×MT-BR5-H75K [11V]	4×FR-BU2-H75K 4×MT-BR5-H75K [15V]	5×FR-BU2-H75K 5×MT-BR5-H75K [18V]	H75K [04V]	H160K [09V]	H220K [13V]	H280K [16V]	-
280kW	280K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [03B]	2×FR-BU2-H75K 2×MT-BR5-H75K [06B]	3×FR-BU2-H75K 3×MT-BR5-H75K [10B]	4×FR-BU2-H75K 4×MT-BR5-H75K [13B]	5×FR-BU2-H75K 5×MT-BR5-H75K [16B]	H75K [04B]	H160K [08B]	H220K [11B]	H280K [15B]	-
	315K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [03V]	2×FR-BU2-H75K 2×MT-BR5-H75K [06V]	3×FR-BU2-H75K 3×MT-BR5-H75K [10V]	4×FR-BU2-H75K 4×MT-BR5-H75K [13V]	5×FR-BU2-H75K 5×MT-BR5-H75K [16V]	H75K [04V]	H160K [08V]	H220K [11V]	H280K [15V]	-
300kW	315K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [03B]	2×FR-BU2-H75K 2×MT-BR5-H75K [06B]	3×FR-BU2-H75K 3×MT-BR5-H75K [09B]	4×FR-BU2-H75K 4×MT-BR5-H75K [12B]	5×FR-BU2-H75K 5×MT-BR5-H75K [15B]	-	-	-	-	-
	355K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [03V]	2×FR-BU2-H75K 2×MT-BR5-H75K [06V]	3×FR-BU2-H75K 3×MT-BR5-H75K [09V]	4×FR-BU2-H75K 4×MT-BR5-H75K [12V]	5×FR-BU2-H75K 5×MT-BR5-H75K [15V]	-	-	-	-	-
315kW	315K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [03B]	2×FR-BU2-H75K 2×MT-BR5-H75K [06B]	3×FR-BU2-H75K 3×MT-BR5-H75K [09B]	4×FR-BU2-H75K 4×MT-BR5-H75K [11B]	5×FR-BU2-H75K 5×MT-BR5-H75K [14B]	-	-	-	-	-
	355K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [03V]	2×FR-BU2-H75K 2×MT-BR5-H75K [06V]	3×FR-BU2-H75K 3×MT-BR5-H75K [09V]	4×FR-BU2-H75K 4×MT-BR5-H75K [11V]	5×FR-BU2-H75K 5×MT-BR5-H75K [14V]	-	-	-	-	-
355kW	355K	Capacitor regeneration [01B]	FR-BU2-H75K MT-BR5-H75K [02B]	2×FR-BU2-H75K 2×MT-BR5-H75K [05B]	3×FR-BU2-H75K 3×MT-BR5-H75K [07B]	4×FR-BU2-H75K 4×MT-BR5-H75K [10B]	5×FR-BU2-H75K 5×MT-BR5-H75K [13B]	-	-	-	-	-
	400K	Capacitor regeneration [01V]	FR-BU2-H75K MT-BR5-H75K [02V]	2×FR-BU2-H75K 2×MT-BR5-H75K [05V]	3×FR-BU2-H75K 3×MT-BR5-H75K [07V]	4×FR-BU2-H75K 4×MT-BR5-H75K [10V]	5×FR-BU2-H75K 5×MT-BR5-H75K [13V]	-	-	-	-	-

Motor capacity	INV capacity	Built-in brake	FR-BU2 / MT-BR5					MT-RC				MT-HC-S
400kW	400K	Capacitor regeneration [01B]	-	-	-	-	-	-	-	-	-	-
	450K	Capacitor regeneration [01V]	-	-	-	-	-	-	-	-	-	-
450kW	450K	Capacitor regeneration [01B]	-	-	-	-	-	-	-	-	-	-
	500K	Capacitor regeneration [01V]	-	-	-	-	-	-	-	-	-	-
500kW	500K	Capacitor regeneration [01B]	-	-	-	-	-	-	-	-	-	-

* Characteristic data of the inverter capacity 75K or higher are the ones when combined with the standard motor SF-TH.

(9) FR-FP520J

Motor capacity	INV capacity	Built-in brake	FR-BU2				FR-RC	FR-CV	FR-HC	
			GZG/GRZG		FR-BR					
0.4kW	0.4K	Capacitor regeneration [01B$_1$]	-	-	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
0.75kW	0.75K	Capacitor regeneration [01B$_1$]	-	-	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
1.5kW	1.5K	Capacitor regeneration [01B$_1$]	FR-BU2-1.5K GZG300W50Ω [12B$_1$]	-	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
2.2kW	2.2K	Capacitor regeneration [005B$_1$]	FR-BU2-3.7K Three GRZG200-10Ω in series [12B$_1$]	-	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
3.7kW	3.7K	Capacitor regeneration [005B$_1$]	FR-BU2-3.7K Three GRZG200-10Ω in series [12B$_1$]	FR-BU2-7.5K Four GRZG300-5Ω in series [12B$_1$]	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
5.5kW	5.5K	Capacitor regeneration [005B$_1$]	FR-BU2-7.5K Four GRZG300-5Ω in series [12B$_1$]	FR-BU2-15K Six GRZG400-2Ω in series [12B$_1$]	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
7.5kW	7.5K	Capacitor regeneration [005B$_1$]	FR-BU2-7.5K Four GRZG300-5Ω in seires [10B$_1$]	FR-BU2-15K Six GRZG400-2Ω in series [12B$_1$]	FR-BU2-15K FR-BR-15K [12B$_1$]	-	15K [12B$_1$]	7.5K [12B$_1$]	7.5K [12B$_1$]	15K [12B$_1$]
11kW	11K	Capacitor regeneration [005B$_1$]	FR-BU2-15K Six GRZG400-2Ω in series [10B$_1$]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12B$_1$]	FR-BU2-15K FR-BR-15K [12B$_1$]	-	15K [12B$_1$]	11K [12B$_1$]	15K [12B$_1$]	-
15kW	15K	Capacitor regeneration [005B$_1$]	FR-BU2-15K Six GRZG400-2Ω in series [07B$_1$]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12B$_1$]	FR-BU2-15K FR-BR-15K [10B$_1$]	FR-BU2-30K FR-BR-30K [12B$_1$]	15K [12B$_1$]	15K [12B$_1$]	15K [12B$_1$]	30K [12B$_1$]

(10) FR-FP720

Motor capacity	INV capacity	Built-in brake	FR-BU2				FR-RC	FR-CV	FR-HC	
			GZG/GRZG		FR-BR					
0.75kW	0.75K	Capacitor regeneration [01B$_1$]	FR-BU2-1.5K GZG300W50Ω [12B$_1$]	-	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
1.5kW	1.5K	Capacitor regeneration [01B$_1$]	FR-BU2-1.5K GZG300W50Ω [12B$_1$]	-	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
2.2kW	2.2K	Capacitor regeneration [005B$_1$]	FR-BU2-3.7K Three GRZG200-10Ω in series [12B$_1$]	-	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
3.7kW	3.7K	Capacitor regeneration [005B$_1$]	FR-BU2-3.7K Three GRZG200-10Ω in series [12B$_1$]	FR-BU2-7.5K Four GRZG300-5Ω in series [12B$_1$]	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
5.5kW	5.5K	Capacitor regeneration [005B$_1$]	FR-BU2-7.5K Four GRZG300-5Ω in series [12B$_1$]	FR-BU2-15K Six GRZG400-2Ω in series [12B$_1$]	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
7.5kW	7.5K	Capacitor regeneration [005B$_1$]	FR-BU2-7.5K Four GRZG300-5Ω in series [10B$_1$]	FR-BU2-15K Six GRZG400-2Ω in series [12B$_1$]	FR-BU2-15K FR-BR-15K [12B$_1$]	-	15K [12B$_1$]	7.5K [12B$_1$]	7.5K [12B$_1$]	15K [12B$_1$]
11kW	11K	Capacitor regeneration [005B$_1$]	FR-BU2-15K Six GRZG400-2Ω in series [10B$_1$]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12B$_1$]	FR-BU2-15K FR-BR-15K [12B$_1$]	-	15K [12B$_1$]	11K [12B$_1$]	15K [12B$_1$]	-
15kW	15K	Capacitor regeneration [005B$_1$]	FR-BU2-15K Six GRZG400-2Ω in series [07B$_1$]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12B$_1$]	FR-BU2-15K FR-BR-15K [10B$_1$]	FR-BU2-30K FR-BR-30K [12B$_1$]	15K [12B$_1$]	15K [12B$_1$]	15K [12B$_1$]	30K [12B$_1$]
18.5kW	18.5K	Capacitor regeneration [005B$_1$]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12B$_1$]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [12B$_1$]	FR-BU2-30K FR-BR-30K [12B$_1$]	-	30K [12B$_1$]	22K [12B$_1$]	30K [12B$_1$]	-
22kW	22K	Capacitor regeneration [005B$_1$]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [10B$_1$]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [12B$_1$]	FR-BU2-30K FR-BR-30K [12B$_1$]	-	30K [12B$_1$]	22K [12B$_1$]	30K [12B$_1$]	-
30kW	30K	Capacitor regeneration [005B$_1$]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [07B$_1$]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [10B$_1$]	FR-BU2-30K FR-BR-30K [10B$_1$]	FR-BU2-55K FR-BR-55K [12B$_1$]	30K [12B$_1$]	30K [12B$_1$]	30K [12B$_1$]	55K [12B$_1$]
37kW	37K	Capacitor regeneration [005B$_1$]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [09B$_1$]	-	FR-BU2-55K FR-BR-55K [12B$_1$]	-	55K [12B$_1$]	37K [12B$_1$]	55K [12B$_1$]	-
45kW	45K	Capacitor regeneration [005B$_1$]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [07B$_1$]	-	FR-BU2-55K FR-BR-55K [12B$_1$]	-	55K [12B$_1$]	55K [12B$_1$]	55K [12B$_1$]	-
55kW	55K	Capacitor regeneration [005B$_1$]	-	-	FR-BU2-55K FR-BR-55K [12B$_1$]	-	55K [12B$_1$]	55K [12B$_1$]	55K [12B$_1$]	-

75K or more

Motor capacity	INV capacity	Built-in brake	FR-BU2 / MT-BR5	
75kW	75K	Capacitor regeneration [005B_1]	FR-BU2-55K MT-BR5-55K [09B_1]	2×FR-BU2-55K 2×MT-BR5-55K [12B_1]

(11) FR-F720P (when connected with an IPM motor)

Motor capacity	INV capacity	Built-in brake	FR-BU2 GRZ/GRZG		FR-BU2 FR-BR/MT-BR5		FR-RC	FR-CV	FR-HC	
0.4kW	0.75K	Capacitor regeneration [01V$_1$]	FR-BU2-1.5K GZG300W50Ω [17V$_1$]	-	-	-	-	7.5K [17V$_1$]	7.5K [17V$_1$]	-
0.75kW	0.75K	Capacitor regeneration [01B$_1$]	FR-BU2-1.5K GZG300W50Ω [12B$_1$]	-	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
1.5kW	1.5K	Capacitor regeneration [01B$_1$]	FR-BU2-1.5K GZG300W50Ω [12B$_1$]	-	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
2.2kW	2.2K	Capacitor regeneration [005B$_1$]	FR-BU2-3.7K Three GRZG200-10Ω in series [12B$_1$]	-	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
3.7kW	3.7K	Capacitor regeneration [005B$_1$]	FR-BU2-3.7K Three GRZG200-10Ω in series [12B$_1$]	FR-BU2-7.5K Four GRZG300-5Ω in series [12B$_1$]	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
5.5kW	5.5K	Capacitor regeneration [005B$_1$]	FR-BU2-7.5K Four GRZG300-5Ω in series [12B$_1$]	FR-BU2-15K Six GRZG400-2Ω in series [12B$_1$]	-	-	-	7.5K [12B$_1$]	7.5K [12B$_1$]	-
7.5kW	7.5K	Capacitor regeneration [005B$_1$]	FR-BU2-7.5K Four GRZG300-5Ω in series [10B$_1$]	FR-BU2-15K Six GRZG400-2Ω in series [12B$_1$]	FR-BU2-15K FR-BR-15K [12B$_1$]	-	15K [12B$_1$]	7.5K [12B$_1$]	7.5K [12B$_1$]	15K [12B$_1$]
11kW	11K	Capacitor regeneration [005B$_1$]	FR-BU2-15K Six GRZG400-2Ω in series [10B$_1$]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12B$_1$]	FR-BU2-15K FR-BR-15K [12B$_1$]	-	15K [12B$_1$]	11K [12B$_1$]	15K [12B$_1$]	-
15kW	15K	Capacitor regeneration [005B$_1$]	FR-BU2-15K Six GRZG400-2Ω in series [07B$_1$]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12B$_1$]	FR-BU2-15K FR-BR-15K [10B$_1$]	FR-BU2-30K FR-BR-30K [12B$_1$]	15K [12B$_1$]	15K [12B$_1$]	15K [12B$_1$]	30K [12B$_1$]
18.5kW	18.5K	Capacitor regeneration [005B$_1$]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [12B$_1$]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [12B$_1$]	FR-BU2-30K FR-BR-30K [12B$_1$]	-	30K [12B$_1$]	22K [12B$_1$]	30K [12B$_1$]	-
22kW	22K	Capacitor regeneration [005B$_1$]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [10B$_1$]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [12B$_1$]	FR-BU2-30K FR-BR-30K [12B$_1$]	-	30K [12B$_1$]	22K [12B$_1$]	30K [12B$_1$]	-
30kW	30K	Capacitor regeneration [005B$_1$]	2×FR-BU2-15K 2×six GRZG400-2Ω in series [07B$_1$]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [10B$_1$]	FR-BU2-30K FR-BR-30K [10B$_1$]	FR-BU2-55K FR-BR-55K [12B$_1$]	30K [12B$_1$]	30K [12B$_1$]	30K [12B$_1$]	55K [12B$_1$]
37kW	37K	Capacitor regeneration [005B$_1$]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [09B$_1$]	-	FR-BU2-55K FR-BR-55K [12B$_1$]	-	55K [12B$_1$]	37K [12B$_1$]	55K [12B$_1$]	-
45kW	45K	Capacitor regeneration [005B$_1$]	3×FR-BU2-15K 3×six GRZG400-2Ω in series [07B$_1$]	-	FR-BU2-55K FR-BR-55K [12B$_1$]	-	55K [12B$_1$]	55K [12B$_1$]	55K [12B$_1$]	-
55kW	55K	Capacitor regeneration [005B$_1$]	-	-	FR-BU2-55K FR-BR-55K [12B$_1$]	-	55K [12B$_1$]	55K [12B$_1$]	55K [12B$_1$]	-

75K or more

Motor capacity	INV capacity	Built-in brake	FR-BU2	
			MT-BR5	
75kW	75K	Capacitor regeneration [005B_1]	FR-BU2-55K MT-BR5-55K [09B_1]	2×FR-BU2-55K 2×MT-BR5-55K [12B_1]

(12) FR-FP540J

Motor capacity	INV capacity	Built-in brake	FR-BU2				FR-RC	FR-CV	FR-HC	
			GZG/GRZG		FR-BR					
0.4kW	0.4K	Capacitor regeneration [01B$_1$]	-	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
0.75kW	0.75K	Capacitor regeneration [01B$_1$]	-	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
1.5kW	1.5K	Capacitor regeneration [01B$_1$]	-	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
2.2kW	2.2K	Capacitor regeneration [005B$_1$]	-	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
3.7kW	3.7K	Capacitor regeneration [005B$_1$]	FR-BU2-H7.5K Six GRZG200-10Ω in series[12B$_1$]	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
5.5kW	5.5K	Capacitor regeneration [005B$_1$]	FR-BU2-H7.5K Six GRZG200-10Ω in series[12B$_1$]	FR-BU2-H15K Eight GRZG300-5Ω in series[12B$_1$]	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
7.5kW	7.5K	Capacitor regeneration [005B$_1$]	FR-BU2-H7.5K Six GRZG200-10Ω in series[12B$_1$]	FR-BU2-H15K Eight GRZG300-5Ω in series[12B$_1$]	FR-BU2-H15K FR-BR-H15K [12B$_1$]	-	H15K [12B$_1$]	H7.5K [12B$_1$]	H7.5K [12B$_1$]	H15K [12B$_1$]
11kW	11K	Capacitor regeneration [005B$_1$]	FR-BU2-H15K Eight GRZG300-5Ω in series[12B$_1$]	FR-BU2-H30K Twelve GRZG400-2Ω in series[12B$_1$]	FR-BU2-H15K FR-BR-H15K [12B$_1$]	-	H15K [12B$_1$]	H11K [12B$_1$]	H15K [12B$_1$]	-
15kW	15K	Capacitor regeneration [005B$_1$]	FR-BU2-H15K Eight GRZG300-5Ω in series[09B$_1$]	FR-BU2-H30K Twelve GRZG400-2Ω in series[12B$_1$]	FR-BU2-H15K FR-BR-H15K [10B$_1$]	FR-BU2-H30K FR-BR-H30K [12B$_1$]	H15K [12B$_1$]	H15K [12B$_1$]	H15K [12B$_1$]	H30K [12B$_1$]

(13) FR-FP740

Motor capacity	INV capacity	Built-in brake	FR-BU2				FR-RC		FR-CV	FR-HC	
			GZG/GRZG		FR-BR						
0.75kW	0.75K	Capacitor regeneration [01B$_1$]	-	-	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
1.5kW	1.5K	Capacitor regeneration [01B$_1$]	-	-	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
2.2kW	2.2K	Capacitor regeneration [005B$_1$]	-	-	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
3.7kW	3.7K	Capacitor regeneration [005B$_1$]	FR-BU2-H7.5K Six GRZG200-10Ω in series [12B$_1$]	-	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
5.5kW	5.5K	Capacitor regeneration [005B$_1$]	FR-BU2-H7.5K Six GRZG200-10Ω in series [12B$_1$]	FR-BU2-H15K Eight GRZG300-5Ω in series [12B$_1$]	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
7.5kW	7.5K	Capacitor regeneration [005B$_1$]	FR-BU2-H7.5K Six GRZG200-10Ω in series [12B$_1$]	FR-BU2-H15K Eight GRZG300-5Ω in series [12B$_1$]	FR-BU2-H15K FR-BR-H15K [12B$_1$]	-	H15K [12B$_1$]	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	H15K [12B$_1$]
11kW	11K	Capacitor regeneration [005B$_1$]	FR-BU2-H15K Eight GRZG300-5Ω in series [12B$_1$]	FR-BU2-H30K Twelve GRZG400-2Ω in series [12B$_1$]	FR-BU2-H15K FR-BR-H15K [12B$_1$]	-	H15K [12B$_1$]	-	H11K [12B$_1$]	H15K [12B$_1$]	-
15kW	15K	Capacitor regeneration [005B$_1$]	FR-BU2-H15K Eight GRZG300-5Ω in series [09B$_1$]	FR-BU2-H30K Twelve GRZG400-2Ω in series [12B$_1$]	FR-BU2-H15K FR-BR-H15K [10B$_1$]	FR-BU2-H30K FR-BR-H30K [12B$_1$]	H15K [12B$_1$]	-	H15K [12B$_1$]	H15K [12B$_1$]	H30K [12B$_1$]
18.5kW	18.5K	Capacitor regeneration [005B$_1$]	FR-BU2-H30K Twelve GRZG400-2Ω in series [12B$_1$]	-	FR-BU2-H30K FR-BR-H30K [12B$_1$]	-	H30K [12B$_1$]	-	H22K [12B$_1$]	H30K [12B$_1$]	-
22kW	22K	Capacitor regeneration [005B$_1$]	FR-BU2-H30K Twelve GRZG400-2Ω in series [10B$_1$]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [12B$_1$]	FR-BU2-H30K FR-BR-H30K [12B$_1$]	-	H30K [12B$_1$]	-	H22K [12B$_1$]	H30K [12B$_1$]	-
30kW	30K	Capacitor regeneration [005B$_1$]	FR-BU2-H30K Twelve GRZG400-2Ω in series [07B$_1$]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [12B$_1$]	FR-BU2-H30K FR-BR-H30K [10B$_1$]	FR-BU2-H55K FR-BR-H55K [12B$_1$]	H30K [12B$_1$]	H55K [12B$_1$]	H30K [12B$_1$]	H30K [12B$_1$]	H55K [12B$_1$]
37kW	37K	Capacitor regeneration [005B$_1$]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [12B$_1$]	3×FR-BU2-H30K 3×twelve GRZG400-2Ω in series [12B$_1$]	FR-BU2-H55K FR-BR-H55K [12B$_1$]	-	H55K [12B$_1$]	-	H37K [12B$_1$]	H55K [12B$_1$]	-
45kW	45K	Capacitor regeneration [005B$_1$]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [10B$_1$]	3×FR-BU2-H30K 3×twelve GRZG400-2Ω in series [12B$_1$]	FR-BU2-H55K FR-BR-H55K [12B$_1$]	-	H55K [12B$_1$]	-	H55K [12B$_1$]	H55K [12B$_1$]	-
55kW	55K	Capacitor regeneration [005B$_1$]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [08B$_1$]	-	FR-BU2-H55K FR-BR-H55K [12B$_1$]	-	H55K [12B$_1$]	-	H55K [12B$_1$]	H55K [12B$_1$]	-

75K or more

Motor capacity	INV capacity	Built-in brake	FR-BU2 / MT-BR5		MT-RC		MT-HC-S
75kW	75K	Capacitor regeneration [005B_1]	FR-BU2-H75K MT-BR5-H75K [12B_1]	2×FR-BU2-H75K 2×MT-BR5-H75K [12B_1]	H75K [12B_1]	-	H75K [12B_1]
90kW	90K	Capacitor regeneration [005B_1]	FR-BU2-H75K MT-BR5-H75K [10B_1]	2×FR-BU2-H75K 2×MT-BR5-H75K [12B_1]	H75K [12B_1]	H160K [12B_1]	H110K [12B_1]
110kW	110K	Capacitor regeneration [005B_1]	FR-BU2-H75K MT-BR5-H75K [08B_1]	2×FR-BU2-H75K 2×MT-BR5-H75K [12B_1]	H75K [10B_1]	H160K [12B_1]	H110K [12B_1]

(14) FR-F740P (when connected with an IPM motor)

Motor capacity	INV capacity	Built-in brake	FR-BU2 GRZ/GRZG		FR-BU2 FR-BR		FR-RC		FR-CV	FR-HC	
0.4kW	0.75K	Capacitor regeneration [01V$_1$]	-	-	-	-	-	-	H7.5K [17V$_1$]	H7.5K [17V$_1$]	-
0.75kW	0.75K	Capacitor regeneration [01B$_1$]	-	-	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
1.5kW	1.5K	Capacitor regeneration [01B$_1$]	-	-	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
2.2kW	2.2K	Capacitor regeneration [005B$_1$]	-	-	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
3.7kW	3.7K	Capacitor regeneration [005B$_1$]	FR-BU2-H7.5K Six GRZG200-10Ω in series [12B$_1$]	-	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
5.5kW	5.5K	Capacitor regeneration [005B$_1$]	FR-BU2-H7.5K Six GRZG200-10Ω in series [12B$_1$]	FR-BU2-H15K Eight GRZG300-5Ω in series [12B$_1$]	-	-	-	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	-
7.5kW	7.5K	Capacitor regeneration [005B$_1$]	FR-BU2-H7.5K Six GRZG200-10Ω in series [12B$_1$]	FR-BU2-H15K Eight GRZG300-5Ω in series [12B$_1$]	FR-BU2-H15K FR-BR-H15K [12B$_1$]	-	H15K [12B$_1$]	-	H7.5K [12B$_1$]	H7.5K [12B$_1$]	H15K [12B$_1$]
11kW	11K	Capacitor regeneration [005B$_1$]	FR-BU2-H15K Eight GRZG300-5Ω in series [12B$_1$]	FR-BU2-H30K Twelve GRZG400-2Ω in series [12B$_1$]	FR-BU2-H15K FR-BR-H15K [12B$_1$]	-	H15K [12B$_1$]	-	H11K [12B$_1$]	H15K [12B$_1$]	-
15kW	15K	Capacitor regeneration [005B$_1$]	FR-BU2-H15K Eight GRZG300-5Ω in series [09B$_1$]	FR-BU2-H30K Twelve GRZG400-2Ω in series [12B$_1$]	FR-BU2-H15K FR-BR-H15K [10B$_1$]	FR-BU2-H30K FR-BR-H30K [12B$_1$]	H15K [12B$_1$]	-	H15K [12B$_1$]	H15K [12B$_1$]	H30K [12B$_1$]
18.5kW	18.5K	Capacitor regeneration [005B$_1$]	FR-BU2-H30K Twelve GRZG400-2Ω in series [12B$_1$]	-	FR-BU2-H30K FR-BR-H30K [12B$_1$]	-	H30K [12B$_1$]	-	H22K [12B$_1$]	H30K [12B$_1$]	-
22kW	22K	Capacitor regeneration [005B$_1$]	FR-BU2-H30K Twelve GRZG400-2Ω in series [10B$_1$]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [12B$_1$]	FR-BU2-H30K FR-BR-H30K [12B$_1$]	-	H30K [12B$_1$]	-	H22K [12B$_1$]	H30K [12B$_1$]	-
30kW	30K	Capacitor regeneration [005B$_1$]	FR-BU2-H30K Twelve GRZG400-2Ω in series [07B$_1$]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [12B$_1$]	FR-BU2-H30K FR-BR-H30K [10B$_1$]	FR-BU2-H55K FR-BR-H55K [12B$_1$]	H30K [12B$_1$]	H55K [12B$_1$]	H30K [12B$_1$]	H30K [12B$_1$]	H55K [12B$_1$]
37kW	37K	Capacitor regeneration [005B$_1$]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [12B$_1$]	3×FR-BU2-H30K 3×twelve GRZG400-2Ω in series [12B$_1$]	FR-BU2-H55K FR-BR-H55K [12B$_1$]	-	H55K [12B$_1$]	-	H37K [12B$_1$]	H55K [12B$_1$]	-
45kW	45K	Capacitor regeneration [005B$_1$]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [10B$_1$]	3×FR-BU2-H30K 3×twelve GRZG400-2Ω in series [12B$_1$]	FR-BU2-H55K FR-BR-H55K [12B$_1$]	-	H55K [12B$_1$]	-	H55K [12B$_1$]	H55K [12B$_1$]	-
55kW	55K	Capacitor regeneration [005B$_1$]	2×FR-BU2-H30K 2×twelve GRZG400-2Ω in series [08B$_1$]	-	FR-BU2-H55K FR-BR-H55K [12B$_1$]	-	H55K [12B$_1$]	-	H55K [12B$_1$]	H55K [12B$_1$]	-

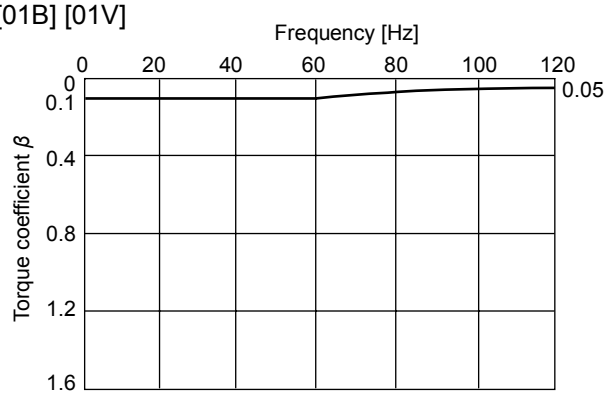
75K or more

Motor capacity	INV capacity	Built-in brake	FR-BU2 / MT-BR5		MT-RC		MT-HC-S
75kW	75K	Capacitor regeneration [005B_1]	FR-BU2-H75K MT-BR5-H75K [12B_1]	2×FR-BU2-H75K 2×MT-BR5-H75K [12B_1]	H75K [12B_1]	-	H75K [12B_1]
90kW	90K	Capacitor regeneration [005B_1]	FR-BU2-H75K MT-BR5-H75K [10B_1]	2×FR-BU2-H75K 2×MT-BR5-H75K [12B_1]	H75K [12B_1]	H160K [12B_1]	H110K [12B_1]
110kW	110K	Capacitor regeneration [005B_1]	FR-BU2-H75K MT-BR5-H75K [08B_1]	2×FR-BU2-H75K 2×MT-BR5-H75K [12B_1]	H75K [10B_1]	H160K [12B_1]	H110K [12B_1]

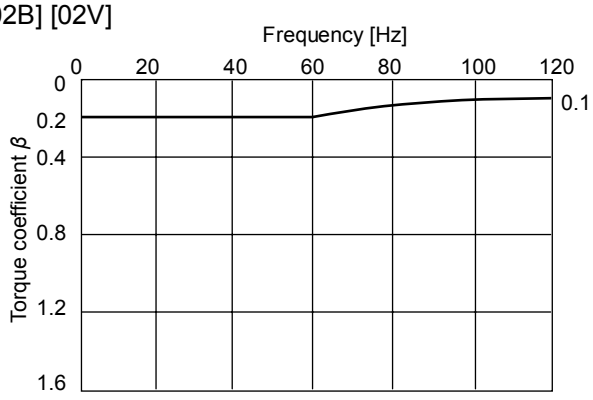
3.3 Brake torque data

(1) Inverter

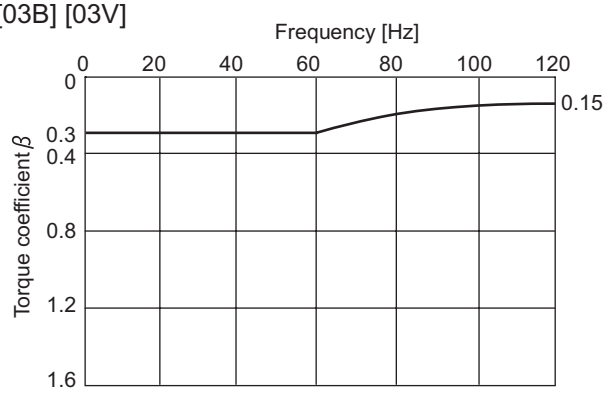
[01B] [01V]



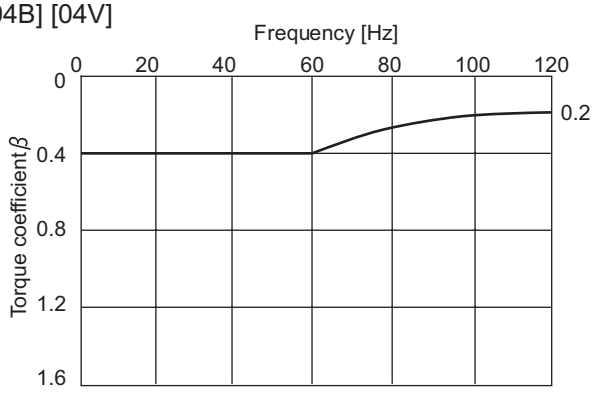
[02B] [02V]



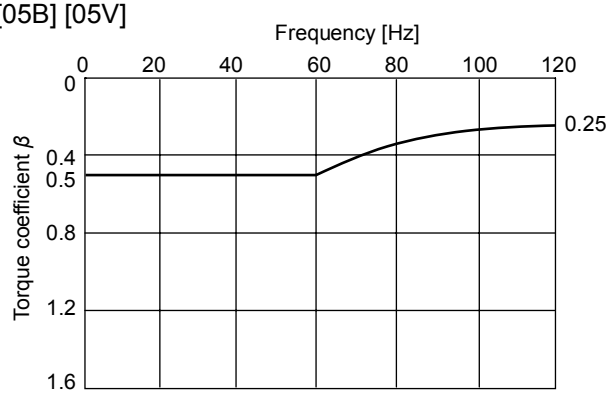
[03B] [03V]



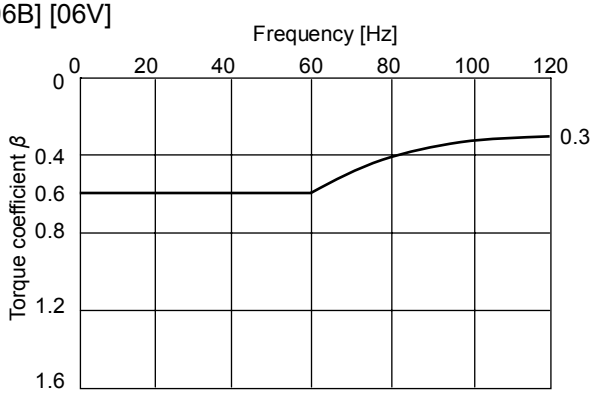
[04B] [04V]



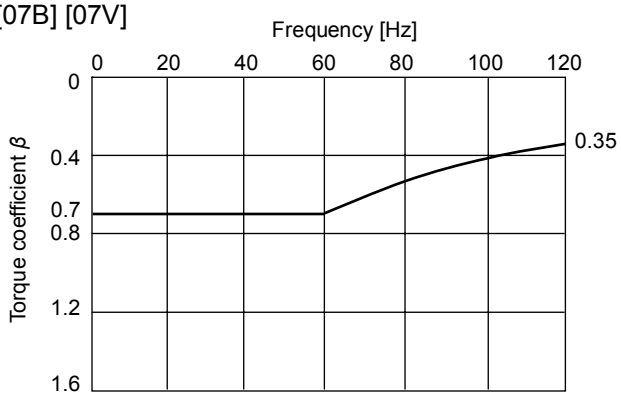
[05B] [05V]



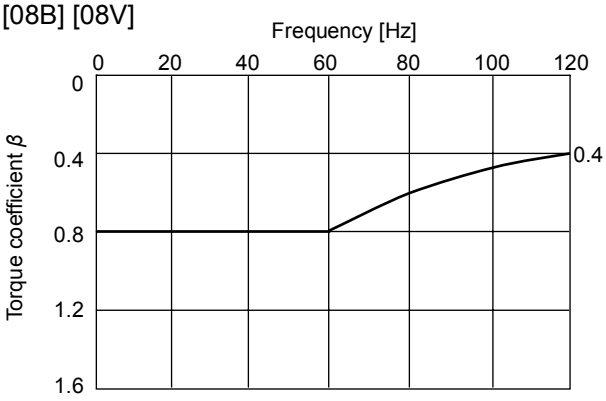
[06B] [06V]



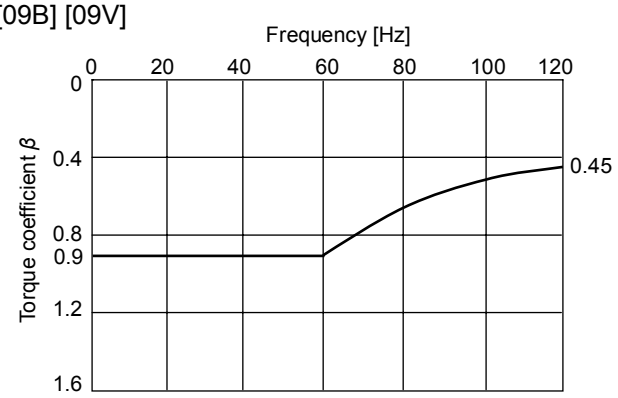
[07B] [07V]



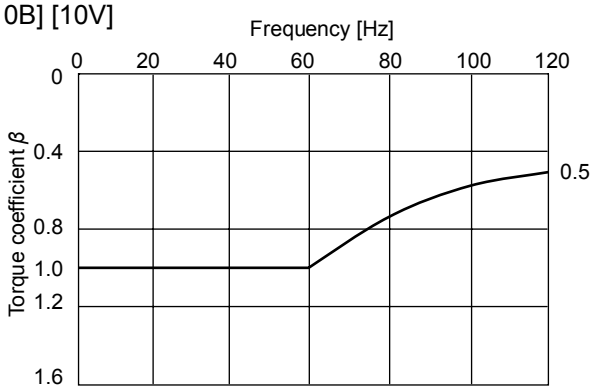
[08B] [08V]



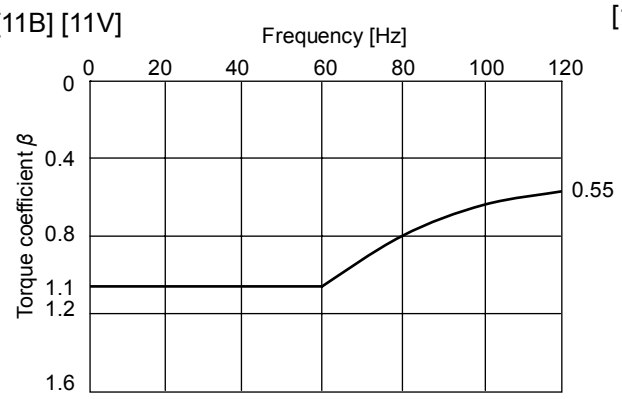
[09B] [09V]



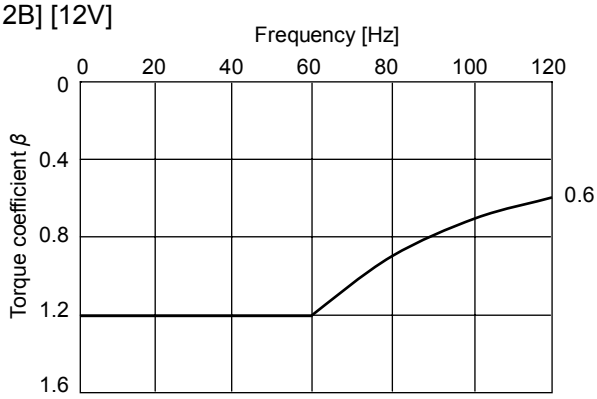
[10B] [10V]



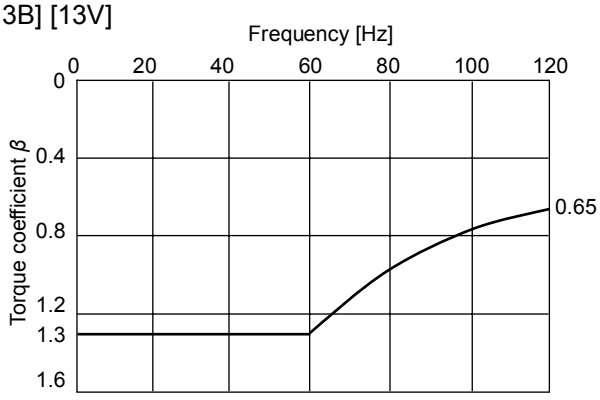
[11B] [11V]



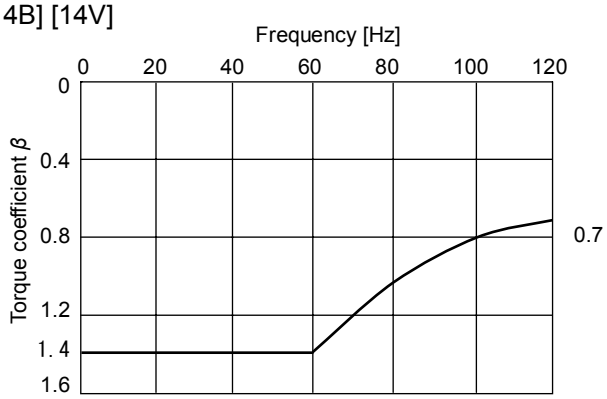
[12B] [12V]



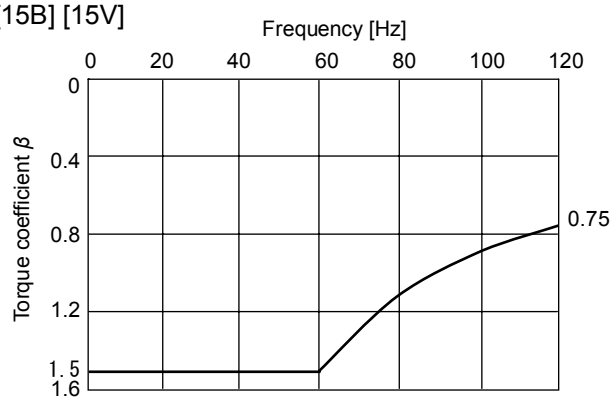
[13B] [13V]



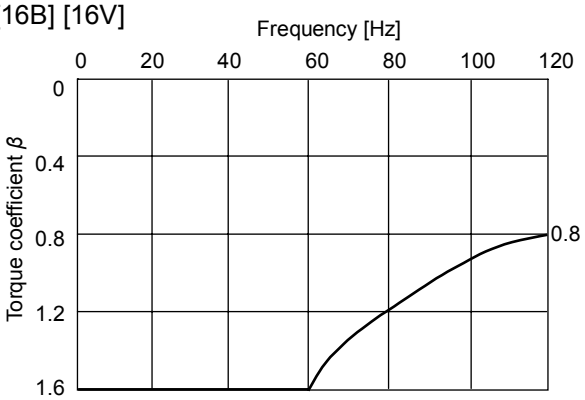
[14B] [14V]



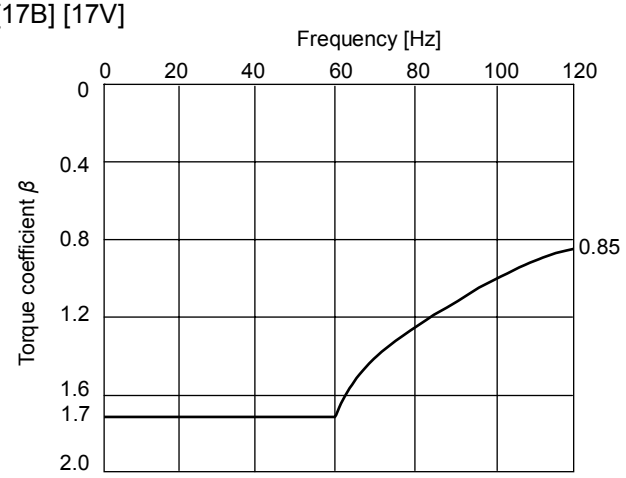
[15B] [15V]



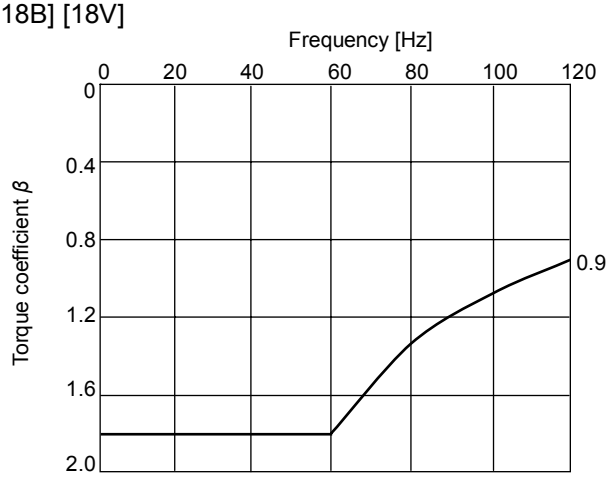
[16B] [16V]



[17B] [17V]

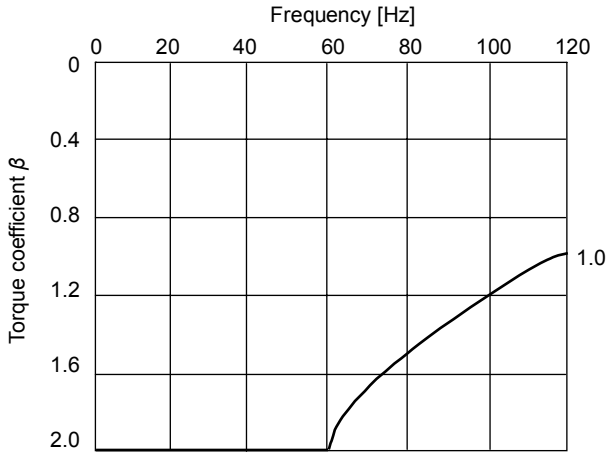


[18B] [18V]



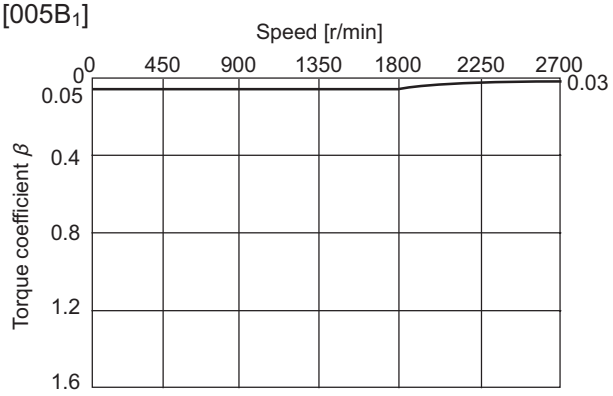
*For 75k or higher, the maximum frequency is 60Hz.

[20V]

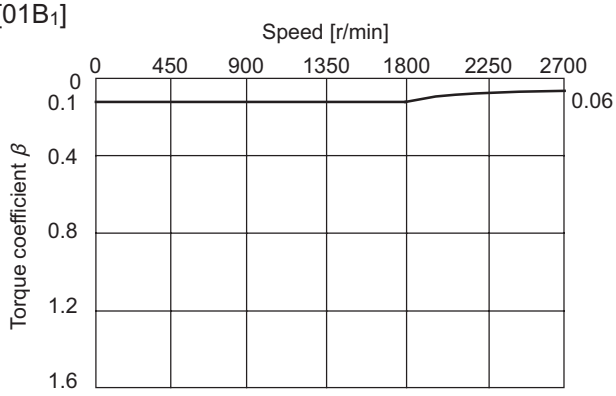


(2) IPM drive unit

[005B$_1$]



[01B$_1$]



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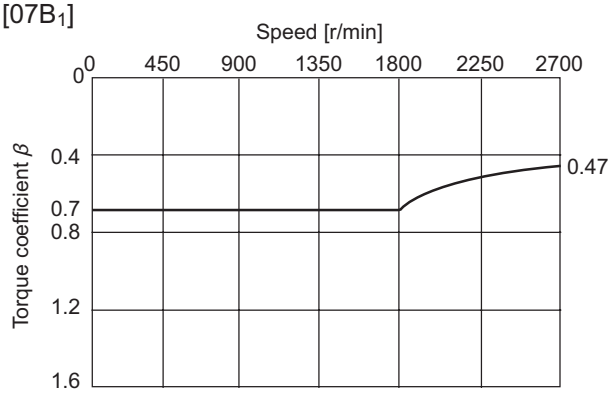
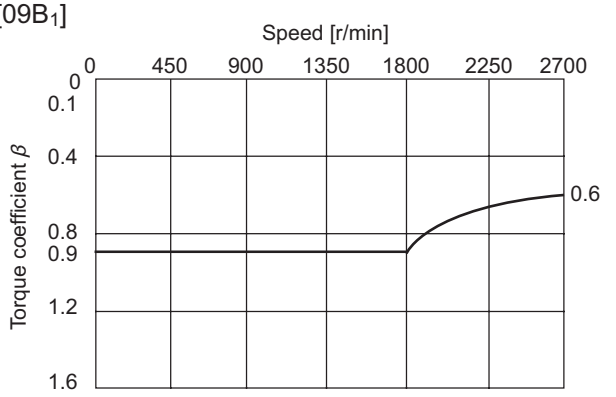
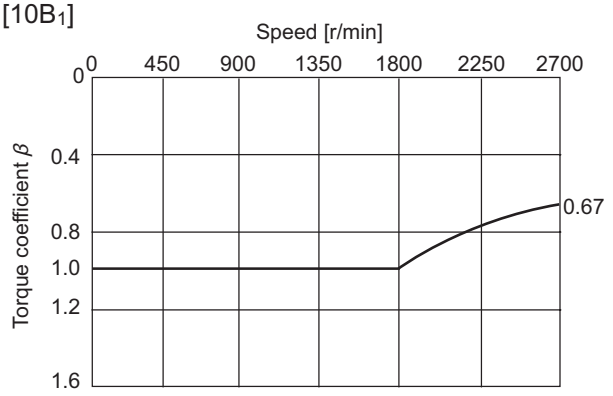


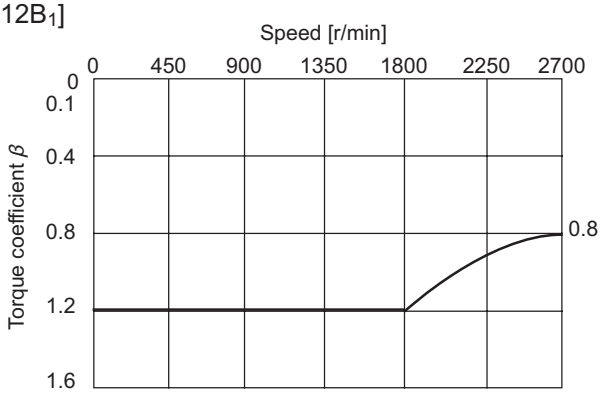
[09B$_1$]



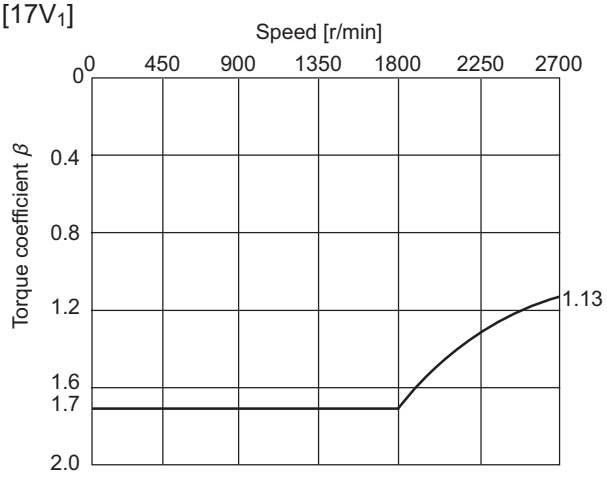
[10B$_1$]



[12B$_1$]



[17V$_1$]



3.4 Permissible power

3.4.1 Permissible power table

(1) 200V class

Inverter		Permissible load power in continuous operation (*) W_{RC}'（W）
Model	Capacity	
Capacitor regeneration	0.1K	75
	0.2K	150
	0.4K	200
	0.75K	375
	1.5K	375
	2.2K	440
	3.7K	740
	5.5K	1100
	7.5K	1500
	11K	2200
	15K	3000
	18.5K	3700
	22K	4400
	30K	6000
	37K	7400
	45K	9000
	55K	11000

75K or more

Inverter		Permissible load power in continuous operation (*) W_{RC}'（kW）
Model	Capacity	
Capacitor regeneration	75K	7.5
	90K	9
	110K	11

* Indicates the maximum regenerative power that is consumed at the machine side. The short-time permissible power of capacitor regeneration is limited. For lift operation, consider using a braking option.

Braking option			Short-time permissible power W_{RS}（W）	Continuous operation permissible power W_{RC}（W）
Model	Capacity			
Built-in brake resistor [A720]	2A type (200Ω)	FR-A720-0.4K	520（5s）	15
	2B type (100Ω)	FR-A720-0.75K	1120（5s）	30
	2C type (60Ω)	FR-A720-1.5K, 2.2K	1320（5s）	55
	2D type (40Ω)	FR-A720-3.7K	1720（5s）	80
	2E type (25Ω)	FR-A720-5.5K	2860（5s）	130
	2F type (20Ω)	FR-A720-7.5K	2860（5s）	130

Braking option			Short-time permissible power W_{RS}（W）	Continuous operation permissible power W_{RC}（W）
Model	Capacity			
External brake resistor MRS	MRS 120W 200Ω	FR-D720-0.4K FR-E720-0.4K	520（5s）	15
	MRS 120W 100Ω	FR-D720-0.75K FR-E720-0.75K	1120（5s）	30
	MRS 120W 60Ω	FR-D720-1.5K, 2.2K FR-E720-1.5K, 2.2K	1320（5s）	55
	MRS 120W 40Ω	FR-D720-2.2K, 3.7K FR-E720-2.2K, 3.7K	1720（5s）	80
External brake resistor MYS	Two MYS 220W 50 in parallel	FR-D720-3.7K FR-E720-3.7K	4520（5s）	160

Braking option			Short-time permissible power W_{RS} (W)	Continuous operation permissible power W_{RC} (W)
Model		Capacity		
External brake resistor FR-ABR		FR-ABR-0.4K (200Ω)	600(5s)	60
		FR-ABR-0.75K (100Ω)	1300(5s)	80
		FR-ABR-2.2K(60Ω)	2100(5s)	120
		FR-ABR-3.7K (40Ω)	3100(5s)	155
		FR-ABR-5.5K (25Ω)	5000(5s)	185
		FR-ABR-7.5K (20Ω)	6000(5s)	340
		FR-ABR-11K (13Ω)	10000(5s)	560
		Two FR-ABR-15K in parallel (9Ω)	15000(5s)	805
		Two FR-ABR-22K in parallel (6.5Ω)	20000(5s)	1120
Brake unit FR-BU2	Resistor GZG GRZG	FR-BU2-1.5K + GZG300W-50Ω	1250(3s)	100
		FR-BU2-3.7K + GRZG200-10Ω (three in series)	2200(6.5s)	300
		FR-BU2-7.5K + GRZG300-5Ω (four in series)	3200(12s)	600
		FR-BU2-15K + GRZG400-2Ω (six in series)	5400(15s)	1200
		FR-BU2-15K + GRZG400-2Ω (six in series) two sets in parallel	10800(15s)	2400
		FR-BU2-15K + GRZG400-2Ω (six in series) three sets in parallel	16200(15s)	3600
	Resistor unit FR-BR	FR-BU2-15K + FR-BR-15K	16500(15s)	990
		FR-BU2-30K + FR-BR-30K	33000(15s)	1990
		FR-BU2-55K + FR-BR-55K	65000(15s)	3910
Power regeneration converter FR-RC		FR-RC-15K	22500(30s)	11000
		FR-RC-30K	45000(30s)	15000
		FR-RC-55K	82500(30s)	30000
Power regeneration common converter FR-CV		FR-CV-7.5K	11250(60s)	7500
		FR-CV-11K	16500(60s)	11000
		FR-CV-15K	22500(60s)	15000
		FR-CV-22K	33000(60s)	22000
		FR-CV-30K	45000(60s)	30000
		FR-CV-37K	55500(60s)	37000
		FR-CV-55K	82500(60s)	55000
High power factor converter FR-HC		FR-HC-7.5K	11250(60s)	7500
		FR-HC-15K	22500(60s)	15000
		FR-HC-30K	45000(60s)	30000
		FR-HC-55K	82500(60s)	55000

75K or more

Braking option			Short-time permissible power W_{RS}(kW)	Continuous operation permissible power W_{RC}(kW)
Model		Capacity		
Brake unit FR-BU2	Resistor unit MT-BR5	FR-BU2-55K + MT-BR5-55K(2.0Ω)	70(15s)	5.5
		FR-BU2-55K + MT-BR5-55K two sets in parallel	140(15s)	11

(2) 400V class

Inverter		Permissible load power in continued operation (*) W_{RC}'(W)
Model	Capacity	
Capacitor regeneration	0.4K	200
	0.75K	375
	1.5K	375
	2.2K	440
	3.7K	740
	5.5K	1100
	7.5K	1500
	11K	2200
	15K	3000
	18.5K	3700
	22K	4400
	30K	6000
	37K	7400
	45K	9000
	55K	11000

75K or more

Inverter		Permissible load power in continued operation (*) W_{RC}'(kW)
Model	Capacity	
Capacitor regeneration	75K	7.5
	90K	9
	110K	11
	132K	13.2
	160K	16
	185K	18.5
	220K	22
	250K	25
	280K	28
	315K	31.5
	355K	35.5
	400K	40
	450K	45
	500K	50
	560K	56

* Indicates the maximum regenerative power that is consumed at the machine side. The short-time permissible power of capacitor regeneration is limited. For lift operation, consider using a braking option.

Braking option			Short-time permissible power W_{RS}(W)	Continuous operation permissible power W_{RC}(W)
Model	Capacity			
Built-in brake resistor [A740]	4A type (1200Ω)	FR-A740-0.4K	400(6.5s)	15
	4B type (700Ω)	FR-A740-0.75K	700(8s)	30
	4C type (350Ω)	FR-A740-1.5K	1320(5s)	55
	4D type (250Ω)	FR-A740-2.2K	1320(5s)	55
	4E type (150Ω)	FR-A740-3.7K	1720(5s)	80
	4F type (75Ω)	FR-A740-5.5K, 7.5K	2860(5s)	130

Braking option			Short-time permissible power W_{RS}(W)	Continuous operation permissible power W_{RC}(W)
Model		Capacity		
External brake resistor FR-ABR		FR-ABR-H0.4K (1200Ω)	400(5s)	45
		FR-ABR-H0.75K (700Ω)	700(5s)	75
		FR-ABR-H1.5K (350Ω)	1400(5s)	115
		FR-ABR-H2.2K (250Ω)	2000(5s)	120
		FR-ABR-H3.7K (150Ω)	3200(5s)	155
		FR-ABR-H5.5K (110Ω)	4500(5s)	185
		FR-ABR-H7.5K (75Ω)	6500(5s)	340
		FR-ABR-H11K (52Ω)	10000(5s)	530
		Two FR-ABR-H15K in series (36Ω)	15000(5s)	870
		Two FR-ABR-H22K in parallel (26Ω)	20000(5s)	1060
Brake unit FR-BU2	Resistor GRZG	FR-BU2-H7.5K + GRZG200-10Ω (six in series)	4400(8.5s)	600
		FR-BU2-H15K + GRZG300-5Ω (eight in series)	6800(12s)	1200
		FR-BU2-H30K + GRZG400-2Ω (twelve in series)	11500(15s)	2400
		FR-BU2-H30K + GRZG400-2Ω (twelve in series) two sets in parallel	23000(15s)	4800
		FR-BU2-H30K + GRZG400-2Ω (twelve in series) three sets in parallel	34500(15s)	7200
	Resistor unit FR-BR	FR-BU2-H15K + FR-BR-H15K	16500(15s)	990
		FR-BU2-H30K + FR-BR-H30K	33000(15s)	1990
		FR-BU2-H55K + FR-BR-H55K	65000(15s)	3910
Power regeneration converter FR-RC		FR-RC-H15K	22500(30s)	11000
		FR-RC-H30K	45000(30s)	22000
		FR-RC-H55K	82500(30s)	45000
Power regeneration common converter FR-CV		FR-CV-H7.5K	11250(60s)	7500
		FR-CV-H11K	16500(60s)	11000
		FR-CV-H15K	22500(60s)	15000
		FR-CV-H22K	33000(60s)	22000
		FR-CV-H30K	45000(60s)	30000
		FR-CV-H37K	55500(60s)	37000
		FR-CV-H55K	82500(60s)	55000
High power factor converter FR-HC		FR-HC-H7.5K	11250(60s)	7500
		FR-HC-H15K	22500(60s)	15000
		FR-HC-H30K	45000(60s)	30000
		FR-HC-H55K	82500(60s)	55000

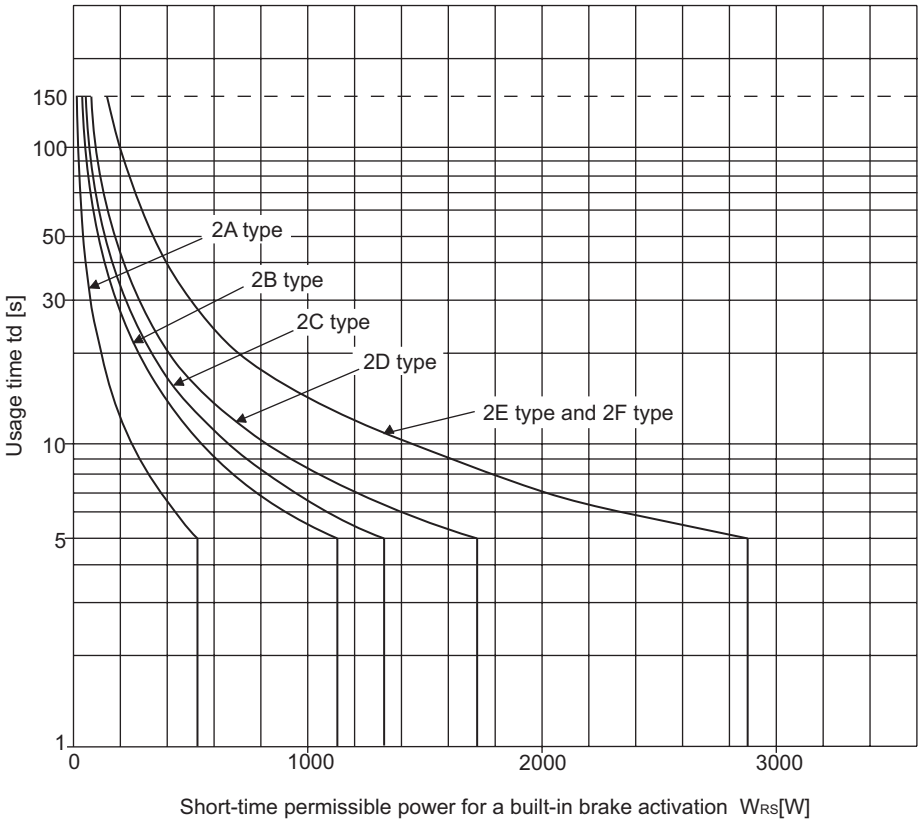
75K or more

Braking option			Short-time permissible power W_{RS}(kW)	Continuous operation permissible power W_{RC}(kW)
Model		Capacity		
Brake unit FR-BU2	Resistor unit MT-BR5	FR-BU2-H75K + MT-BR5-H75K(6.5Ω)	94(15s)	7.5
		FR-BU2-H75K + MT-BR5-H75K two sets in parallel	188(15s)	15
		FR-BU2-H75K + MT-BR5-H75K three sets in parallel	282(15s)	22.5
		FR-BU2-H75K + MT-BR5-H75K four sets in parallel	376(15s)	30
		FR-BU2-H75K + MT-BR5-H75K five sets in parallel	470(15s)	37.5
Power regeneration converter MT-RC		MT-RC-H75K	112.5(60s)	75
		MT-RC-H160K	240(60s)	160
		MT-RC-H220K	330(60s)	220
		MT-RC-H280K	420(60s)	280
High power factor converter MT-HC-S		MT-HC-H75K-S	112.5(60s)	75
		MT-HC-H110K-S	165(60s)	110
		MT-HC-H150K-S	225(60s)	150
		MT-HC-H220K-S	330(60s)	220

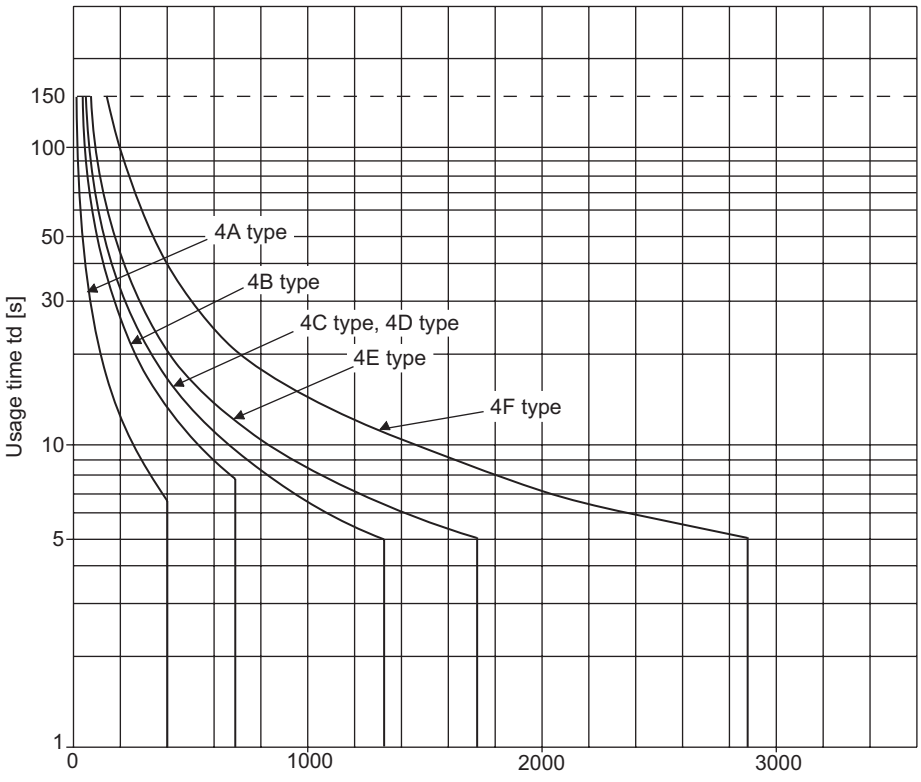
3.4.2 Permissible power data (W_{RS})

(1) Built-in brake resistor

200V class

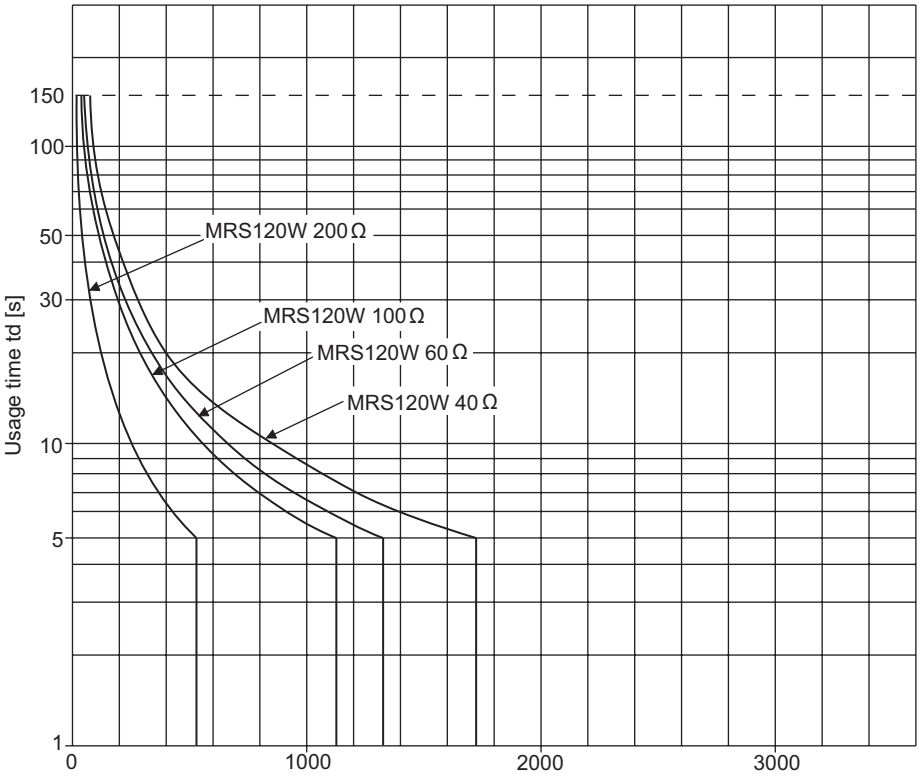


400V class



(2) Brake resistor MRS

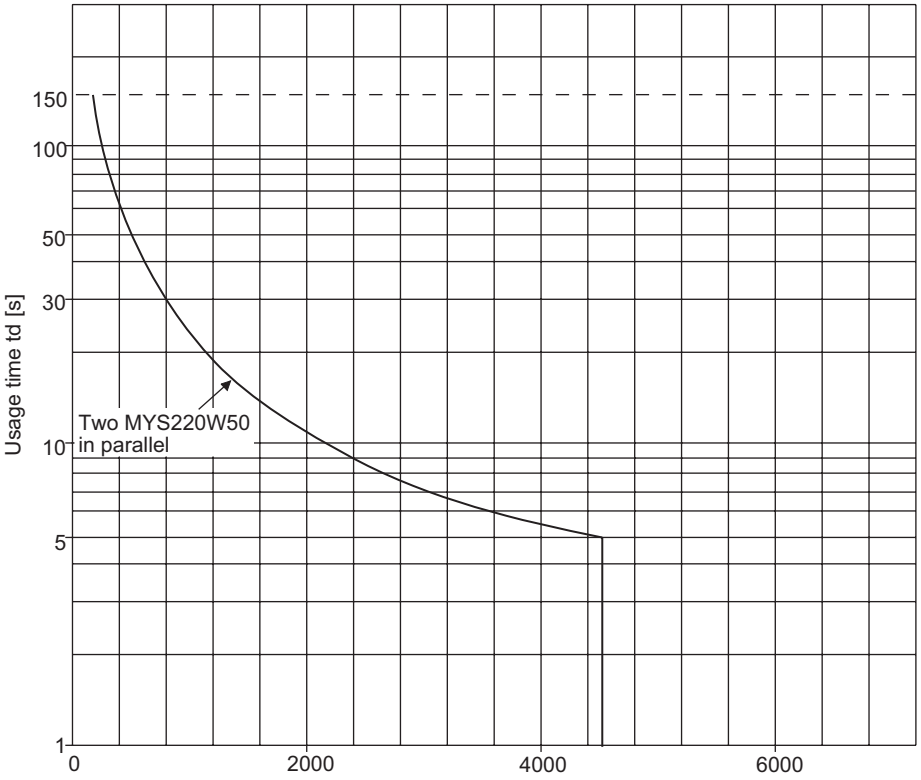
200V class



Short-time permissible power for a MRS-type brake resistor activation W_{RS}[W]

(3) Brake resistor MYS

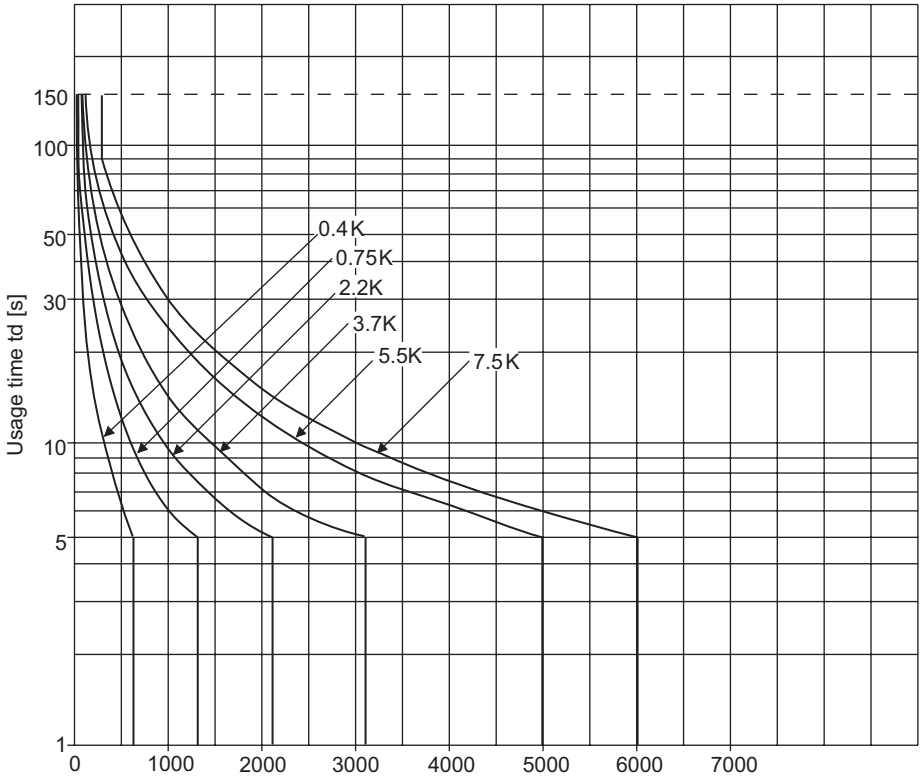
200V class

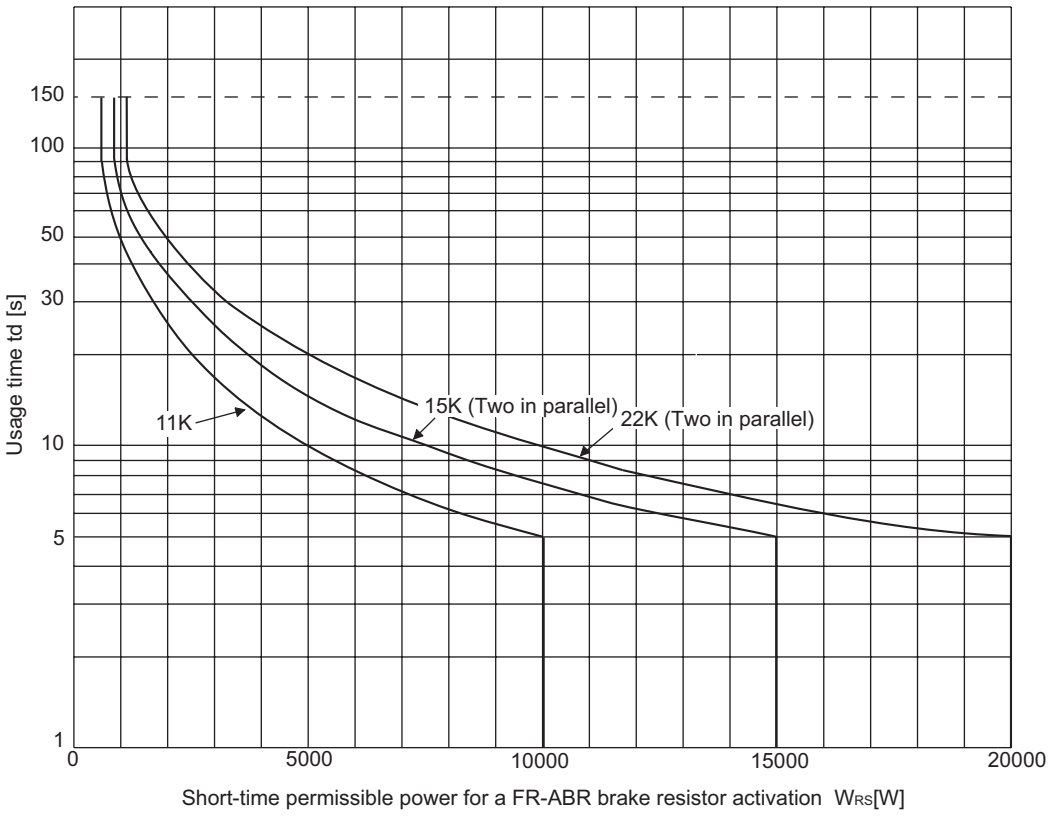


Short-time permissible power for a MYS-type brake resistor activation W_{RS}[W]

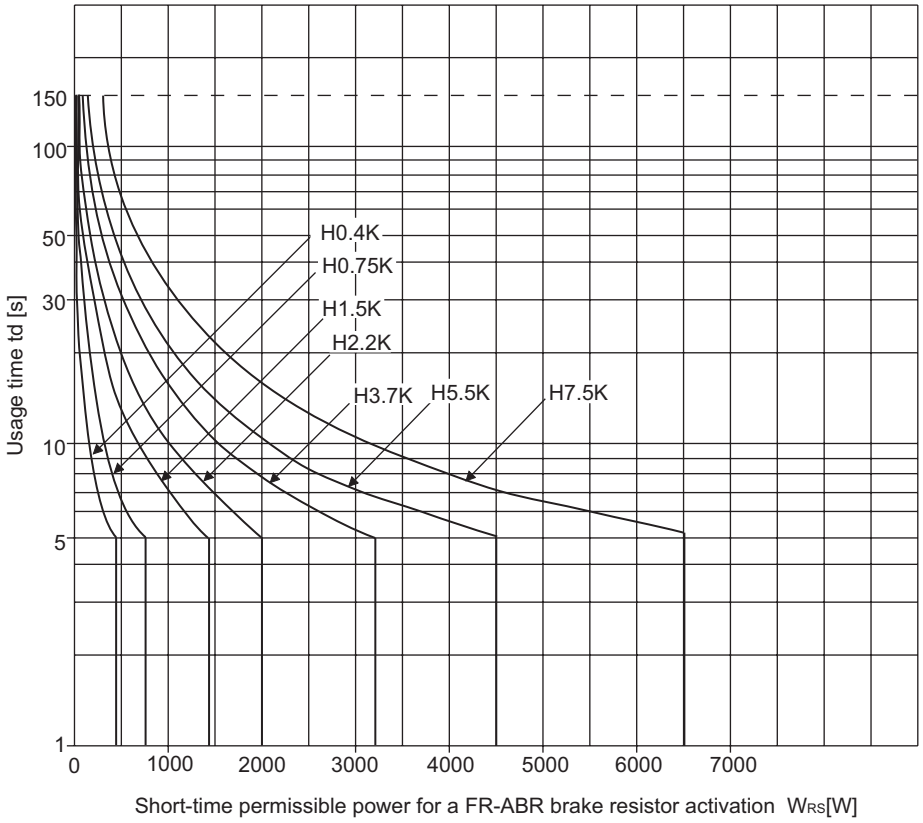
(4) Brake resistor FR-ABR

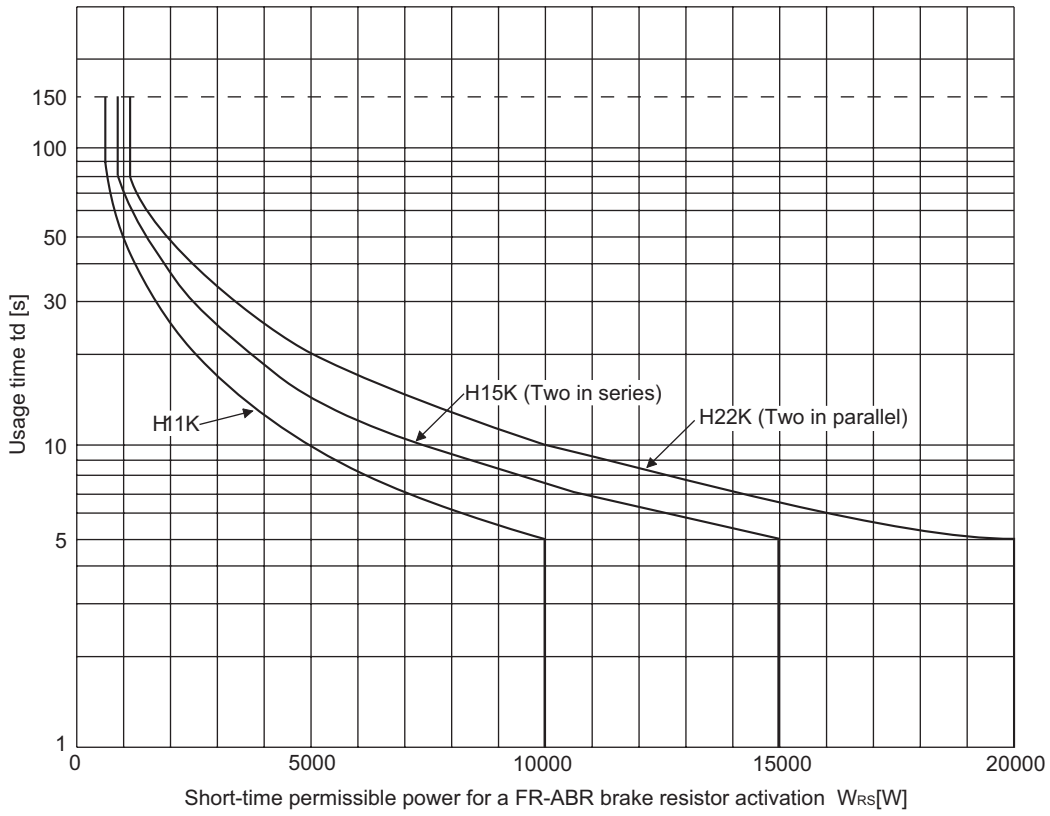
200V class





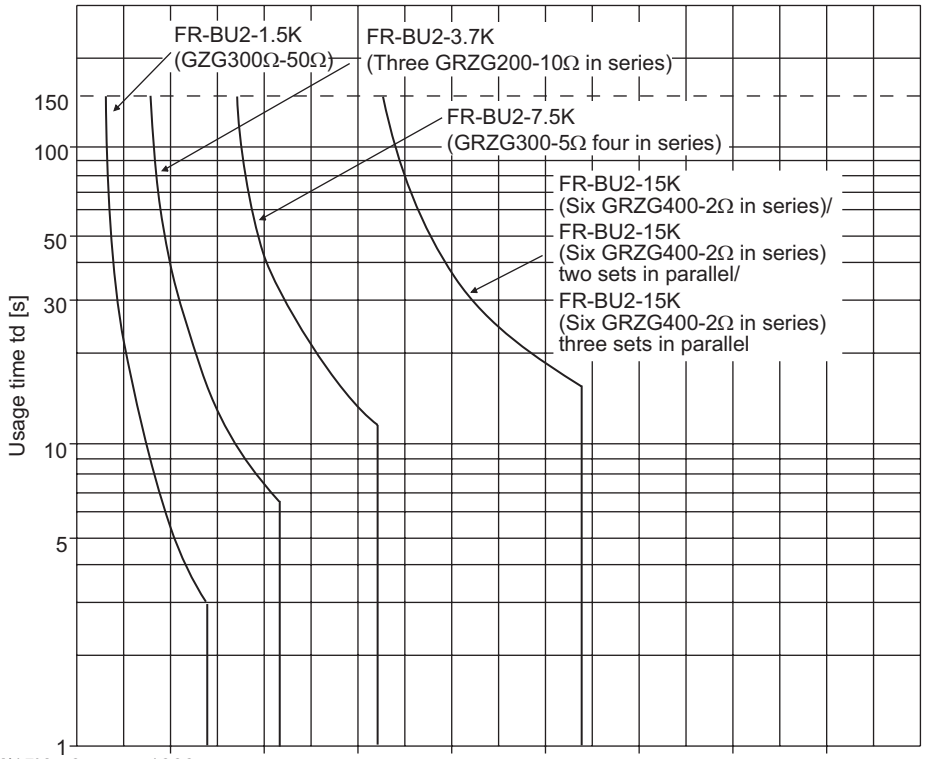
400V class


150
100
50
30
10
5
1
Usage time td [s]
H0.4K
H0.75K
H1.5K
H2.2K
H3.7K
H5.5K
H7.5K
0
1000
2000
3000
4000
5000
6000
7000
Short-time permissible power for a FR-ABR brake resistor activation WRS[W]


150
100
50
30
10
5
1
Usage time td [s]
H11K
H15K (Two in series)
H22K (Two in parallel)
0
5000
10000
15000
20000
Short-time permissible power for a FR-ABR brake resistor activation WRS[W]

(5) Brake unit FR-BU2(GZG/GRZG)

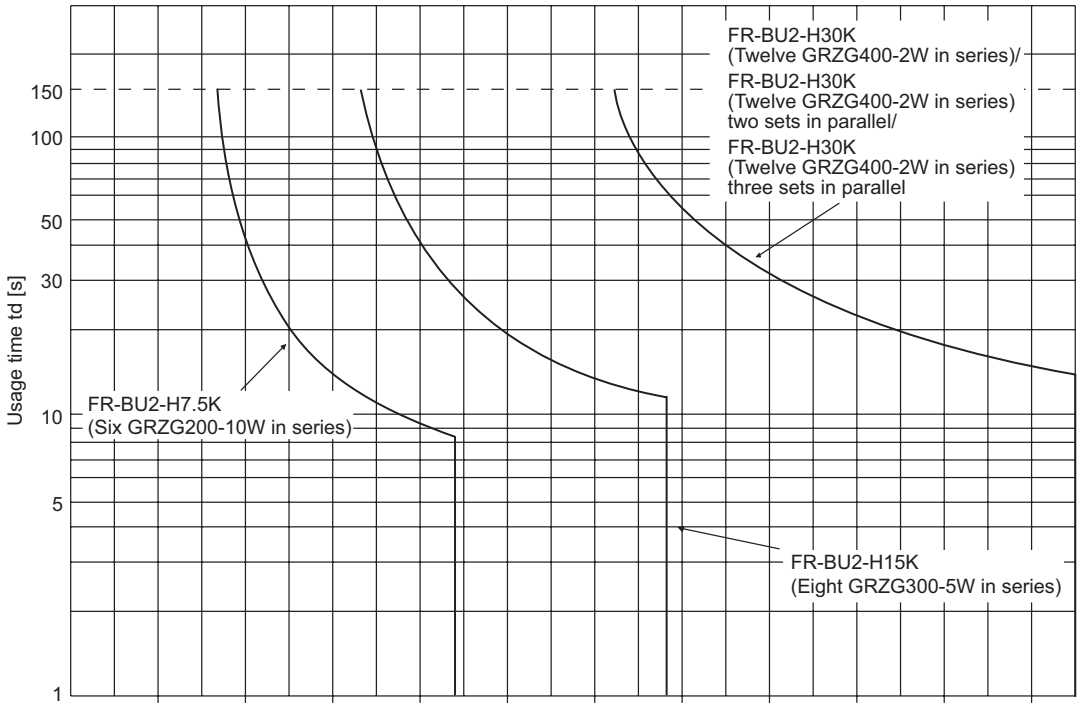
200V class



FR-BU2-1.5K/3.7K/7.5K/15K	0	1000	2000	3000	4000	5000	6000	7000	8000	9000
2×FR-BU2-15K	0	2000	4000	6000	8000	10000	12000	14000	16000	18000
3×FR-BU2-15K	0	3000	6000	9000	12000	15000	18000	21000	24000	27000

Short-time permissible power for a FR-BU2 brake unit activation W_{RS}[W]

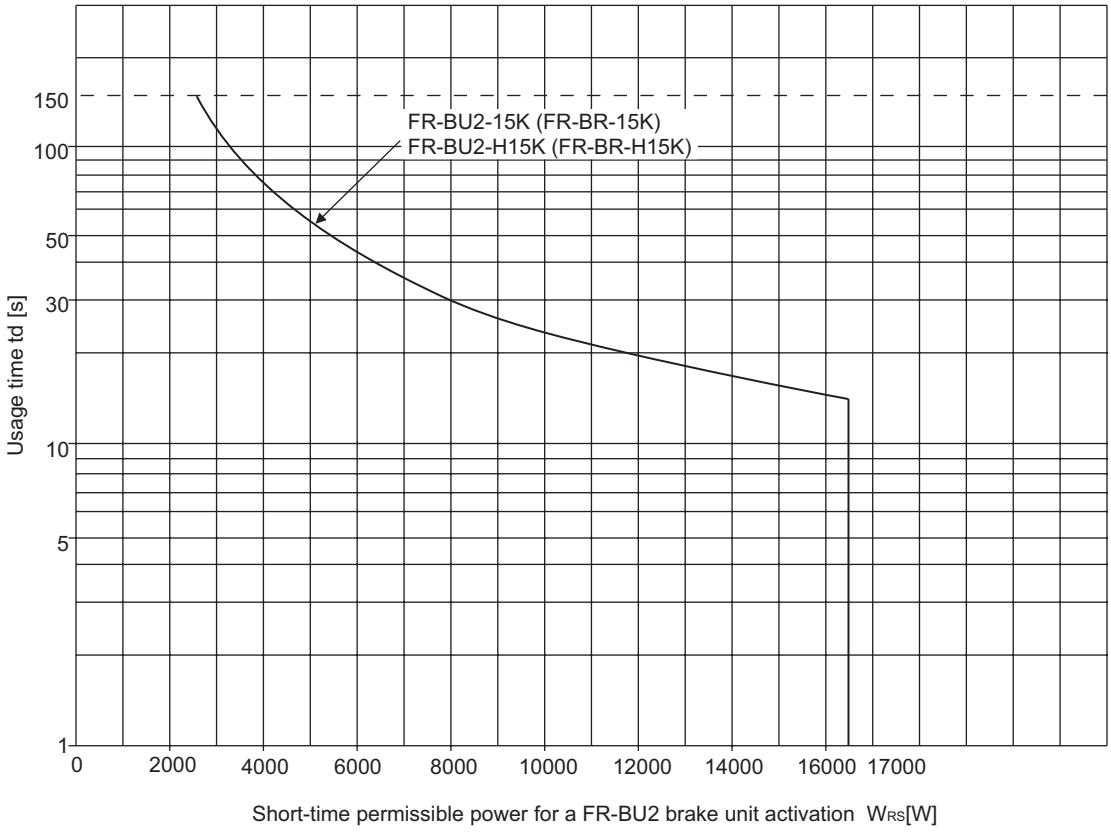
400V class

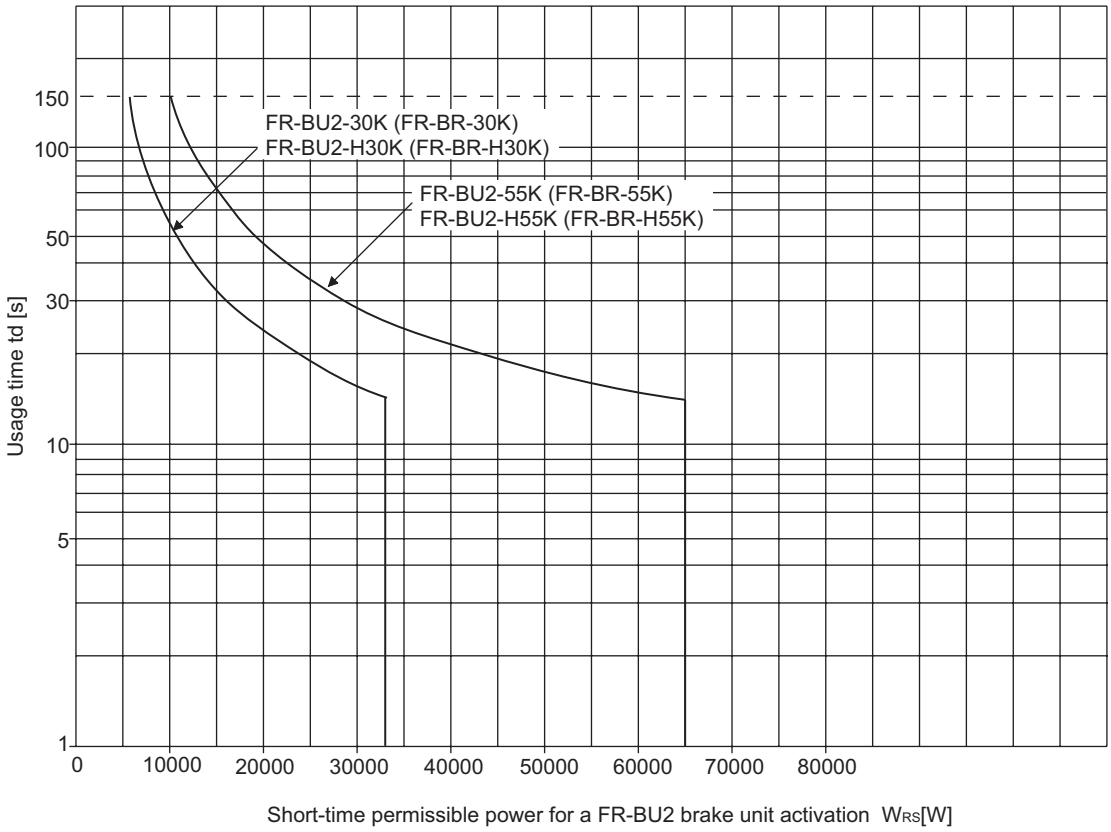


FR-BU2-H7.5K/H15K/H30K	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000
2×FR-BU2-H30K	0	2000	4000	6000	8000	10000	12000	14000	16000	18000	20000	22000
3×FR-BU2-H30K	0	3000	6000	9000	12000	15000	18000	21000	24000	27000	30000	33000

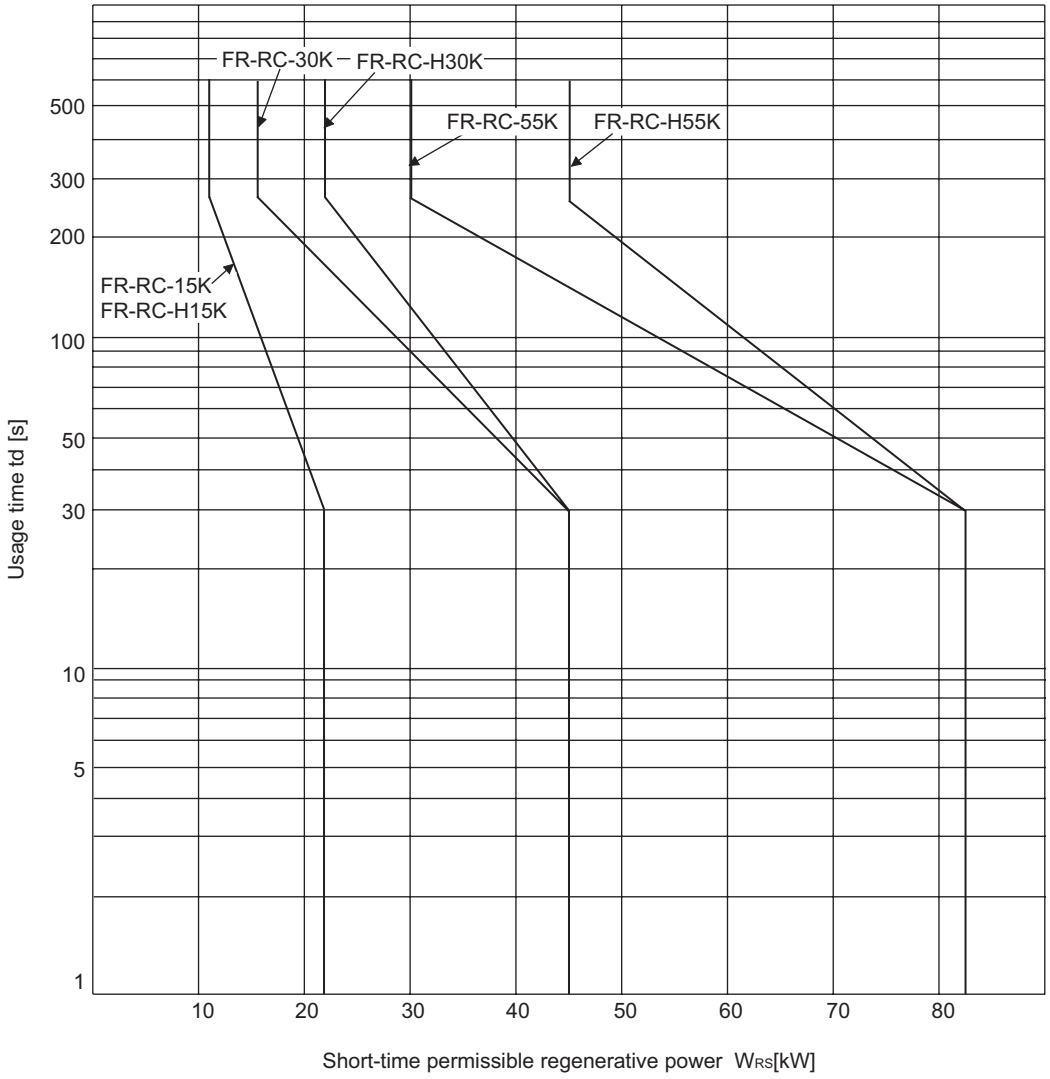
Short-time permissible power for a FR-BU2 brake unit activation W_{RS}[W]

(6) Brake unit FR-BU2(FR-BR)



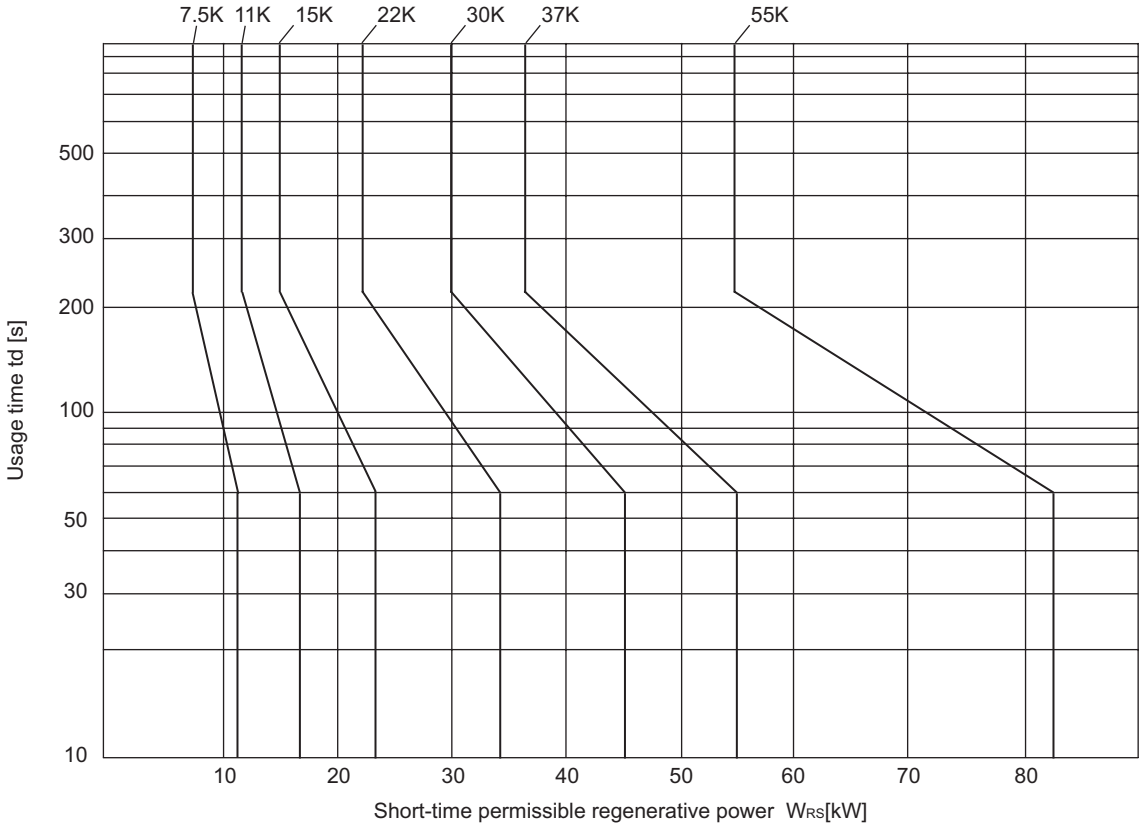


(7) Power regeneration converter FR-RC



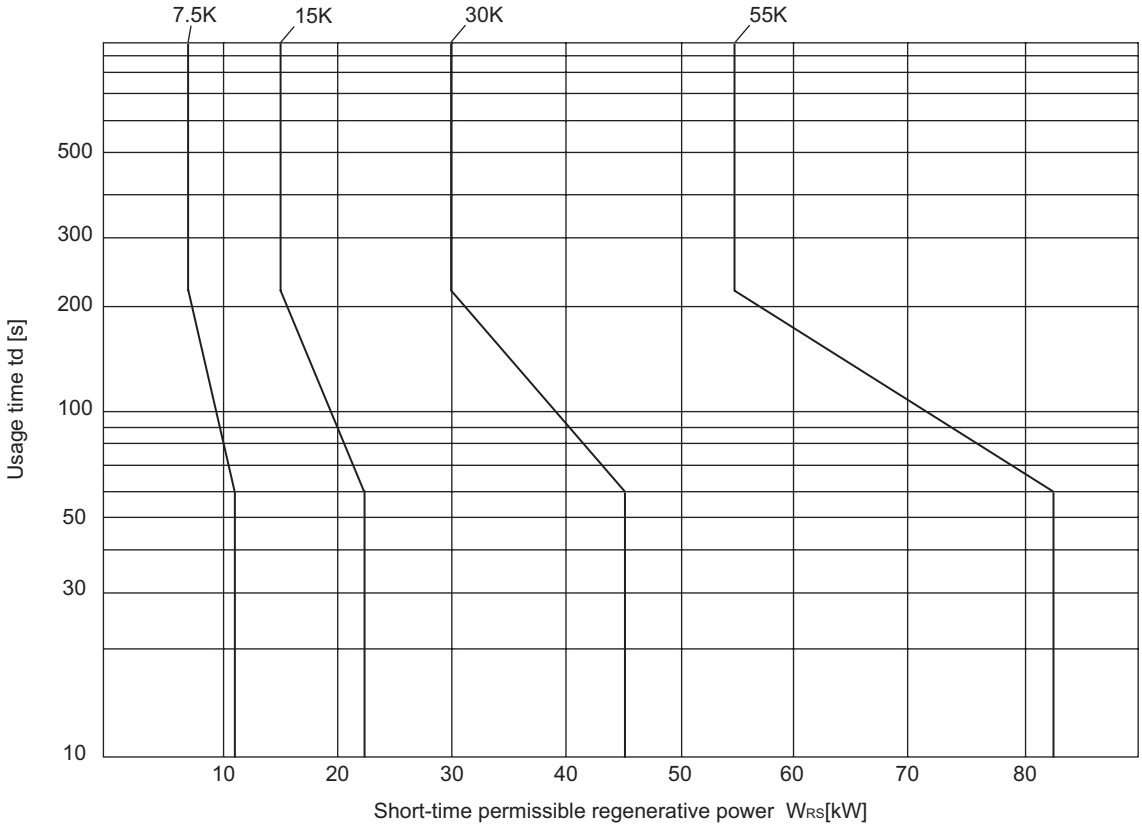
(8) Power regeneration common converter FR-CV

200V class/400 V class



(9) High power factor converter FR-HC

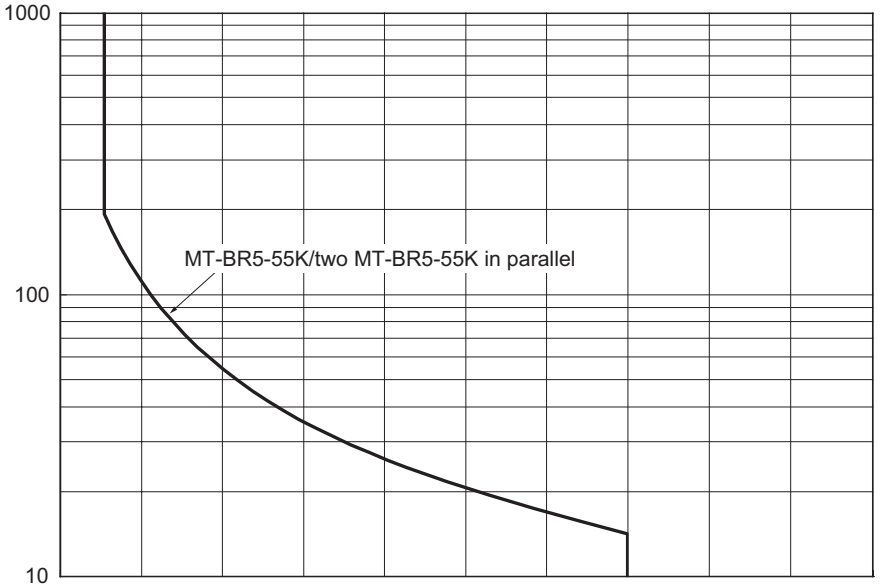
200V class/400 V class



75K or more

(10) Brake unit FR-BU2 (FR-BR5)

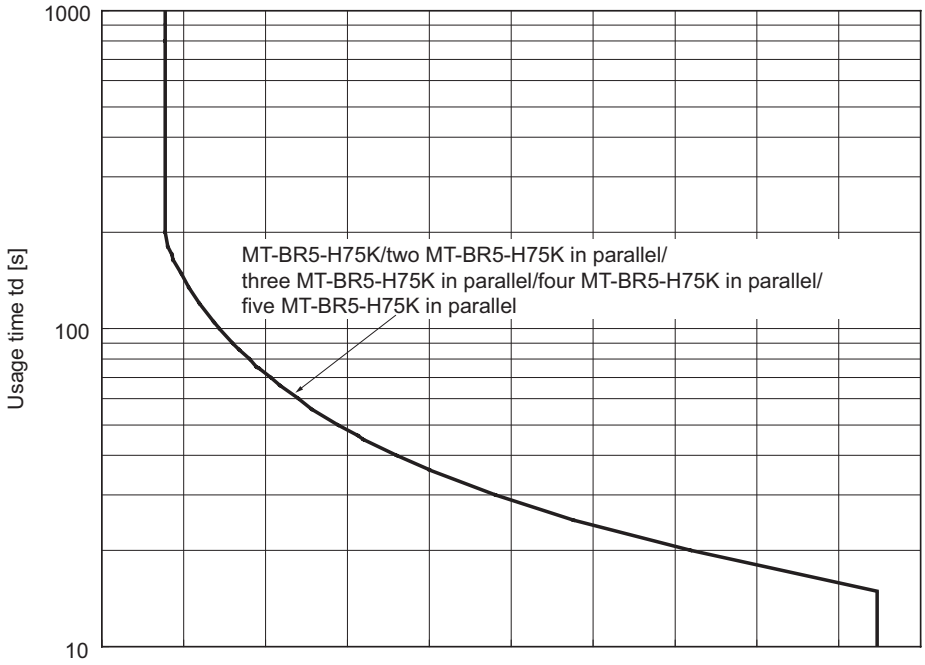
200V class



FR-BU-2-55K	0	10	20	30	40	50	60	70	80	90	100
2×FR-BU2-55K	0	20	40	60	80	100	120	140	160	180	200

Short-time permissible power for a FR-BU2 (MR-BR5) brake unit activation W_{RS}[kW]

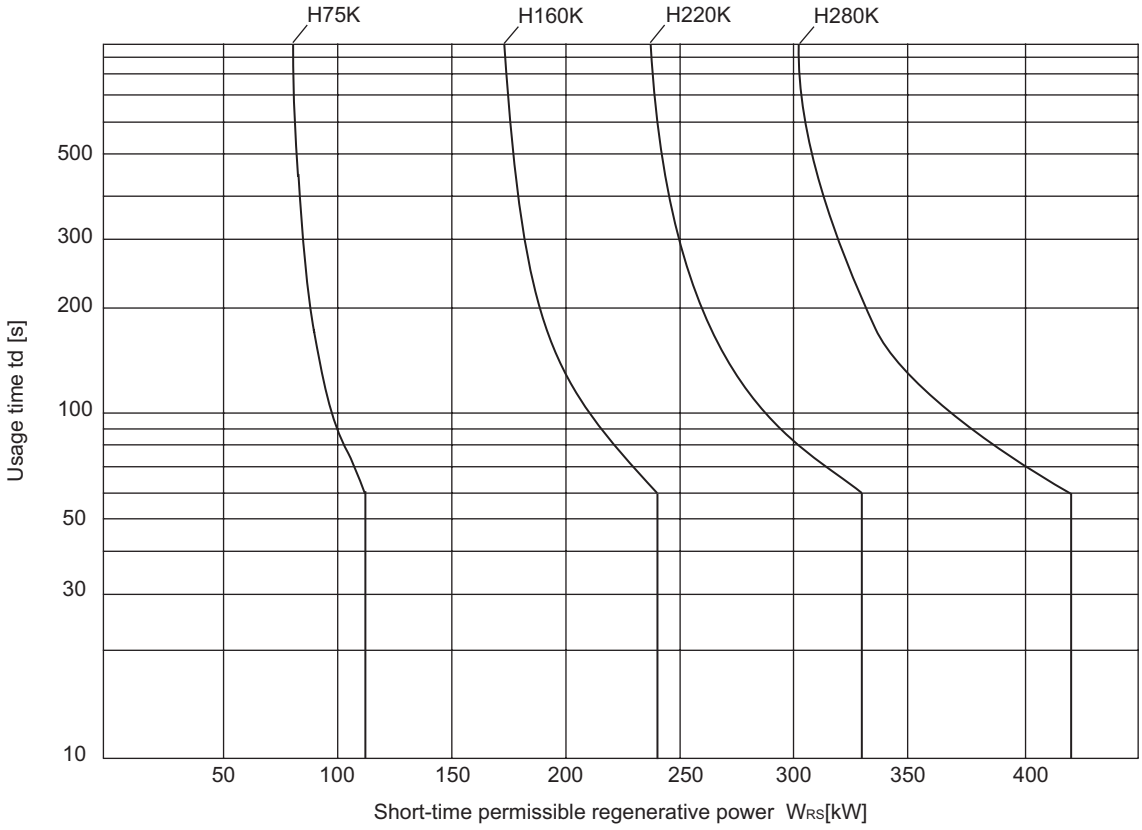
400V class



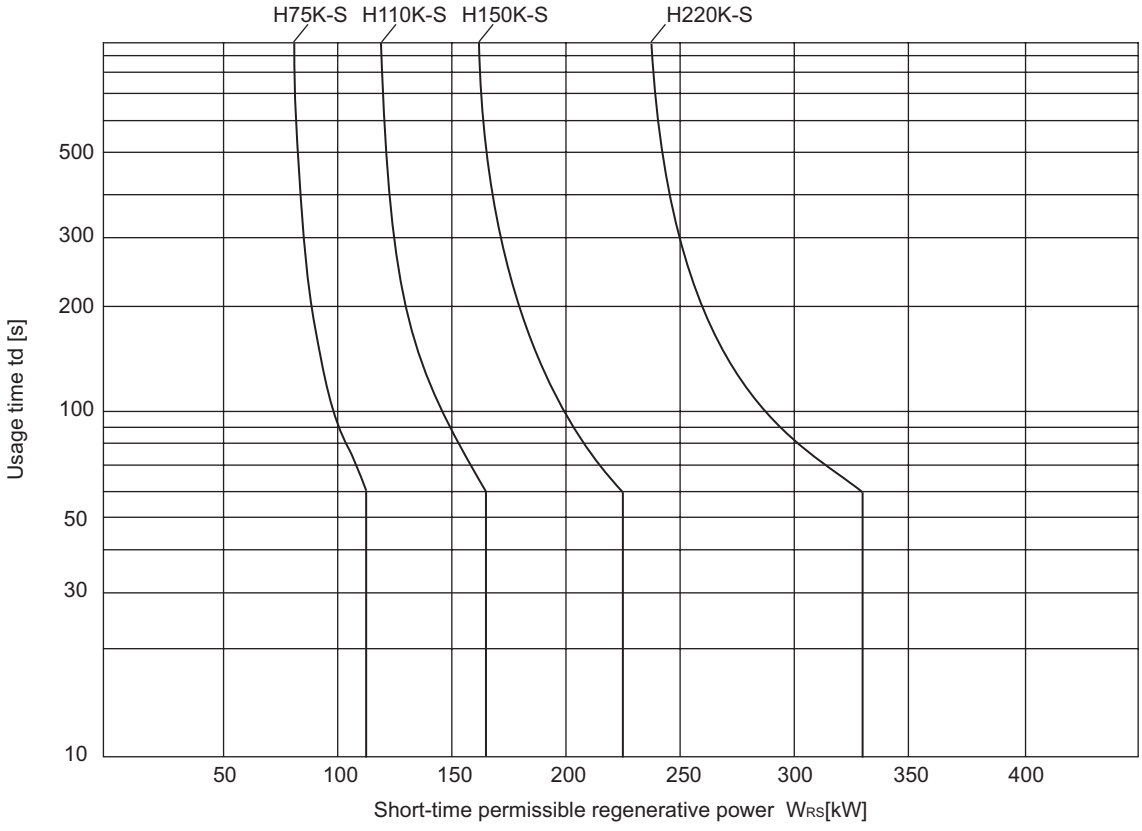
FR-BU2-H75K	0	10	20	30	40	50	60	70	80	90	100
2×FR-BU2-H75K	0	20	40	60	80	100	120	140	160	180	200
3×FR-BU2-H75K	0	30	60	90	120	150	180	210	240	270	300
4×FR-BU2-H75K	0	40	80	120	160	200	240	280	320	360	400
5×FR-BU2-H75K	0	50	100	150	200	250	300	350	400	450	500

Short-time permissible power for a FR-BU2 (MR-BR5) brake unit activation W_{RS}[kW]

(11) Power regeneration converter FR-RC



(12) High power factor converter MT-HC-S



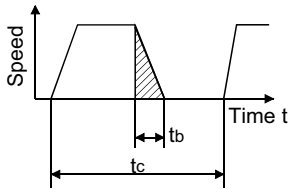
3.5 Permissible brake duty (%ED)

(1) Brake duty %ED

Brake duty %ED indicates the ratio of the actual running time to the set time during intermittent operation. Simple selection of a brake can be performed based on the value. If the continuous operation time t_b is 5s or longer, check the continued operation permissible power (W_{RC}).

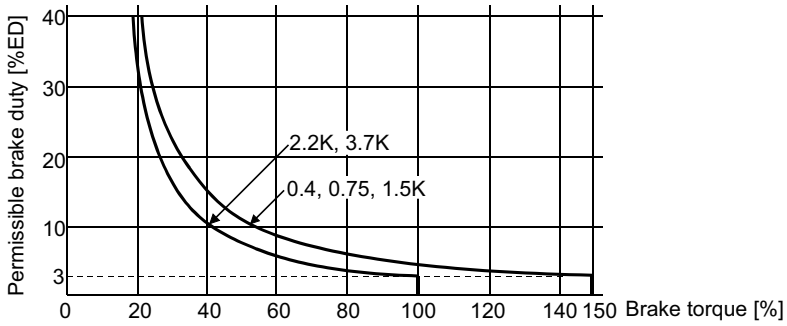
$$\%ED = \frac{tb}{tc} \times 100$$

t_b < 5s (continuous operation time)



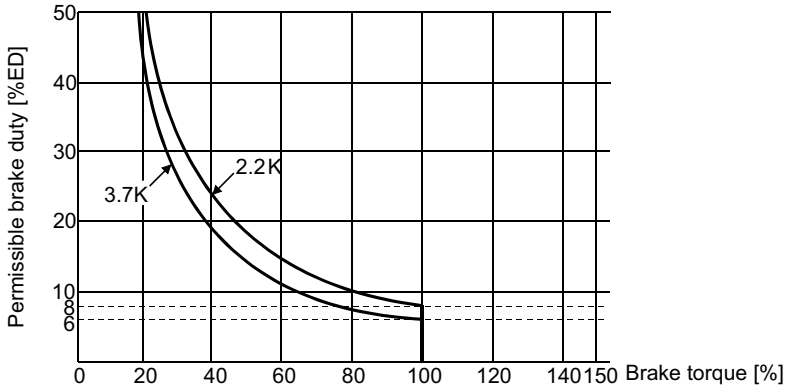
(2) Brake resistor MRS

The kW value in the diagram indicates the output of the applied motor.
The brake torque % is the ratio to the rated motor torque.



(3) Brake resistor MYS

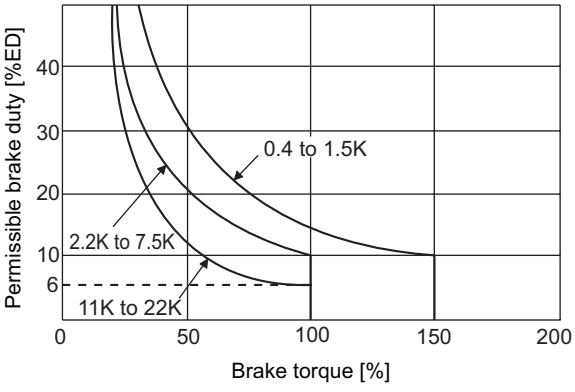
The kW value in the diagram indicates the output of the applied motor.
The brake torque % is the ratio to the rated motor torque.



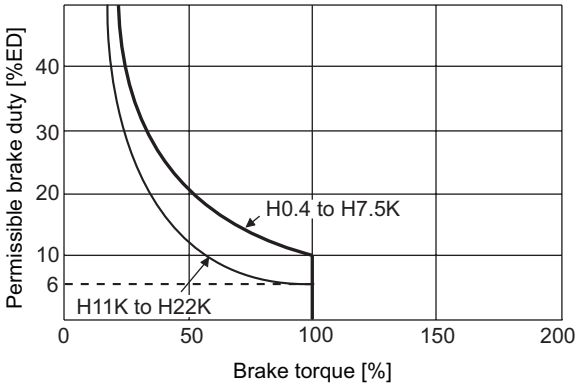
(4) Brake resistor FR-ABR

The kW value in the diagram indicates the output of the applied motor.
The brake torque % is the ratio to the rated motor torque.

200V class



400V class

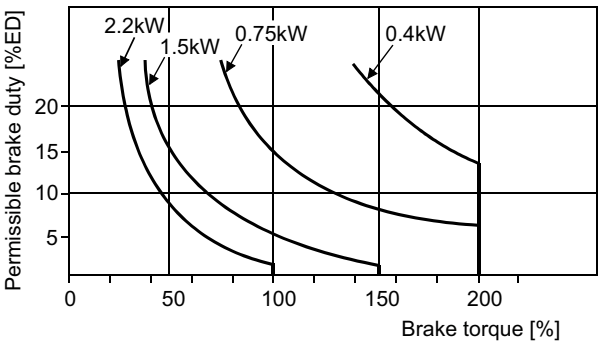


(5) Brake unit FR-BU2(GZG/GRZG)

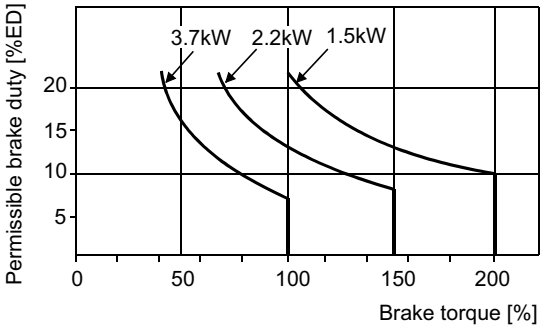
The kW value in the diagram indicates the output of the applied motor. The brake torque % is the ratio to the rated motor torque.

200V class

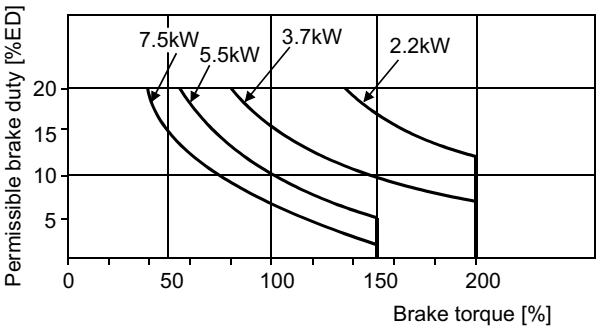
FR-BU2-1.5K/GZG300W-50Ω



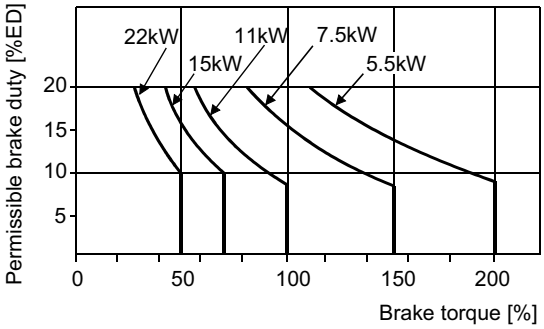
FR-BU2-3.7K/GRZG200-10Ω (three in series)



FR-BU2-7.5K/GRZG300-5Ω (four in series)

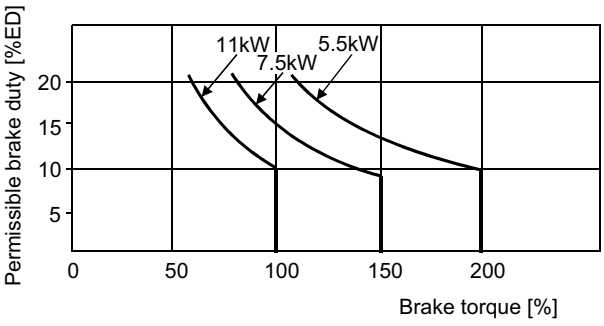


FR-BU2-15K/GRZG400-2Ω (six in series)

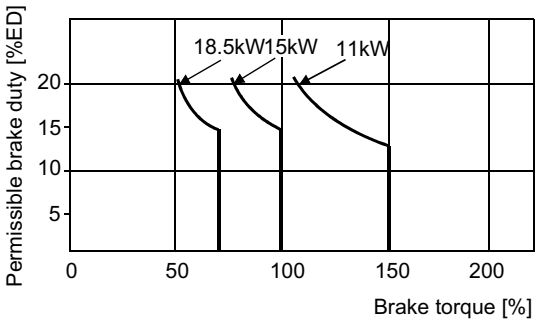


400V class

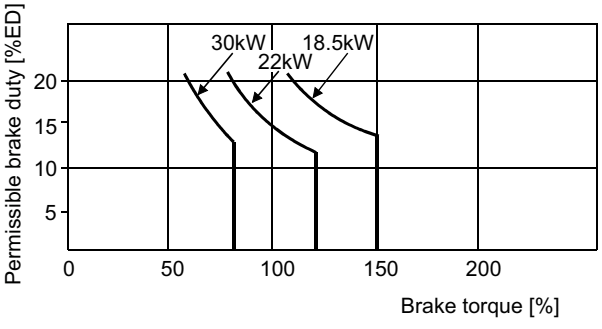
FR-BU2-H7.5K/GRZG200-10Ω (six in series)



FR-BU2-H15K/GRZG300-5Ω (eight in series)



FR-BU2-H30K/GRZG400-2Ω (twelve in series)

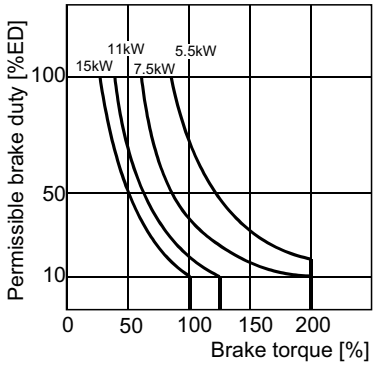


(6) Brake unit FR-BU2(FR-BR)

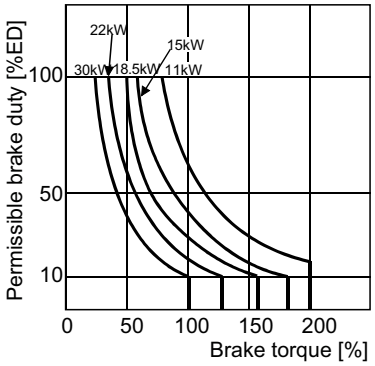
The kW value in the diagram indicates the output of the applied motor. The brake torque % is the ratio to the rated motor torque.

200V class

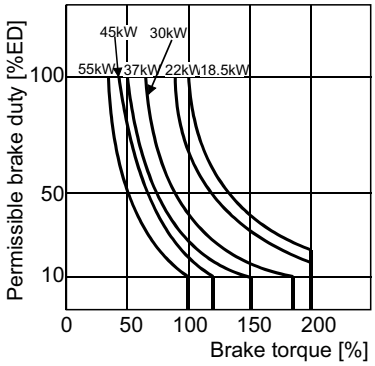
FR-BU2-15K/FR-BR-15K



FR-BU2-30K/FR-BR-30K

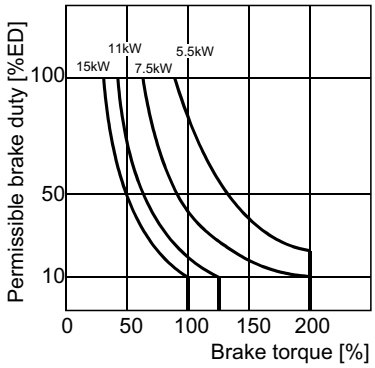


FR-BU2-55K/FR-BR-55K

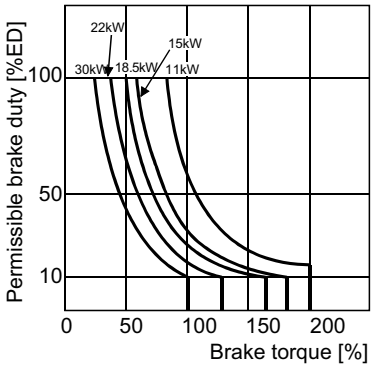


400V class

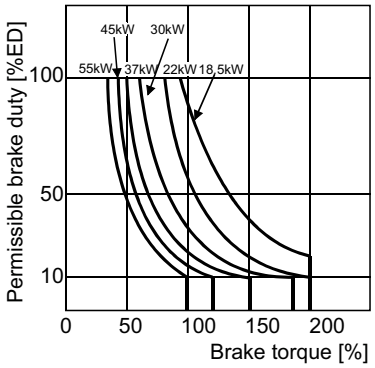
FR-BU2-H15K/FR-BR-H15K



FR-BU2-H30K/FR-BR-H30K



FR-BU2-H55K/FR-BR-H55K

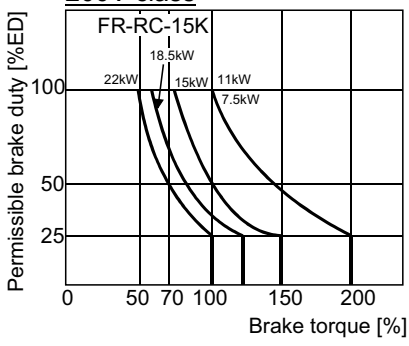


(7) Power regeneration converter FR-RC

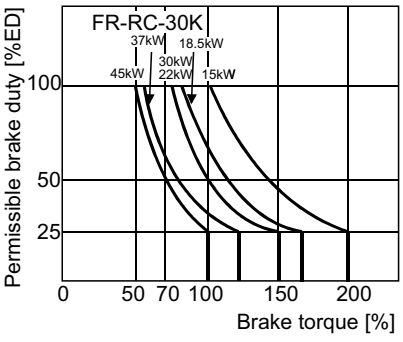
The kW value in the diagram indicates the output of the applied motor. The brake torque % is the ratio to the rated motor torque.

200V class

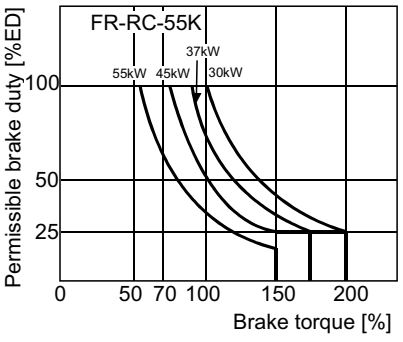
FR-RC-15K



FR-RC-30K

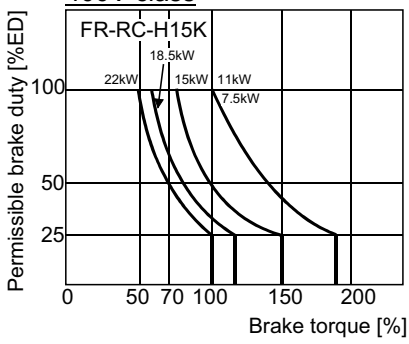


FR-RC-55K

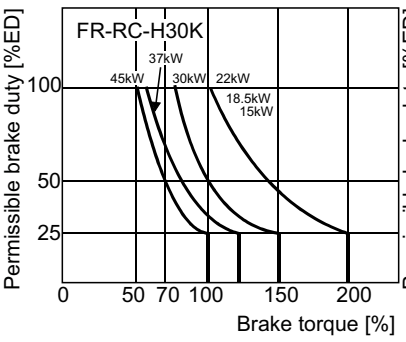


400V class

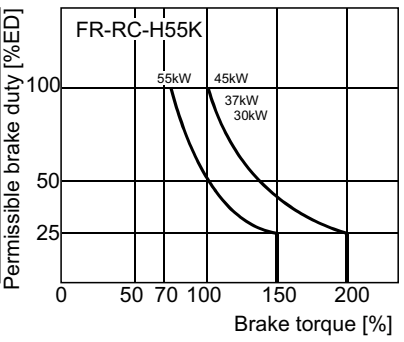
FR-RC-H15K



FR-RC-H30K



FR-RC-H55K

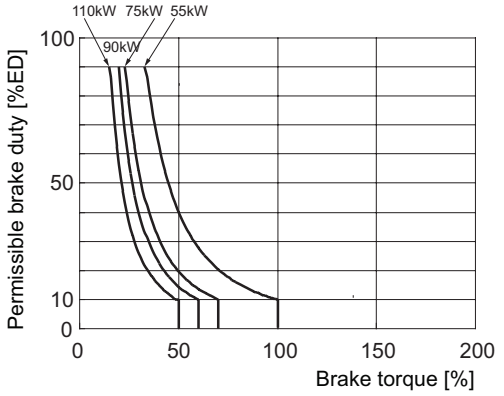


(8) Brake unit FR-BU2(MT-BR5)

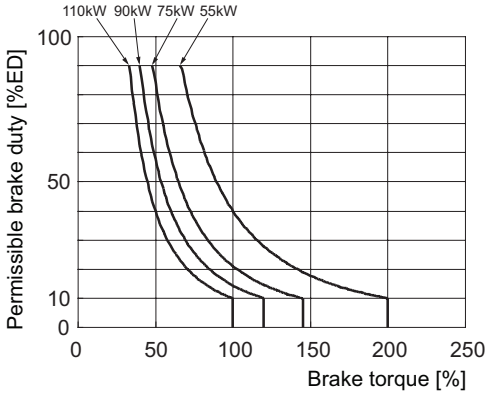
The kW value in the diagram indicates the output of the applied motor. The brake torque % is the ratio to the rated motor torque.

200V class

FR-BU2-55K/MT-BR5-55K

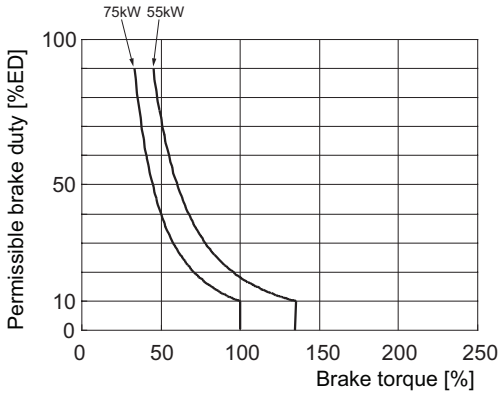


Two FR-BU2-55K/MT-BR5-55K in parallel

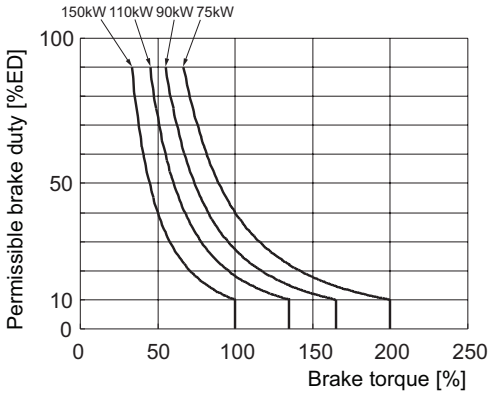


400V class

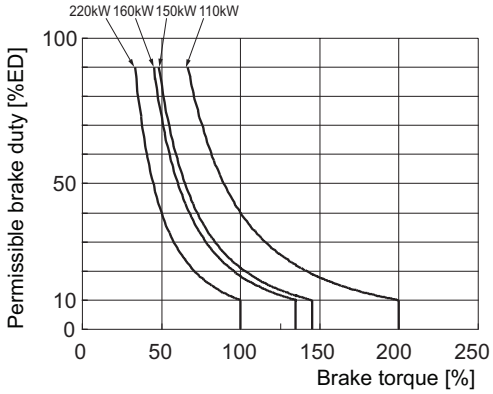
FR-BU2-H75K/MT-BR5-H75K



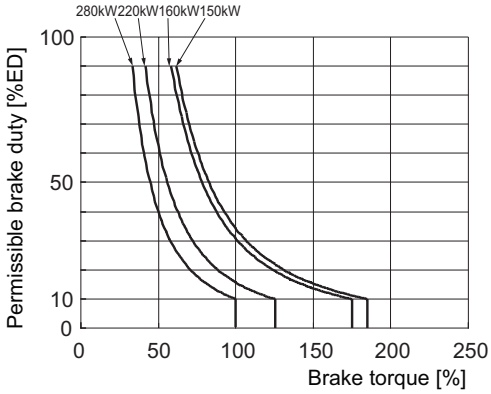
Two FR-BU2-H75K/MT-BR5-H75K in parallel



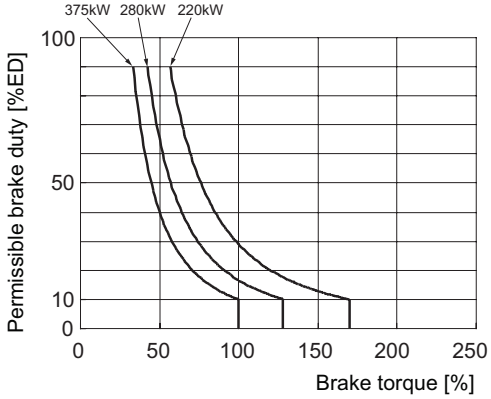
Three FR-BU2-H75K/MT-BR5-H75K in parallel



Four FR-BU2-H75K/MT-BR5-H75K in parallel



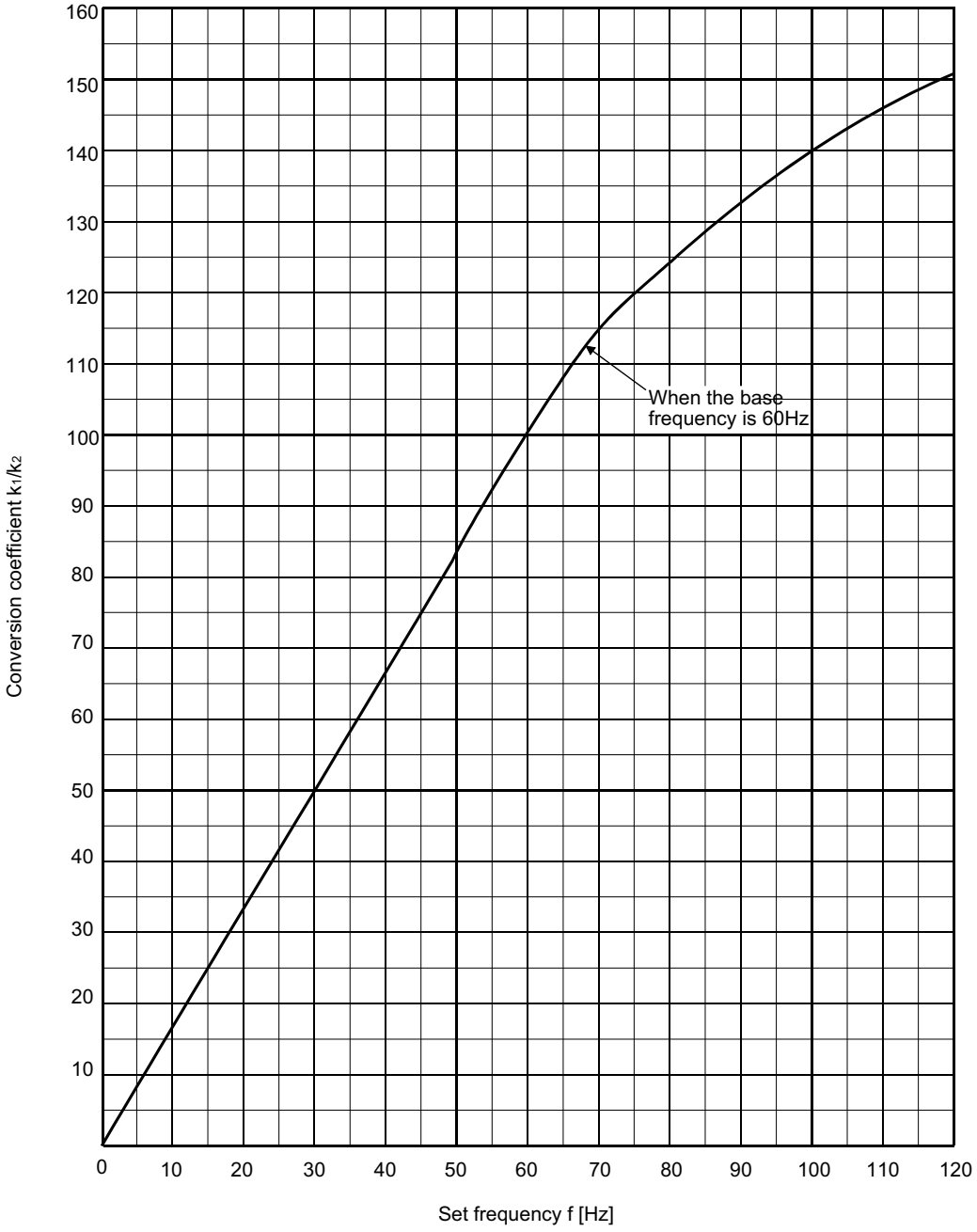
Five FR-BU2-H75K/MT-BR5-H75K in parallel



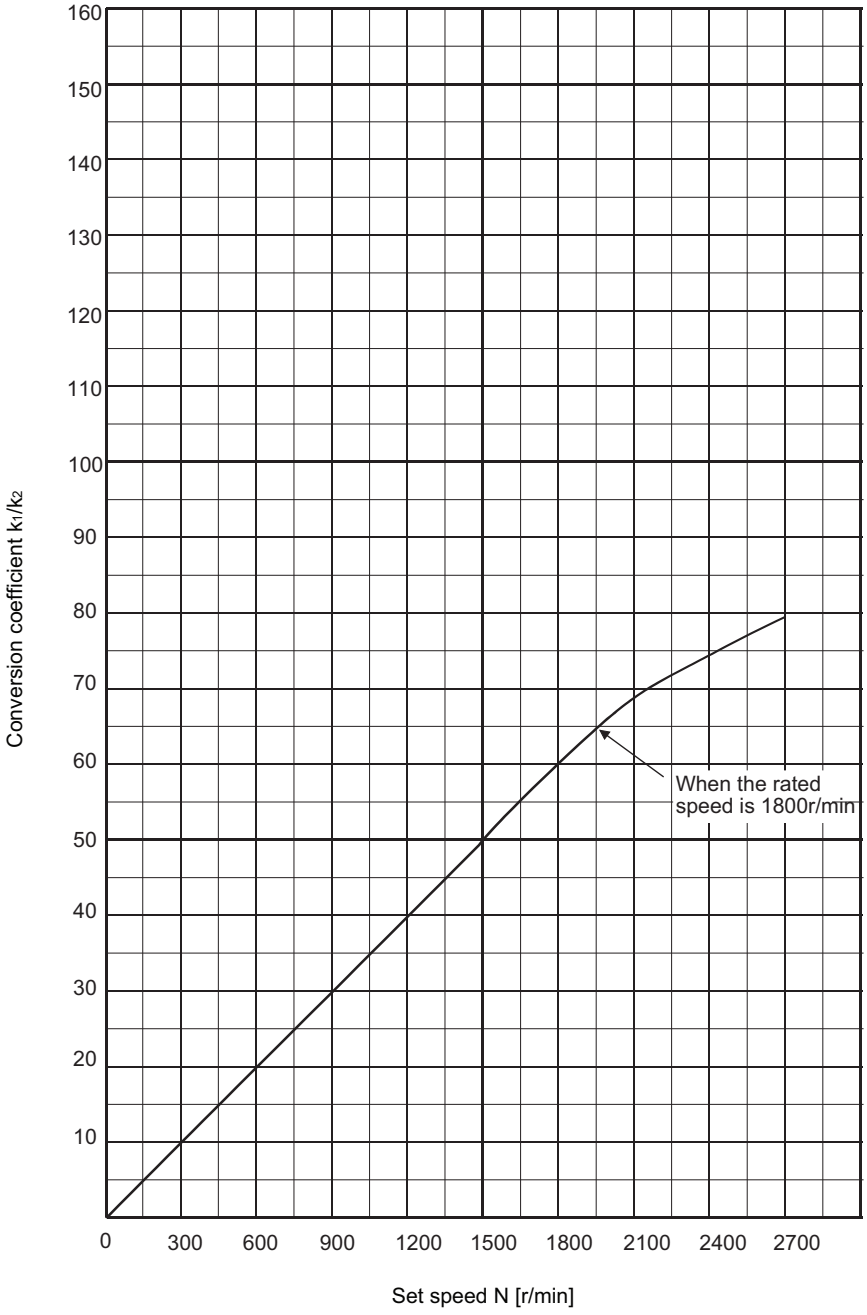
3.6 Power consumed by the motor

The following diagrams indicate conversion coefficients for the power consumed inside the motor.

(1) Standard motor, geared motor, constant-torque motor, dedicated motor



(2) IPM motor


160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
Conversion coefficient k1/k2
0
300
600
900
1200
1500
1800
2100
2400
2700
Set speed N [r/min]
When the rated
speed is 1800r/min

CHAPTER 4 MOTOR AND BRAKE CHARACTERISTICS

This section describes the electric characteristic of standard, constant-torque, and dedicated motors and the characteristics of a TB brake during commercial power supply operation.
Electric characteristic of an IPM motor during drive unit operation is also described.

4.1 Motor current characteristics at different load torque

(1) Standard motors (SF-JR and SF-TH) and geared motors (GM-S, GM-D, GM-SSY, GM-SY, GM-SHY, and GM-HY2)

Figure 4.1 (2 poles and 4 poles) and Figure 4.2 (6 poles) show the current characteristic at different load torque of a standard motor. Figure 4.1 (2 poles and 4 poles) also show the current characteristic at different load torque of a geared motor. Standard torque boost is applied.

Line	Standard motor	Geared motor
———	0.2 to 0.75kW	0.1 to 0.2kW
- - - - - -	1.5 to 2.2kW	0.4 to 0.75kW
— · — · —	3.7 to 7.5kW	1.5kW
— ·· — ·· —	11 to 22kW	2.2kW to 7.5kW
— — — ·	30 to 450kW	-

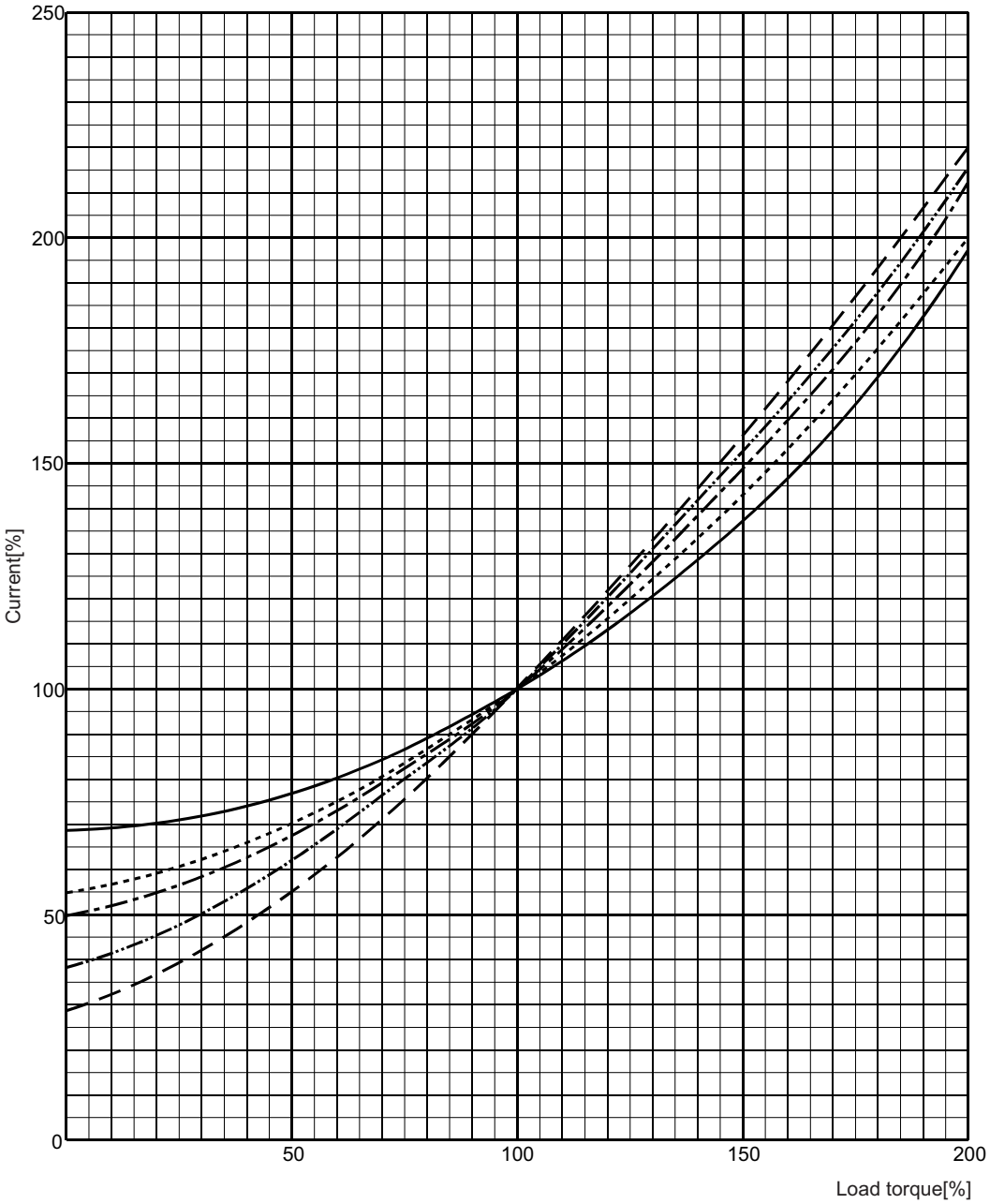


Figure 4.1 Current characteristic at different load torque (2 poles/4 poles)

Line	Standard motor
———	0.4 to 0.75kW
- - - - -	1.5 to 2.2kW
—·—·—	3.7 to 5.5kW
—··—··—	7.5kW or higher

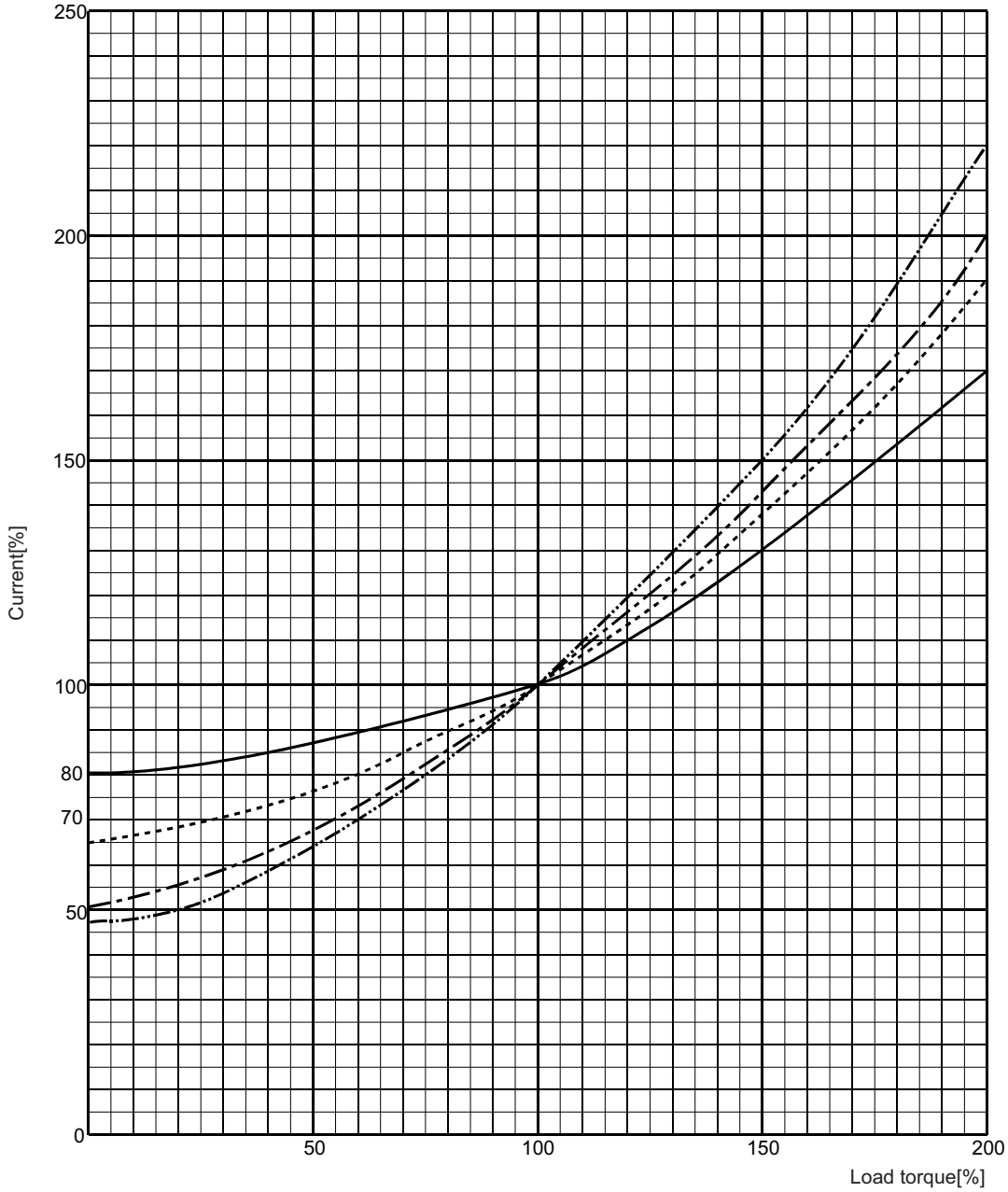


Figure 4.2 Current characteristic at different load torque (6 poles)

(2) Standard motor (SF-HR)

Line	Standard motor
———	0.2kW
- - - - -	0.4kW
—·—·—	0.75 to 1.5kW
—··—··—	2.2 to 18.5kW
— — — — ·	22 to 55kW

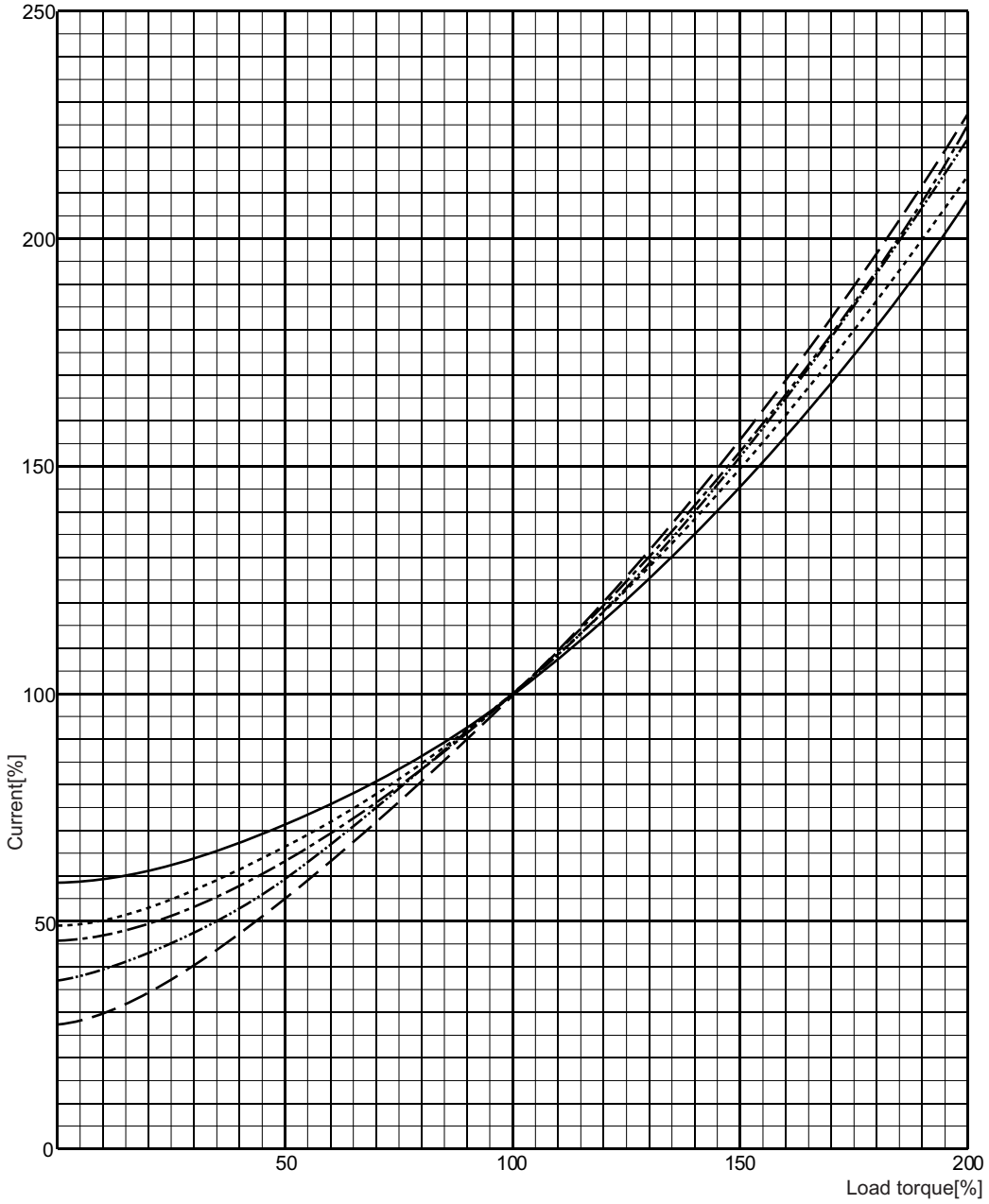


Figure 4.3 Current characteristic at different load torque (4 poles)

(3) Constant-torque motor (SF-HRCA, SF-TH)

Line	Constant-torque motor
———	0.4kW
- - - - - -	0.75kW to 3.7kW
—·—·—	5.5kW to 18.5kW
— — — ·	22kW to 355kW

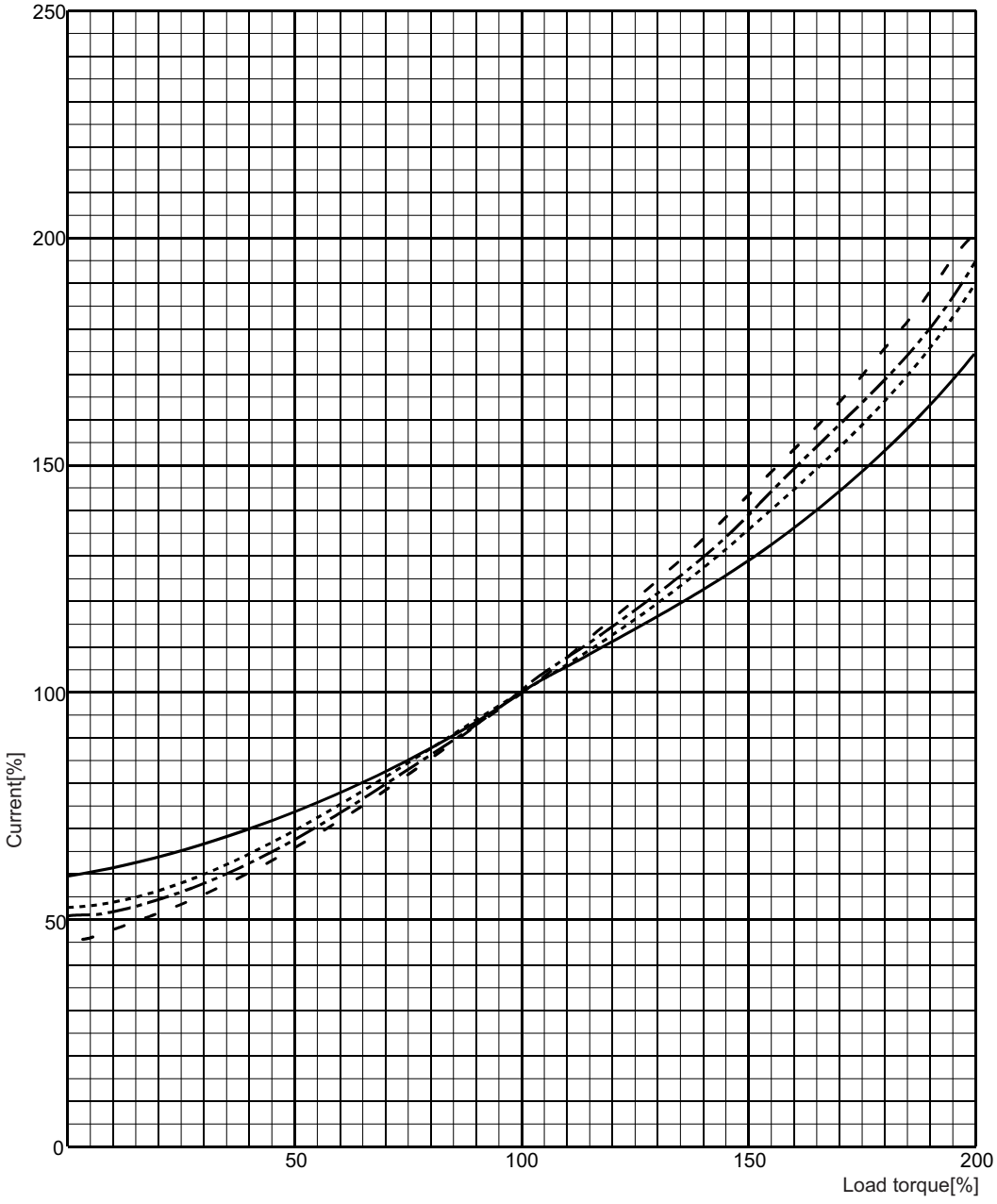


Figure 4.4 Current characteristics at different load torque

(4) Dedicated motor (SF-V5RU, SF-THY)

Line	Dedicated motor
— — — — ·	1.5kW
—··—··—	2.2kW to 3.7kW
———	5.5 to 7.5kW, 55kW
- - - - - - - - - - - -	11 to 22kW
—·—·—	30 to 45kW, 75kW to 250kW

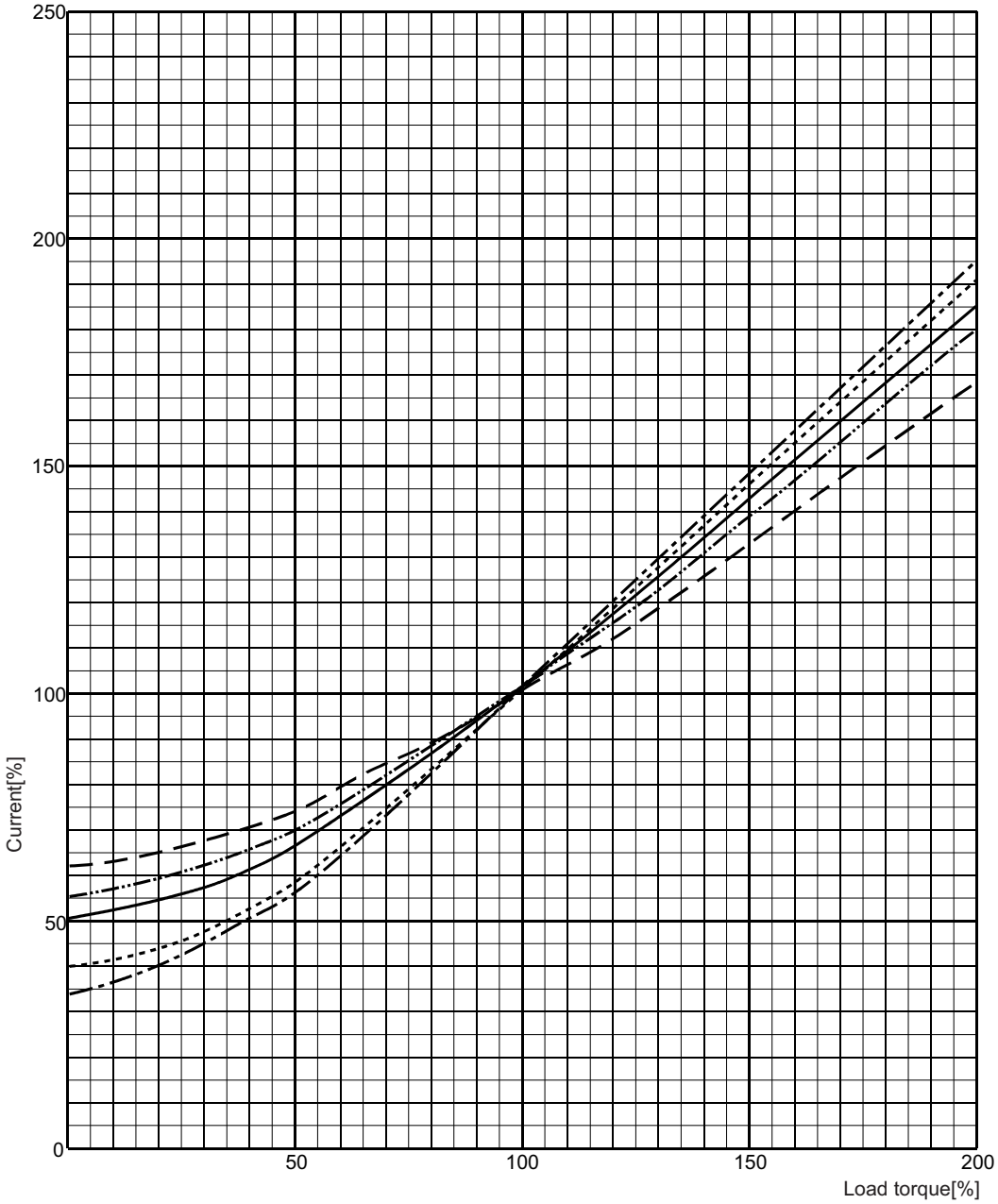


Figure 4.5 Current characteristics at different load torque

(5) IPM motor

Line	IPM motor
———	0.4 to 110kW

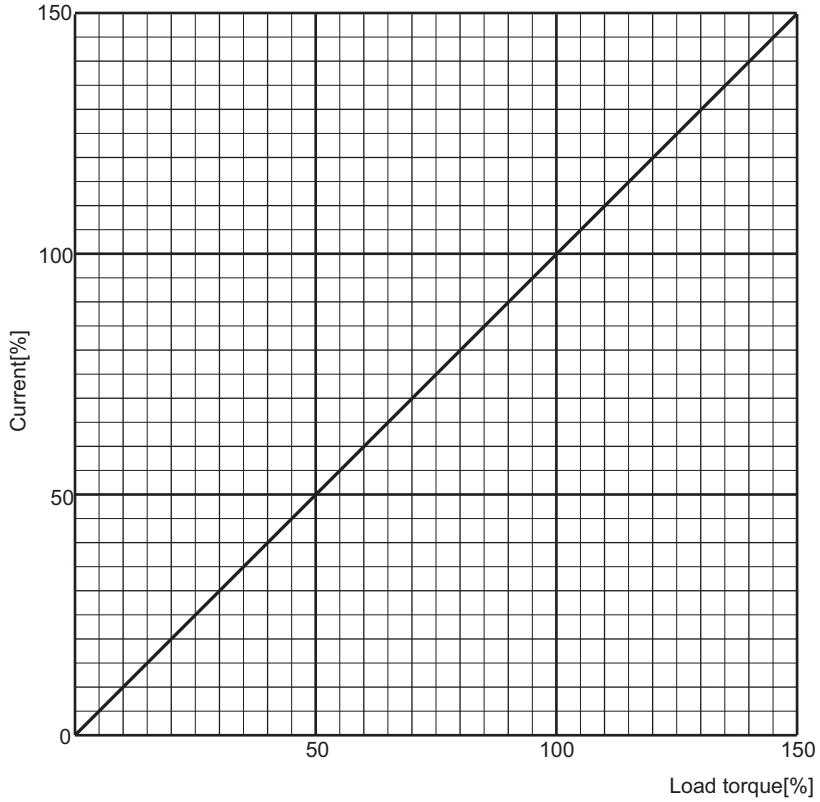


Figure 4.6 Current characteristics at different load torque

4.2 Current compensation coefficient

(1) Inverter

When the maximum frequency f_{max} exceeds the base frequency of the inverter during acceleration/deceleration, the motor current needs to be compensated by referring to the figure below.

Obtain k60 according to the f_{max} and f_{min} in Figure 4.7.

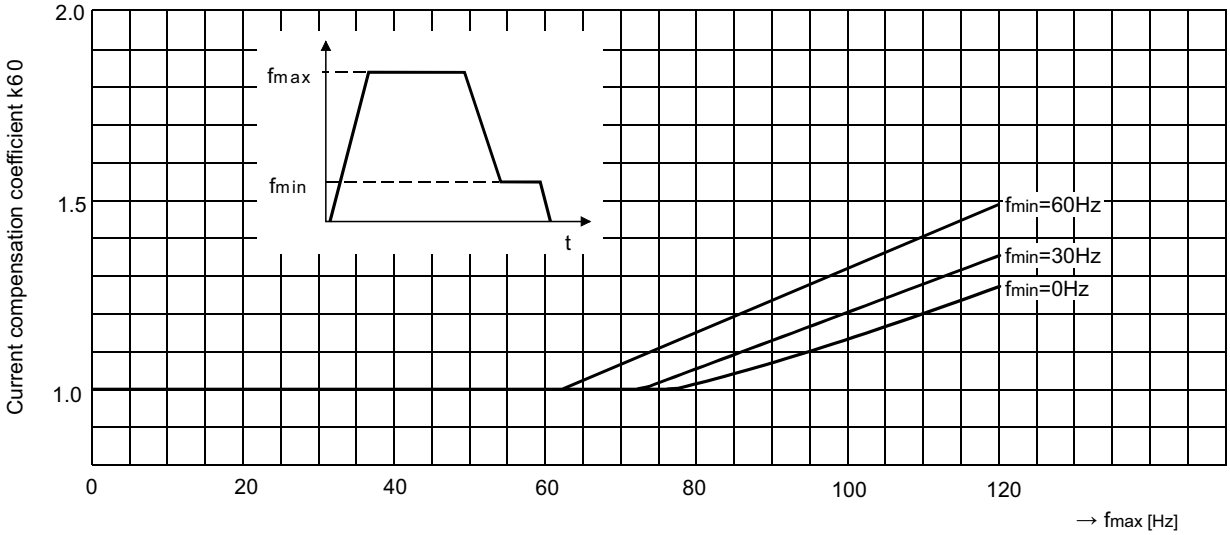


Figure 4.7 Current compensation coefficient during acceleration/deceleration
(when the base frequency is 60Hz)

(2) IPM drive unit

When the maximum speed N_{max} exceeds the rated speed of the drive unit during acceleration/deceleration, the motor current needs to be compensated by referring to the figure below.

Obtain k1800 according to the N_{max} and N_{min} in Figure 4.8.

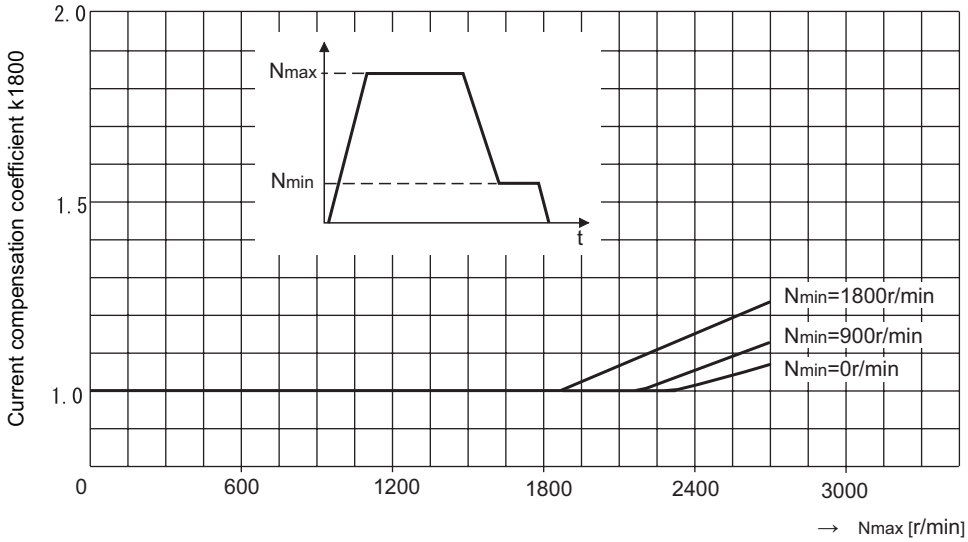


Figure 4.8 Current compensation coefficient during acceleration/deceleration
(when the rated speed is 1800r/min)

4.3 Cooling coefficient

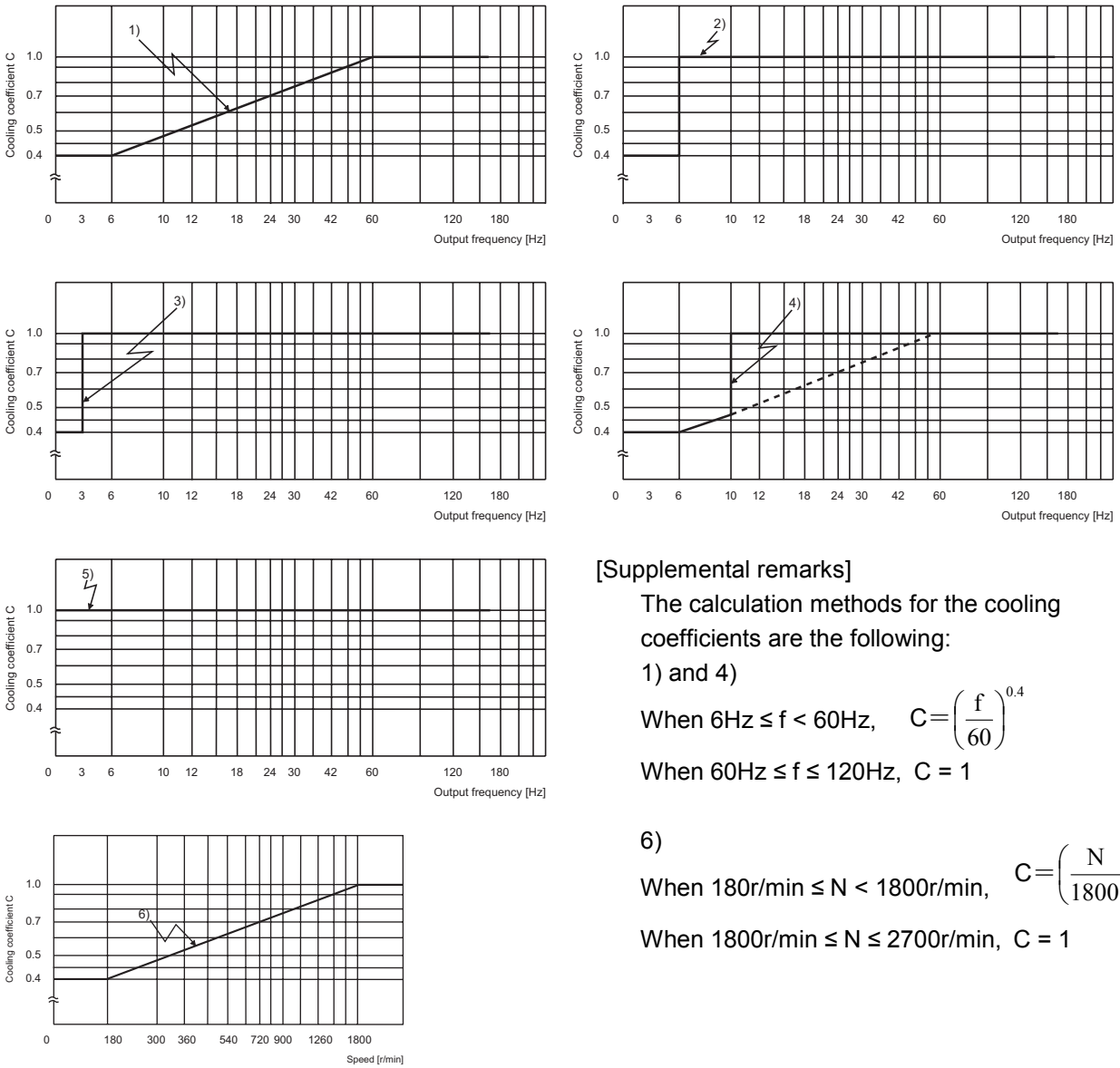
In a standard or IPM motor, the cooling fan is attached to the motor axis. When the motor rotates slower, the amount of cooling air reduces, and less cooling effect is obtained. Compensate for this with the cooling coefficient.

How to obtain the cooling coefficient (C) in each operation block

1) During stop
   Cooling coefficient (C) = 0.4
2) During constant-speed operation
   Obtain the value according to the running frequency f in Figure 4.9.
3) During acceleration/deceleration
   Inverter
   (a) When the maximum frequency f_{max} is equal to or lower than the base frequency of the inverter, calculate the average value of the inverter output frequency before acceleration/deceleration and after acceleration/deceleration. With the calculated average value, obtain the coefficient in Figure 4.9.
   (b) When the maximum frequency f_{max} exceeds the base frequency of the inverter, obtain the coefficient according to f_{max} and f_{min} on Line 1) in Figure 4.10. On Line 2) to 5), the coefficient is 1.0.
   IPM drive unit
   (c) When the maximum speed N_{max} is equal to or lower than the rated speed of the drive unit, calculate the average value of the drive unit speed before acceleration/deceleration and after acceleration/deceleration. With the calculated average value, obtain the coefficient on Line 6) in Figure 4.9.
   (d) When the maximum speed N_{max} exceeds the rated speed of the drive unit, obtain the coefficient according to N_{max} and N_{min} in Figure 4.11.

The numbers ended with) indicate cooling coefficient lines.

	SF-JR	SF-HR	SF-HRCA	GM-S,GM-D GM-SSY,GM-SY, GM-SHY,GM-HY2	SF-V5RU, SF-THY	SF-TH (Standard motor)	SF-TH (Constant-torque motor)	MM-EF (IPM motor)
V/F control	0.2 to 55kW: 1)	0.2 to 55kW: 1)	-	0.1 to 7.5kW: 1)	-	75kW or higher: 1)	75kW or higher: 1)	-
General-purpose Vector control	0.2 to 1.5kW: 2) 2.2 to 7.5kW: 1)	0.2 to 1.5kW: 2) 2.2 to 7.5kW: 1)	0.2 to 7.5kW: 2)	0.1 to 0.75kW: 2) 1.5 to 7.5kW: 1)	-	-	-	-
Advanced magnetic flux vector control Real sensorless vector control	0.4 to 3.7kW: 2) 5.5 to 55kW: 1)	0.4 to 0.75kW: 2) 1.5 to 55kW: 4)	0.4 to 37kW: 2) 45 to 55kW: 4)	0.1 to 0.75kW: 3) 1.5 to 7.5kW: 2)	-	75kW or higher: 1)	75kW or higher: 2)	-
Vector control	0.4 to 3.7kW: 2) 5.5 to 55kW: 1)	-	-	-	1.5 to 250kW: 5)	-	-	-
IPM high-efficiency control	-	-	-	-	-	-	-	0.4 to 110kW: 6)
IPM motor control	-	-	-	-	-	-	-	0.4 to 110kW: 6)



[Supplemental remarks]

The calculation methods for the cooling coefficients are the following:

1) and 4)

When 6Hz ≤ f < 60Hz, $C=\left(\frac{f}{60}\right)^{0.4}$

When 60Hz ≤ f ≤ 120Hz, C = 1

6)

When 180r/min ≤ N < 1800r/min, $C=\left(\frac{N}{1800}\right)^{0.4}$

When 1800r/min ≤ N ≤ 2700r/min, C = 1

Figure 4.9 Cooling coefficient

・ Average cooling coefficient during acceleration

(1) Inverter

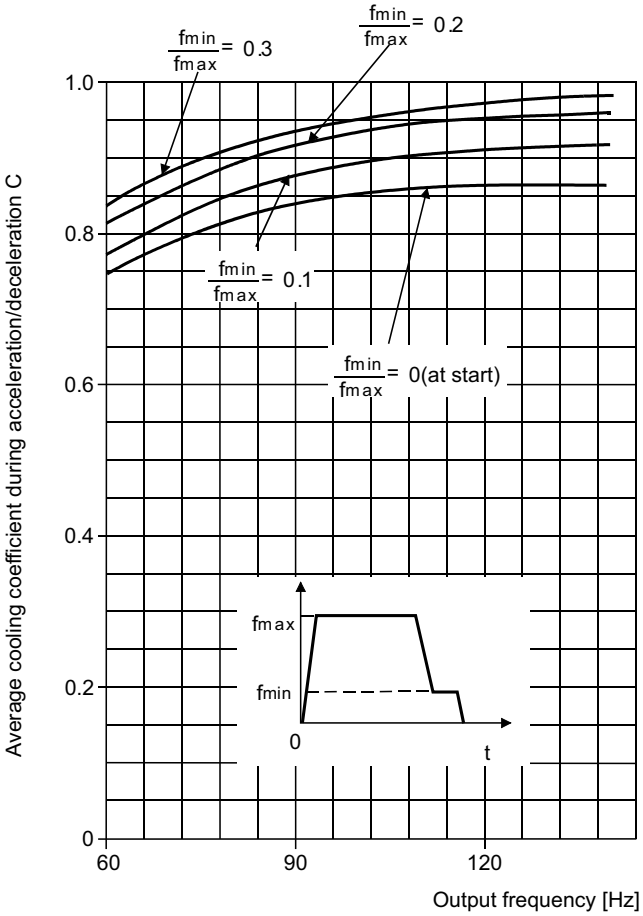


Figure 4.10 Average cooling coefficient during acceleration/deceleration (When f_{max} exceeds the base frequency of the inverter)

(2) IPM drive unit

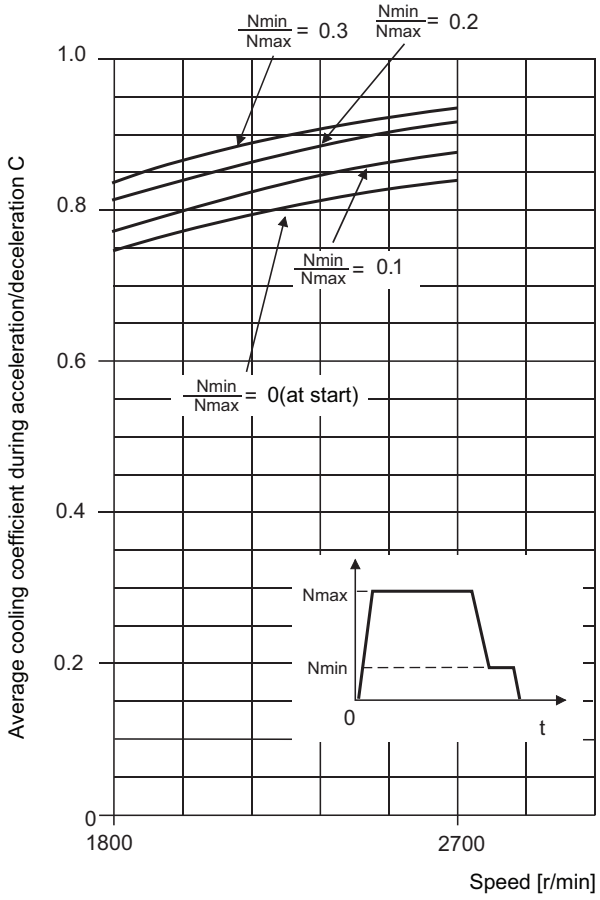


Figure 4.11 Average cooling coefficient during acceleration/deceleration
(When Nmax exceeds the rated speed of the drive unit)

4.4 Electronic thermal relay characteristic

(1) Inverter

Figure 4.12 shows the electronic thermal relay characteristic of an inverter. The horizontal axis is the ratio of motor current to the Pr.9 (Electronic thermal relay) setting.
Horizontal axis is calculated as (motor current [A]/Pr.9[A])×100[%]).

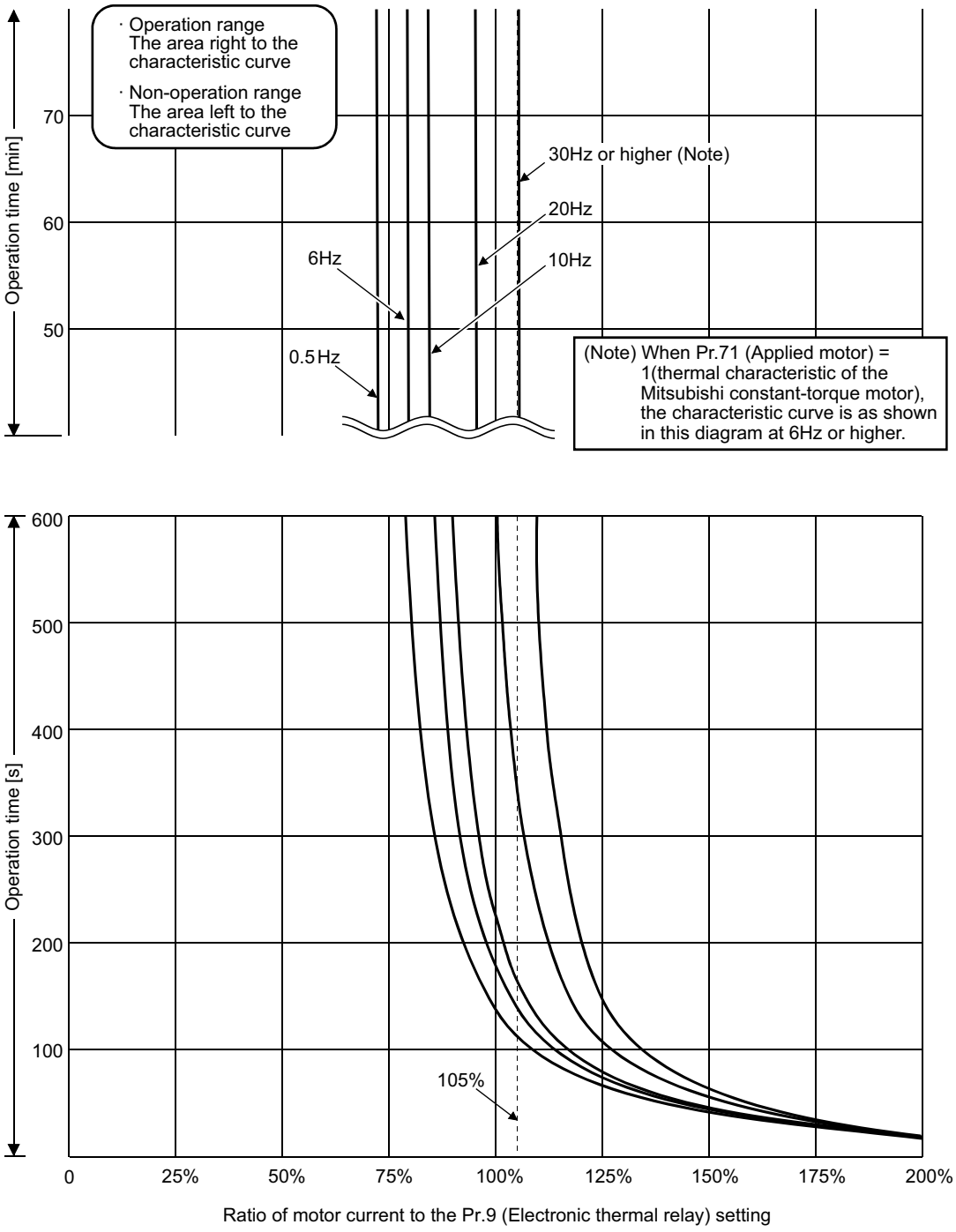


Figure 4.12 Operation characteristic of an inverter electronic thermal relay

(2) IPM drive unit

Figure 4.13 shows the electronic thermal relay characteristic of a drive unit. The horizontal axis is the ratio of motor current to the Pr.9 (Electronic thermal relay) setting.
Horizontal axis is calculated as (motor current [A]/Pr.9[A])×100[%]).

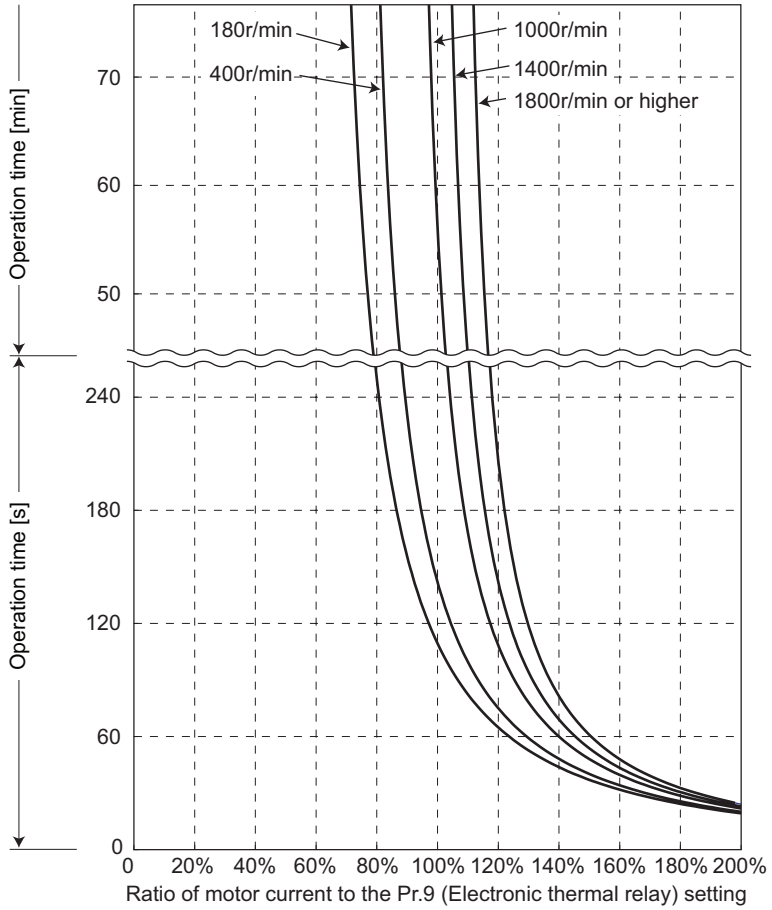


Figure 4.13 Operation characteristic of an electronic thermal relay in an IPM drive unit (*1, *2)

*1 Characteristic curve of an IPM motor (MM-EF series)

*2 For an IPM motor (MM-EF series), the number of magnetic poles differs by the motor capacity. (Refer to Appendix 2.) Be careful when calculating the electronic thermal relay operation time from the running frequency.

4.5 Motor characteristic table

(1) Rating plate value

Table 4.1 shows the rating plate values of a totally-enclosed fan-cooled standard motor. Table 4.2 shows the characteristics at different load %. When using a drip-proof type, please refer to the other documents.

Table 4.1 Rating plate value of the totally-enclosed fan-cooled squirrel-cage motor (SF-JR and SF-TH)

Number of poles	Model	Output (kW)	Frame number	Isolation	200V class						400V class					
					Rated current (A)			Rated speed [r/min]			Rated current (A)			Rated speed [r/min]		
					200V 50Hz	200V 60Hz	220V 60Hz	200V 50Hz	200V 60Hz	220V 60Hz	400V 50Hz	400V 60Hz	440V 60Hz	400V 50Hz	400V 60Hz	440V 60Hz
2 poles	SF-JR	0.2	63	E	1.1	1.0	1.0	2800	3340	3400	0.58	0.54	0.53	2820	3370	3400
		0.4	71		2.1	1.9	1.8	2850	3420	3450	1	0.9	0.9	2850	3430	3440
		0.75	80		3.4	3.3	3.1	2810	3400	3410	1.7	1.65	1.55	2810	3400	3410
		1.5	90L		6.2	6	5.6	2870	3440	3450	3.1	3	2.8	2870	3440	3450
		2.2	90L		8.6	8.4	7.8	2860	3430	3460	4.3	4.2	3.9	2860	3430	3460
		3.7	112M		14.2	13.8	12.8	2910	3480	3490	7.1	6.9	6.4	2910	3480	3490
		5.5	132S	B	22.4	20.8	19.8	2910	3490	3500	11.2	10.4	9.9	2910	3490	3500
		7.5	132S		27.6	26.6	24.6	2920	3500	3510	13.8	13.3	12.3	2920	3500	3510
		11	160M		40	39	36	2920	3500	3510	20	19.5	18	2920	3500	3510
		15	160M		53	52	48	2920	3500	3510	26.5	26	24	2920	3500	3510
		18.5	160L		64	63	58	2920	3500	3510	32	31.5	29	2920	3500	3510
		22	180M		78	76	70	2920	3500	3510	39	38	35	2920	3500	3510
		30	180L	F	104	104	94	2930	3500	3520	52	52	47	2930	3500	3520
		37	200L		134	128	120	2930	3520	3530	67	64	60	2930	3520	3530
		45	200L		162	154	144	2930	3520	3530	81	77	72	2930	3520	3530
		55	225S		198	192	176	2940	3530	3540	99	96	88	2940	3530	3540
	SF-TH (Standard motor)	75	250MD		268	-	240	2975	-	3575	134	-	120	2975	-	3575
		90	250MD		306	-	278	2970	-	3570	153	-	139	2970	-	3570
		110	250MD		366	-	332	2970	-	3575	183	-	166	2970	-	3575
		132	280MD		-	-	-	-	-	-	223	-	203	2975	-	3575
		150	280MD		-	-	-	-	-	-	259	-	230	2980	-	3580
		160	280MD		-	-	-	-	-	-	274	-	244	2980	-	3575
		185	280L		-	-	-	-	-	-	317	-	284	2975	-	3575
		200	280L		-	-	-	-	-	-	344	-	304	2980	-	3575
		220	280L		-	-	-	-	-	-	374	-	332	2975	-	3575
		250	280L		-	-	-	-	-	-	414	-	376	2975	-	3575
		280	280L		-	-	-	-	-	-	-	-	416	-	-	3575
			315H		-	-	-	-	-	-	470	-	-	2975	-	-
		300	315H		-	-	-	-	-	-	500	-	450	2980	-	3575
		315	315H		-	-	-	-	-	-	522	-	471	2980	-	3575
		355	315H		-	-	-	-	-	-	-	-	527	-	-	3575
			355H		-	-	-	-	-	-	605	-	-	2975	-	-
		400	355H		-	-	-	-	-	-	675	-	615	2980	-	3575
		450	355H		-	-	-	-	-	-	755	-	685	2975	-	3575
		500	355H		-	-	-	-	-	-	-	-	760	-	-	3575
4 poles	SF-JR	0.2	63	E	1.26	1.1	1.1	1430	1730	1740	0.63	0.55	0.55	1430	1730	1740
		0.4	71		2.2	2.0	2.0	1410	1690	1700	1.1	1	1	1410	1690	1700
		0.75	80		3.7	3.4	3.3	1400	1690	1700	1.8	1.7	1.65	1400	1690	1700
		1.5	90L		6.6	6.2	6	1420	1710	1720	3.3	3.1	3	1420	1710	1720
		2.2	100L		9.2	9.0	8.6	1430	1710	1720	4.6	4.5	4.3	1430	1710	1720
		3.7	112M		14.6	14.2	13.4	1420	1710	1730	7.3	7.1	6.7	1420	1710	1730
		5.5	132S	B	22	21	19.8	1430	1720	1730	11	10.5	9.9	1430	1720	1730
		7.5	132M		29	28	26.4	1440	1730	1740	14.5	14	13.2	1440	1730	1740
		11	160M		42.5	41	38	1430	1720	1740	21.5	20.5	19	1430	1720	1740
		15	160L		56	54	50	1440	1730	1740	28	27	25	1440	1730	1740
		18.5	180M		68	66	62	1460	1750	1760	34	33	31	1460	1750	1760
		22	180M		81	78	72	1460	1750	1760	40.5	39	36	1460	1750	1760
		30	180L	F	110	106	98	1460	1750	1760	55	53	49	1460	1750	1760
		37	200L		131	130	118	1460	1760	1770	65.5	65	59	1460	1760	1770
		45	200L		162	156	144	1460	1760	1770	81	78	72	1460	1760	1770
		55	225S		202	192	178	1470	1760	1770	101	96	89	1470	1760	1770

* The values in the frame number 250MD or higher are the reference values.

Table 4.1 Rating plate value of the totally-enclosed fan-cooled squirrel-cage motor (SF-JR and SF-TH)

Number of poles	Model	Output (kW)	Frame number	Isolation	200V class						400V class					
					Rated current (A)			Rated speed [r/min]			Rated current (A)			Rated speed [r/min]		
					200V 50Hz	200V 60Hz	220V 60Hz	200V 50Hz	200V 60Hz	220V 60Hz	400V 50Hz	400V 60Hz	440V 60Hz	400V 50Hz	400V 60Hz	440V 60Hz
4 poles	SF-TH (Standard motor)	75	250MD	F	280	-	246	1485	-	1785	140	-	123	1485	-	1785
		90	250MD		324	-	290	1480	-	1780	162	-	145	1480	-	1780
		110	250MD		382	-	344	1480	-	1780	191	-	172	1480	-	1780
		132	280MD		-	-	-	-	-	-	237	-	211	1485	-	1785
		150	280MD		-	-	-	-	-	-	265	-	232	1485	-	1785
		160	280MD		-	-	-	-	-	-	281	-	247	1485	-	1785
		185	280MD		-	-	-	-	-	-	-	-	289	-	-	1785
			280L		-	-	-	-	-	-	320	-	-	1485	-	-
		200	280L		-	-	-	-	-	-	347	-	309	1485	-	1785
		220	280L		-	-	-	-	-	-	378	-	337	1485	-	1785
		250	280L		-	-	-	-	-	-	428	-	381	1485	-	1785
		280	280L		-	-	-	-	-	-	-	-	427	-	-	1785
			315H		-	-	-	-	-	-	469	-	-	1485	-	-
		300	315H		-	-	-	-	-	-	499	-	449	1485	-	1780
		315	315H		-	-	-	-	-	-	522	-	471	1480	-	1780
		355	315H		-	-	-	-	-	-	-	-	527	-	-	1780
			355H		-	-	-	-	-	-	625	-	-	1485	-	-
		400	355H		-	-	-	-	-	-	685	-	630	1480	-	1780
		450	355H		-	-	-	-	-	-	775	-	700	1480	-	1780
6 poles	SF-JR	0.2	71	E	1.4	1.3	1.3	930	1110	1120	0.7	0.65	0.65	930	1110	1120
		0.4	80		2.7	2.5	2.5	920	1100	1110	1.3	1.2	1.2	920	1100	1110
		0.75	90L		4.2	4	4	950	1140	1150	2.1	2	2	950	1140	1150
		1.5	100L		7.4	7	6.8	930	1110	1120	3.7	3.5	3.4	930	1110	1120
		2.2	112M		10.4	10	9.8	940	1120	1140	5.2	5	4.9	940	1120	1140
		3.7	132S	B	17.2	16	15.2	950	1140	1150	8.6	8	7.6	950	1140	1150
		5.5	132M		24.6	23	22	950	1140	1150	12.3	11.5	11	950	1140	1150
		7.5	160M		32	30	29	960	1140	1150	16	15	14.5	960	1140	1150
		11	160L		46	43	41	970	1150	1160	23	21.5	20.5	970	1150	1160
		15	180M		62	58	56	970	1160	1170	31	29	28	970	1160	1170
		18.5	180L	F	72	70	65	970	1160	1170	36	35	32.5	970	1160	1170
		22	180L		85	82	76	970	1160	1170	42.5	41	38	970	1160	1170
		30	200L		117	110	102	970	1160	1170	58.5	55	51	970	1160	1170
		37	200L		145	136	128	970	1160	1170	72.5	68	64	970	1160	1170
		45	225S		174	164	152	970	1160	1170	87	82	76	970	1160	1170
	SF-TH (Standard motor)	55	250MD		222	-	196	990	-	1190	111	-	98	990	-	1190
		75	250MD		290	-	258	985	-	1185	145	-	129	985	-	1185
		90	250MD		340	-	304	985	-	1185	170	-	152	985	-	1185
		110	280MD		428	-	376	990	-	1190	214	-	188	990	-	1190
		132	280MD		-	-	-	-	-	-	252		222	990	-	1190
		150	280MD		-	-	-	-	-	-	-	-	251	-	-	1190
			280L		-	-	-	-	-	-	273	-	-	990	-	-
		160	280MD		-	-	-	-	-	-	-	-	265	-	-	1185
			280L		-	-	-	-	-	-	289	-	-	985	-	-
		185	280L		-	-	-	-	-	-	-	-	297	-	-	1185
			315H		-	-	-	-	-	-	341	-	-	990	-	-
		200	280L		-	-	-	-	-	-	-	-	341	-	-	1190
			315H		-	-	-	-	-	-	369	-	-	990	-	-
		220	280L		-	-	-	-	-	-	-	-	368	-	-	1190
			315H		-	-	-	-	-	-	400	-	-	990	-	-
		250	315H		-	-	-	-	-	-	450	-	398	990	-	1190
		280	315H		-	-	-	-	-	-	-	-	443	-	-	1190
			355H		-	-	-	-	-	-	515	-	-	990	-	-
		300	315H		-	-	-	-	-	-	-	-	472	-	-	1185
			355H		-	-	-	-	-	-	550	-	-	990	-	-
		315	355H		-	-	-	-	-	-	575	-	515	985	-	1185
		355	355H		-	-	-	-	-	-	640	-	580	985	-	1185
		400	355H		-	-	-	-	-	-	-	-	650	-	-	1185

* The values in the frame number 250MD or higher are the reference values.

Table 4.2 Rating plate value of the totally-enclosed fan-cooled squirrel-cage motor (SF-HR)

Number of poles	Model	Output (kW)	Frame number	Isolation	200V class						400V class					
					Rated current (A)			Rated speed [r/min]			Rated current (A)			Rated speed [r/min]		
					200V	200V	220V	200V	200V	220V	400V	400V	440V	400V	400V	440V
					50Hz	60Hz	60Hz	50Hz	60Hz	60Hz	50Hz	60Hz	60Hz	50Hz	60Hz	60Hz
4 poles	SF-HR	0.2	63M	E	1.12	1.02	1.02	1400	1680	1700	0.56	0.51	0.51	1400	1680	1700
		0.4	71M		2.0	1.88	1.8	1400	1680	1700	1.0	0.94	0.9	1400	1680	1700
		0.75	80M		3.5	3.2	3.1	1400	1680	1700	1.75	1.6	1.55	1400	1680	1700
		1.5	90L		7.0	6.4	6.2	1430	1725	1735	3.5	3.2	3.1	1430	1725	1735
		2.2	100L		9.2	8.7	8.3	1430	1725	1735	4.6	4.35	4.15	1430	1725	1735
		3.7	112M	B	15.4	14.4	13.8	1440	1730	1740	7.7	7.2	6.9	1440	1730	1740
		5.5	132S		21.8	20.2	19.2	1460	1750	1760	10.9	10.1	9.6	1460	1750	1760
		7.5	132M		28.8	27.2	25.6	1460	1750	1760	14.4	13.6	12.8	1460	1750	1760
		11	160M		43	41	38.4	1460	1760	1760	21.5	20.5	19.2	1460	1760	1760
		15	160L		58	55	52	1460	1760	1760	29	27.5	26	1460	1760	1760
		18.5	180M		70	66	63	1470	1770	1770	35	33	31.5	1470	1770	1770
		22	180M		81	78	72	1470	1770	1770	40.5	39	36	1470	1770	1770
		30	180L	F	112	106	99	1470	1770	1770	56	53	49.5	1470	1770	1770
		37	200L		134	130	120	1470	1760	1770	67	65	60	1470	1760	1770
		45	200L		164	156	146	1470	1770	1770	82	78	73	1470	1770	1770
		55	225S		208	192	180	1470	1770	1780	104	96	90	1470	1770	1780

(2) Load characteristic

Table 4.3 Characteristic table of the totally-enclosed fan-cooled motor (SF-JR and SF-TH)
200V class and 400V class

Output kW	Number of poles	Frame number	Moment of inertia [kg·m^2]	Voltage V	Frequency Hz	Load characteristic									Rated speed min^{-1}	Starting current A
						50% load			75% load			100% load				
						Current A	Efficiency %	Power factor %	Current A	Efficiency %	Power factor %	Current A	Efficiency %	Power factor %		
0.2	2	63M	0.00050	200	50	0.859	57.4	58.6	0.958	64.2	70.4	1.09	67.1	78.9	2800	6.20
				200	60	0.719	61.2	65.6	0.839	67.2	76.8	0.990	69.4	84.0	3340	5.60
				220	60	0.767	58.0	59.0	0.859	65.2	70.3	0.977	68.6	78.3	3400	6.16
	4	63M	0.0010	200	50	0.986	59.1	49.5	1.08	65.4	61.2	1.22	67.6	70.1	1400	5.40
				200	60	0.800	64.6	55.8	0.918	69.8	67.6	1.08	71.0	75.4	1690	5.00
				220	60	0.875	60.4	49.6	0.963	67.1	60.9	1.08	69.9	69.3	1700	5.50
	6	71M	0.0018	200	50	1.11	55.5	46.9	1.20	62.2	58.2	1.33	64.5	67.4	910	5.00
				200	60	0.928	60.9	51.0	1.04	66.4	62.9	1.19	67.6	71.5	1090	4.60
				220	60	1.01	57.0	45.8	1.09	64.0	56.7	1.20	66.9	65.5	1100	5.06
0.4	2	71M	0.00075	200	50	1.43	68.5	58.8	1.65	73.6	71.3	1.93	75.3	79.5	2810	12.0
				200	60	1.18	71.3	68.8	1.44	75.6	79.6	1.76	76.7	85.6	3380	10.8
				220	60	1.26	68.9	60.6	1.46	74.4	72.5	1.71	76.5	80.1	3410	11.9
	4	71M	0.0018	200	50	1.62	65.6	54.2	1.83	70.9	66.8	2.11	72.4	75.6	1410	10.6
				200	60	1.32	71.1	61.5	1.57	75.0	73.7	1.89	75.4	81.1	1690	9.80
				220	60	1.42	67.4	54.7	1.61	72.9	67.0	1.86	74.8	75.5	1700	10.8
	6	80M	0.0028	200	50	2.22	60.2	43.1	2.38	66.7	54.6	2.61	69.1	64.2	920	11.0
				200	60	1.80	66.4	48.2	2.00	71.5	60.6	2.28	72.7	69.8	1100	10.2
				220	60	1.98	62.6	42.4	2.12	69.1	53.7	2.33	71.7	62.9	1110	11.2
0.75	2	80M	0.0013	200	50	2.19	72.3	68.2	2.67	76.5	79.6	3.25	77.5	86.1	2810	21.6
				200	60	1.96	73.4	75.3	2.48	77.2	84.7	3.10	77.9	89.5	3400	20.0
				220	60	2.01	71.2	68.7	2.43	76.2	79.6	2.94	78.0	85.8	3410	22.0
	4	80M	0.0030	200	50	2.75	69.2	56.9	3.16	74.3	69.2	3.69	75.8	77.4	1400	22.5
				200	60	2.29	73.6	64.2	2.77	77.5	75.7	3.36	78.2	82.3	1690	20.0
				220	60	2.39	70.5	58.4	2.77	75.7	70.3	3.25	77.6	78.0	1700	22.0
	6	90L	0.0065	200	50	3.31	67.8	48.2	3.68	73.0	60.4	4.19	74.5	69.3	940	21.6
				200	60	2.84	71.2	53.6	3.28	75.3	65.8	3.87	76.0	73.7	1120	18.4
				220	60	3.02	68.3	47.7	3.36	73.8	59.5	3.81	75.8	68.2	1130	20.2
1.5	2	90L	0.0025	200	50	3.95	77.7	70.5	4.93	81.3	81.1	6.08	82.2	86.7	2870	48.2
				200	60	3.53	77.6	79.0	4.61	81.1	86.8	5.85	81.9	90.3	3440	42.0
				220	60	3.57	76.0	72.6	4.47	80.4	82.2	5.50	82.0	87.2	3450	46.2
	4	90L	0.0068	200	50	4.48	76.5	63.2	5.38	80.3	75.1	6.49	81.4	81.9	1420	49.0
				200	60	3.89	79.1	70.4	4.91	82.1	80.6	6.12	82.5	85.7	1710	43.4
				220	60	4.03	76.6	63.8	4.86	80.8	75.3	5.85	82.2	81.9	1720	47.7
	6	100L	0.0093	200	50	5.41	75.3	53.2	6.25	78.4	66.2	7.39	78.5	74.7	930	40.0
				200	60	4.62	77.9	60.1	5.62	80.1	72.2	6.91	79.4	78.9	1110	35.0
				220	60	4.87	75.7	53.4	5.63	79.3	66.1	6.64	79.9	74.2	1120	38.5
2.2	2	90L	0.0050	200	50	5.24	80.4	75.3	6.76	83.5	84.5	8.50	84.1	88.9	2860	75.4
				200	60	4.81	80.5	82.1	6.44	83.4	88.7	8.28	83.9	91.4	3430	64.8
				220	60	4.77	78.9	76.7	6.14	82.8	85.2	7.70	84.0	89.2	3460	71.3
	4	100L	0.0080	200	50	6.25	81.9	62.1	7.57	84.1	74.8	9.21	84.0	82.1	1430	67.0
				200	60	5.20	84.6	72.1	6.73	85.9	82.4	8.53	85.3	87.3	1710	59.0
				220	60	5.39	83.4	64.2	6.62	85.7	76.4	8.09	85.9	83.1	1720	64.9
	6	112M	0.015	200	50	7.27	79.4	55.0	8.55	81.6	68.3	10.2	81.2	76.4	940	62.0
				200	60	6.22	82.1	62.1	7.71	83.3	74.2	9.61	82.1	80.5	1120	53.0
				220	60	6.54	80.5	54.8	7.70	82.9	67.8	9.20	82.9	75.7	1140	58.3
3.7	2	112M	0.0073	200	50	8.44	85.0	74.5	10.9	87.0	84.0	13.8	87.2	88.5	2910	110
				200	60	7.54	85.3	83.0	10.3	87.3	89.0	13.4	87.4	91.2	3480	93.4
				220	60	7.50	83.9	77.1	9.83	86.7	85.4	12.5	87.5	89.1	3490	103
	4	112M	0.016	200	50	9.10	86.5	67.8	11.5	88.2	79.1	14.3	88.3	84.7	1420	122
				200	60	8.05	87.9	75.5	10.7	89.2	83.9	13.7	89.0	87.4	1710	104
				220	60	8.11	86.7	69.0	10.3	88.8	79.6	12.8	89.3	84.7	1730	114
	6	132S	0.035	200	50	10.5	84.2	60.1	12.9	85.8	72.2	15.9	85.4	78.7	950	96.0
				200	60	8.91	86.4	69.4	11.6	87.1	79.1	14.9	86.0	83.2	1140	80.0
				220	60	9.23	85.1	61.8	11.4	86.8	73.5	14.1	86.7	79.6	1150	88.0
5.5	2	132S	0.011	200	50	14.1	82.6	68.2	17.7	85.5	78.7	21.9	86.2	83.9	2910	146
				200	60	11.4	84.9	82.3	15.5	87.1	88.2	20.1	87.4	90.4	3490	124
				220	60	11.7	83.2	73.9	15.2	86.3	82.8	19.0	87.3	86.9	3500	136
	4	132S	0.028	200	50	13.3	86.4	68.9	17.1	87.7	79.6	21.5	87.4	84.6	1430	150
				200	60	11.8	87.3	77.4	15.9	88.3	85.0	20.6	87.6	88.0	1720	126
				220	60	11.8	86.2	70.8	15.2	88.0	80.8	19.2	88.1	85.5	1730	139
	6	132M	0.050	200	50	16.3	83.8	58.1	19.7	86.1	70.2	23.9	86.4	76.8	950	159
				200	60	13.1	87.1	69.3	17.1	88.3	78.9	21.8	87.9	83.0	1140	131
				220	60	13.8	85.4	61.2	17.0	87.6	72.8	20.8	88.0	78.9	1150	144

Above characteristics are the representative values obtained by the circle diagram method.

Above characteristics are the values during commercial power supply operation.

Table 4.3 Characteristic table of the totally-enclosed fan-cooled motor (SF-JR and SF-TH)
200V class and 400V class

Output kW	Number of poles	Frame number	Moment of inertia [kg·m^2]	Voltage V	Frequency Hz	Load characteristic									Rated speed min^{-1}	Starting current A
						50% load			75% load			100% load				
						Current A	Efficiency %	Power factor %	Current A	Efficiency %	Power factor %	Current A	Efficiency %	Power factor %		
7.5	2	132S	0.016	200	50	15.9	87.2	78.0	21.3	88.6	86.1	27.4	88.4	89.5	2920	210
				200	60	14.5	86.5	86.3	20.3	88.2	90.8	26.6	88.1	92.3	3500	179
				220	60	14.1	85.7	81.4	19.1	88.0	88.1	24.5	88.5	90.8	3510	197
	4	132M	0.040	200	50	17.4	87.7	71.1	22.6	88.6	81.2	28.7	88.0	85.8	1440	199
				200	60	15.4	88.7	79.1	21.1	89.3	86.2	27.6	88.5	88.8	1730	172
				220	60	15.4	88.2	72.4	20.1	89.5	82.0	25.5	89.3	86.4	1740	189
	6	160M	0.11	200	50	20.6	85.4	61.6	25.4	87.3	73.4	31.2	87.3	79.4	960	180
				200	60	17.1	87.9	71.9	22.6	88.9	80.8	29.1	88.3	84.3	1140	155
				220	60	17.7	86.4	64.4	22.1	88.4	75.5	27.4	88.5	81.0	1150	171
11	2	160M	0.038	200	50	23.8	90.2	73.8	31.3	91.3	83.4	39.7	91.2	87.7	2920	300
				200	60	21.1	90.8	83.0	29.2	91.7	89.0	38.1	91.5	91.2	3500	251
				220	60	20.9	90.0	76.9	27.7	91.5	85.4	35.4	91.7	89.0	3510	276
	4	160M	0.070	200	50	25.7	88.5	69.7	33.2	89.7	80.1	41.8	89.5	84.9	1430	290
				200	60	22.1	89.5	80.2	30.4	90.2	86.8	39.7	89.7	89.1	1720	250
				220	60	22.2	88.5	73.6	29.1	90.0	82.7	37.0	90.0	86.8	1740	275
	6	160L	0.14	200	50	29.2	87.3	62.3	36.4	88.9	73.6	45.1	88.9	79.3	970	264
				200	60	24.4	89.5	72.6	32.4	90.5	81.1	41.8	90.1	84.4	1150	230
				220	60	25.2	88.3	64.9	31.7	90.0	75.8	39.5	90.2	81.1	1160	253
15	2	160M	0.048	200	50	31.0	91.3	76.4	41.3	92.2	85.2	52.8	92.1	89.0	2920	422
				200	60	27.7	92.0	85.0	38.8	92.7	90.3	50.9	92.4	92.2	3500	352
				220	60	27.1	91.3	79.4	36.6	92.5	87.2	47.1	92.6	90.4	3510	387
	4	160L	0.10	200	50	34.1	89.2	71.2	44.0	90.5	81.5	55.4	90.4	86.4	1440	456
				200	60	29.8	89.8	80.9	40.8	90.8	87.7	52.9	90.6	90.3	1730	398
				220	60	29.7	89.1	74.3	38.9	90.7	83.6	49.3	91.0	87.8	1740	438
	6	180M	0.33	200	50	40.9	88.0	60.2	49.9	89.8	72.5	60.8	90.0	79.1	970	439
				200	60	33.9	90.1	71.0	44.2	91.2	80.5	56.2	91.0	84.7	1160	379
				220	60	35.1	88.7	63.2	43.5	90.6	74.9	53.5	91.0	80.9	1170	417
18.5	2	160L	0.06	200	50	36.0	92.0	80.5	49.0	92.9	88.0	63.2	92.8	91.0	2920	554
				200	60	33.8	91.4	86.4	47.5	92.5	91.2	62.2	92.5	92.8	3500	462
				220	60	32.5	90.8	82.3	44.3	92.4	88.9	57.2	92.7	91.6	3510	508
	4	180M	0.17	200	50	39.1	90.3	75.7	52.2	91.2	84.2	67.0	91.0	87.7	1460	484
				200	60	35.4	90.1	83.7	49.5	90.9	89.1	65.1	90.3	90.8	1750	418
				220	60	34.5	89.5	78.6	46.5	90.9	86.2	59.8	90.8	89.3	1760	460
	6	180L	0.40	200	50	43.2	89.4	69.1	55.9	90.3	79.3	70.9	89.9	83.9	970	458
				200	60	38.8	90.5	76.1	52.7	90.8	83.7	68.8	89.8	86.4	1160	402
				220	60	38.6	89.9	69.9	50.2	90.8	79.8	63.7	90.5	84.2	1170	442
22	2	180M	0.088	200	50	42.9	90.3	82.0	59.0	91.3	88.4	76.7	91.2	90.8	2920	588
				200	60	40.5	89.4	87.6	57.5	90.6	91.4	75.9	90.5	92.4	3500	504
				220	60	38.8	89.1	83.5	53.4	90.8	89.3	69.3	91.1	91.4	3510	554
	4	180M	0.21	200	50	47.8	89.6	74.2	63.0	90.8	83.3	80.2	90.8	87.2	1460	592
				200	60	42.6	90.0	82.8	59.1	91.1	88.5	77.3	90.9	90.4	1750	512
				220	60	42.0	89.2	77.0	56.0	90.9	85.1	71.6	91.2	88.5	1760	563
	6	180L	0.48	200	50	51.3	89.6	69.1	66.2	90.5	79.4	83.7	90.2	84.2	970	580
				200	60	45.7	90.6	76.7	62.2	90.9	84.2	81.2	90.0	86.9	1160	506
				220	60	45.7	89.8	70.3	59.4	90.8	80.2	75.3	90.6	84.6	1170	557
30	2	180L	0.11	200	50	57.4	90.4	83.5	79.1	91.6	89.6	103	91.5	92.0	2930	824
				200	60	54.5	89.4	88.8	77.3	90.8	92.5	102	90.7	93.6	3500	730
				220	60	52.0	89.1	85.0	71.8	90.9	90.5	93.2	91.2	92.6	3520	803
	4	180L	0.28	200	50	63.0	90.5	76.0	84.2	91.6	84.2	108	91.6	87.5	1460	884
				200	60	56.3	90.9	84.7	79.1	91.9	89.4	104	91.7	90.6	1750	750
				220	60	55.0	90.2	79.4	74.5	91.7	86.4	96.1	91.9	89.1	1760	825
	6	200L	0.55	200	50	71.2	90.1	67.5	91.5	90.8	78.1	115	90.3	83.0	970	730
				200	60	59.9	91.9	78.7	82.6	92.1	85.4	109	91.3	87.4	1160	640
				220	60	60.5	91.1	71.5	79.4	91.9	80.9	101	91.7	84.9	1170	704
37	2	200L	0.18	200	50	77.2	90.8	76.2	103	92.0	84.5	132	92.0	87.8	2930	875
				200	60	68.3	89.5	87.3	96.6	91.0	91.0	127	91.2	92.0	3520	760
				220	60	67.0	89.1	81.3	91.2	91.1	87.7	118	91.6	90.1	3530	836
	4	200L	0.38	200	50	71.8	92.0	80.9	98.8	92.7	87.4	129	92.5	89.7	1460	1000
				200	60	66.5	91.8	87.5	95.2	92.5	90.9	126	92.2	91.6	1760	880
				220	60	63.9	91.3	83.2	88.6	92.5	88.8	116	92.6	90.7	1770	968
	6	200L	0.68	200	50	91.0	90.3	64.9	115	91.4	76.3	143	91.2	81.8	970	950
				200	60	75.0	92.0	77.4	102	92.5	84.8	133	92.0	87.4	1160	822
				220	60	76.4	91.3	69.7	98.8	92.3	79.8	125	92.3	84.4	1170	904

Above characteristics are the representative values obtained by the circle diagram method.

Above characteristics are the values during commercial power supply operation.

Table 4.3 Characteristic table of the totally-enclosed fan-cooled motor (SF-JR and SF-TH)
200V class and 400V class

Output kW	Number of poles	Frame number	Moment of inertia [kg·m^2]	Voltage V	Frequency Hz	Load characteristic									Rated speed min^{-1}	Starting current A
						50% load			75% load			100% load				
						Current A	Efficiency %	Power factor %	Current A	Efficiency %	Power factor %	Current A	Efficiency %	Power factor %		
45	2	200L	0.20	200	50	94.1	90.9	75.9	126	92.3	84.0	161	92.4	87.3	2930	1130
				200	60	81.9	90.7	87.5	116	92.1	91.0	153	92.3	91.7	3520	976
				220	60	81.0	90.1	80.9	110	91.9	87.3	143	92.5	89.6	3530	1070
	4	200L	0.45	200	50	94.9	92.0	74.3	126	93.0	83.3	161	92.9	87.0	1460	1380
				200	60	81.7	92.6	85.9	115	93.3	90.5	152	93.0	91.8	1760	1200
				220	60	80.3	91.9	80.0	109	93.1	87.2	141	93.2	90.0	1770	1320
	6	225S	1.08	200	50	103	91.3	69.1	133	92.0	79.4	169	91.7	84.1	970	1150
				200	60	86.3	92.7	81.2	120	93.0	87.2	158	92.4	88.9	1160	1030
				220	60	86.5	92.1	74.2	115	92.9	82.9	147	92.7	86.6	1170	1140
55	2	225S	0.30	200	50	116	90.4	75.6	154	91.9	84.1	196	92.2	87.8	2940	1400
				200	60	102	89.7	87.0	143	91.4	91.1	188	91.7	92.3	3530	1250
				220	60	99.9	89.1	81.1	135	91.2	87.7	174	91.8	90.3	3540	1370
	4	225S	0.63	200	50	114	92.3	75.3	152	92.9	84.2	195	92.5	88.0	1470	1490
				200	60	101	92.8	85.0	142	93.1	90.0	187	92.5	91.6	1760	1250
				220	60	98.3	92.4	79.4	134	93.1	86.9	173	93.0	89.9	1770	1370
	6	250SA	0.65	400	50	65	90.9	67.4	83.5	91.7	78	103	92.7	83	980	695
				400	60	53.5	92.4	80.8	74	92.7	87.1	96	93	89.1	1175	635
				440	60	54.5	91.7	72.3	72	92.6	81.7	90	93.2	85.8	1180	660
75	2	250SA	0.33	400	50	71.5	93.2	81.5	99	94.0	87.4	129	93.9	89.5	2970	985
			0.35	400	60	66.5	92.7	88.4	95	93.5	91.7	126	93.5	92.4	3560	820
				440	60	64	92.5	83.5	89	93.7	88.7	116	94.0	90.5	3570	920
	4	250SA	0.60	400	50	81	92.1	72.8	110	92.9	82.2	134	92.9	86.4	1480	1020
				400	60	69	92.5	85.4	97	93.1	90.1	127	92.7	91.8	1775	855
				440	60	68.5	92.1	78.4	92.5	93.1	86.0	118	92.9	89.2	1780	945
	6	250MA	0.88	400	50	88	91.6	67.2	115	92.4	78.0	140	93.4	83.0	980	995
				400	60	72.5	93.0	80.7	100	93.4	87.2	130	93.7	89.3	1175	845
				440	60	74	92.4	72.2	97	93.2	81.8	122	93.9	85.9	1180	940
	8	280MA	1.7	400	50	100	91.5	59.3	135	92.7	66.2	161	92.4	73.0	735	985
				400	60	84	93.0	69.7	115	93.7	76.0	145	93.2	80.2	885	800
				440	60	86.5	92.5	61.8	120	93.4	68.7	141	93.2	75.0	890	905
90	2	250MA	0.38	400	50	85	93.5	82.0	120	94.2	87.9	154	94.0	90.0	2970	1175
				400	60	79.5	92.9	88.5	115	93.7	91.9	150	93.7	92.5	3560	990
				440	60	76	92.7	84.0	110	93.9	89.2	138	94.0	91.0	3570	1095
	4	250MA	0.70	400	50	94.5	92.7	74.3	130	93.4	83.3	159	93.5	87.2	1480	1245
				400	60	81.5	93.1	86.1	115	93.6	90.6	151	93.2	92.1	1775	1045
				440	60	80	92.7	79.7	110	93.6	86.9	140	93.5	89.9	1780	1165
	6	280SA	1.4	400	50	98	92.7	71.5	130	93.2	81.1	163	94.0	85.2	980	1240
				400	60	86	93.1	81.2	120	93.6	87.1	156	94.0	88.9	1180	1030
				440	60	85.5	92.7	74.5	115	93.5	83.1	145	94.2	86.6	1180	1150
	8	280MD	2.8	400	50	135	90.9	53.5	165	92.2	65.9	193	92.4	72.9	735	1295
				400	60	105	92.4	67.4	140	93.2	76.7	173	93.2	80.7	885	1060
				440	60	115	91.5	57.5	140	93.0	69.0	168	93.2	75.4	890	1195
110	2	280SA	0.63	400	50	99	94.0	85.7	145	94.7	89.2	185	94.5	91.0	2965	1555
				400	60	95	93.9	89.2	140	94.5	91.7	182	94.5	92.5	3560	1315
				440	60	89.5	93.7	86.5	130	94.4	89.7	167	94.5	91.5	3565	1470
	4	280SA	1.0	400	50	120	92.6	74.4	155	93.5	83.3	194	93.5	87.1	1475	1400
				400	60	105	92.6	85.5	145	93.5	90.1	185	93.2	91.4	1770	1130
				440	60	99.5	92.2	78.9	135	93.4	86.2	172	93.5	89.1	1775	1260
	6	280MA	1.7	400	50	115	93.4	76.4	155	93.7	84.4	194	94.0	87.4	980	1420
				400	60	105	93.7	83.7	145	93.9	88.5	188	94.2	89.6	1175	1170
				440	60	99	93.4	78.4	135	94.0	85.6	173	94.4	88.2	1180	1300
	8	280MD	3.3	400	50	165	91.7	54.1	195	92.9	66.5	233	93.0	73.2	735	1585
				400	60	130	93.0	67.9	165	93.7	77.2	209	93.7	81.0	885	1300
				440	60	135	92.2	58.1	170	93.5	69.7	203	93.7	75.7	885	1465
132	2	280MA	0.68	400	50	120	94.7	86.5	170	95.2	90.2	218	95.0	92.0	2965	1945
			0.70	400	60	115	93.9	89.7	165	94.5	92.2	217	94.5	93.0	3560	1650
				440	60	110	93.7	86.9	155	94.5	90.2	200	94.5	91.9	3565	1780
	4	280MA	1.2	400	50	135	93.2	76.7	180	93.9	84.9	229	94.5	88.2	1475	1675
				400	60	120	93.2	86.6	170	93.9	90.7	220	93.7	91.8	1770	1345
				440	60	120	92.9	80.7	160	93.9	87.4	203	94.4	90.0	1775	1505
	6	280MD	2.8	400	50	155	93.2	68.0	195	94.0	78.7	242	94.0	83.7	985	1940
				400	60	130	94.0	79.4	180	94.5	86.0	228	94.4	88.5	1185	1665
				440	60	130	93.5	71.7	170	94.5	81.0	215	94.5	85.2	1185	1720
	8	280L	4.3	400	50	190	91.5	55.3	230	92.7	67.7	276	92.9	74.4	740	1905
				400	60	150	92.9	68.5	200	93.7	77.7	250	93.5	81.5	885	1575
				440	60	160	92.2	59.5	200	93.4	71.0	241	93.7	76.9	890	1785

Above characteristics are the representative values obtained by the circle diagram method.
Above characteristics are the values during commercial power supply operation.

Table 4.3 Characteristic table of the totally-enclosed fan-cooled motor (SF-JR and SF-TH) 200V class and 400V class

Output kW	Number of poles	Frame number	Moment of inertia [kg·m^2]	Voltage V	Frequency Hz	Load characteristic									Rated speed min^{-1}	Starting current A
						50% load			75% load			100% load				
						Current A	Efficiency %	Power factor %	Current A	Efficiency %	Power factor %	Current A	Efficiency %	Power factor %		
150	2	280MD	1.1	400	50	145	94.2	82.0	195	95.0	88.2	251	95.2	90.5	2975	2010
				440	60	130	93.0	83.0	180	94.5	88.5	229	95.0	90.5	3575	1835
	4	280MD	2.2	400	50	155	93.4	75.2	210	94.2	83.9	262	94.4	87.5	1480	1965
				440	60	140	92.5	78.7	185	93.9	86.0	235	94.2	89.0	1780	1860
	6	280MD	3.3	400	50	170	93.7	68.0	220	94.4	78.7	274	94.2	83.7	985	2195
				440	60	150	93.9	71.5	195	94.7	81.0	243	94.7	85.4	1185	1945
	8	280L	4.3	400	50	245	90.0	49.7	285	92.2	62.6	330	93.0	70.5	735	2245
				440	60	210	89.9	52.7	250	92.2	65.2	292	93.0	72.5	885	2105
160	2	280MD	1.2	400	50	155	94.2	79.2	215	95.2	86.5	270	95.5	89.5	2975	2215
			1.1	440	60	135	93.2	84.2	190	94.5	89.0	243	95.0	90.9	3570	1920
	4	280MD	2.8	400	50	155	93.9	79.5	215	94.7	86.7	272	94.7	89.7	1485	2125
				440	60	140	93.0	81.7	190	94.2	88.0	246	94.5	90.4	1785	1970
	6	280MD	3.3	400	50	190	93.7	66.2	240	94.5	77.2	295	94.5	82.7	985	2360
				440	60	155	94.0	73.5	205	94.7	82.2	257	94.7	86.2	1185	2060
	8	315H	6.0	400	50	225	93.2	55.2	275	94.2	67.2	334	94.2	73.4	740	1940
		280L	4.3	440	60	215	90.2	54.8	255	92.4	67.0	305	93.0	74.0	885	2105
185	2	280MD	1.3	400	50	180	94.5	79.5	245	95.4	86.7	311	95.7	89.7	2975	2835
			1.2	440	60	160	93.7	83.5	220	94.9	88.7	281	95.2	90.7	3570	2250
	4	280MD	3.0	400	50	185	94.2	78.0	250	95.0	85.7	316	95.0	89.0	1485	2465
			2.8	440	60	155	93.5	84.4	220	94.5	89.4	281	94.7	91.2	1780	2000
	6	280L	4.0	400	50	195	94.0	73.7	260	94.7	82.7	326	94.5	86.5	985	2610
		280MD	3.3	440	60	175	94.2	74.0	235	95.0	82.7	296	95.0	86.4	1185	2370
	8	315H	6.8	400	50	255	93.5	56.1	315	94.5	67.9	382	94.5	74.0	740	2255
		280L	4.5	440	60	265	91.7	50.8	310	93.2	63.2	367	93.5	70.5	890	2680
200	2	280L	1.1	400	50	195	94.0	78.9	265	94.9	86.2	341	95.0	89.0	2970	2630
		280MD	1.3	440	60	170	93.7	82.5	235	95.0	88.2	304	95.4	90.5	3575	2435
	4	280MD	3.0	400	50	205	94.4	76.2	270	95.2	84.5	344	95.2	88.0	1485	2755
				440	60	170	93.7	82.5	240	94.7	88.4	305	95.0	90.5	1780	2290
	6	280L	4.3	400	50	215	94.2	72.0	280	94.7	81.7	355	94.7	85.9	985	2840
			4.0	440	60	180	94.4	78.0	245	95.0	85.2	314	95.0	88.0	1185	2515
	8	315H	7.3	400	50	285	93.7	55.0	345	94.5	67.0	416	94.5	73.2	740	2455
			6.8	440	60	230	93.5	62.3	290	94.5	72.7	357	94.7	77.5	890	2075
220	2	280L	1.3	400	50	210	94.2	80.4	290	95.0	87.2	371	95.2	89.7	2975	2935
			1.1	440	60	190	93.2	83.2	260	94.5	88.5	337	94.9	90.4	3570	2530
	4	280L	3.5	400	50	210	94.2	81.5	290	94.9	88.0	370	95.0	90.5	1480	2815
		280MD	3.0	440	60	190	94.0	81.5	265	94.9	87.7	337	95.2	90.2	1780	2595
	6	315H	5.5	400	50	235	94.5	72.4	310	95.2	81.4	392	95.2	85.0	985	2705
		280L	4.3	440	60	200	94.5	77.2	270	95.0	84.7	346	95.0	87.7	1185	2770
	8	315H	7.3	440	60	250	93.7	62.0	320	94.7	72.4	394	94.9	77.2	890	2290
250	2	280L	1.4	400	50	240	94.5	80.2	330	95.5	87.0	420	95.5	89.7	2975	3445
			1.3	440	60	210	93.7	84.7	295	94.7	89.4	379	95.0	91.0	3570	2845
	4	280L	4.0	400	50	235	94.5	81.7	325	95.2	88.0	419	95.2	90.5	1480	3185
			3.5	440	60	205	93.7	85.5	290	94.7	90.0	378	94.9	91.5	1780	2610
	6	315H	6.0	400	50	265	94.9	73.0	350	95.4	81.7	443	95.4	85.2	985	3015
		280L	4.3	440	60	255	94.2	69.5	330	95.0	79.5	409	95.0	84.2	1185	3275
	8	355H	12.3	400	50	310	93.2	62.5	395	94.2	73.0	495	94.2	77.5	735	2970
280	2	280L	1.8	400	50	255	95.0	83.5	360	95.7	89.2	462	95.9	91.2	2975	3835
			1.4	440	60	235	94.0	84.2	330	95.0	89.2	423	95.4	91.0	3570	3345
	4	280L	4.3	400	50	265	94.7	81.2	365	95.5	87.7	469	95.5	90.2	1480	3615
			4.0	440	60	230	94.0	85.5	325	95.0	90.0	422	95.0	91.5	1780	2955
	6	315H	6.8	400	50	290	95.0	73.9	385	95.7	82.4	493	95.5	85.7	985	3405
			6.0	440	60	250	94.7	78.9	340	95.2	85.2	441	95.4	87.4	1185	2780
	8	355H	13.5	400	50	345	93.2	63.5	440	94.2	73.7	550	94.5	78.5	735	3355
			12.3	440	60	305	92.7	66.0	390	94.0	75.5	495	94.2	79.7	885	2970
300	2	315H	2.3	400	50	290	94.9	79.4	395	95.7	86.5	504	96.0	89.4	2975	3935
		280L	1.8	440	60	245	94.4	85.5	345	95.4	90.0	449	95.7	91.5	3575	3730
	4	315H	4.3	400	50	315	95.2	73.0	420	95.7	81.5	531	95.7	85.0	1485	3455
		280L	4.0	440	60	250	94.2	84.5	350	95.2	89.5	452	95.4	91.2	1780	3390
	6	315H	6.8	400	50	305	95.2	75.7	410	95.7	83.5	525	95.5	86.2	985	3415
			6.8	440	60	265	94.9	78.7	365	95.5	85.2	470	95.7	87.5	1185	3150
	8	355H	14.8	400	50	375	93.2	62.6	475	94.2	73.2	595	94.4	78.0	735	3750
			13.5	440	60	315	93.0	68.0	410	94.2	76.7	520	94.5	80.5	885	3120

Above characteristics are the representative values obtained by the circle diagram method.
Above characteristics are the values during commercial power supply operation.

Table 4.3 Characteristic table of the totally-enclosed fan-cooled motor (SF-JR and SF-TH)
200V class and 400V class

Output kW	Number of poles	Frame number	Moment of inertia [kg·m^2]	Voltage V	Frequency Hz	Load characteristic									Rated speed min^{-1}	Starting current A
						50% load			75% load			100% load				
						Current A	Efficiency %	Power factor %	Current A	Efficiency %	Power factor %	Current A	Efficiency %	Power factor %		
315	2	315H	2.3	400	50	300	95.0	80.5	410	95.9	87.0	527	96.0	89.7	2975	3955
		280L	1.8	440	60	255	94.5	86.2	360	95.5	90.4	471	95.7	91.7	3570	3725
	4	315H	4.3	400	50	325	95.2	74.2	435	95.7	82.4	555	95.7	85.5	1480	3445
		280L	4.0	440	60	260	94.4	85.2	365	95.2	90.0	473	95.4	91.5	1780	3360
	6	355H	11.3	400	50	390	93.5	63.0	490	94.7	73.5	615	94.9	78.4	985	3875
		315H	6.8	440	60	275	95.0	79.7	380	95.5	85.7	493	95.5	87.7	1185	3110
	8	355H	14.8	400	50	385	93.4	64.0	490	94.4	74.2	615	94.4	78.7	735	3755
			13.5	440	60	325	93.2	69.2	425	94.4	77.5	550	94.5	80.9	885	3245
355	2	315H	3.0	400	50	330	95.2	81.7	455	96.2	88.0	587	96.4	90.5	2975	4700
			2.3	440	60	295	94.2	84.7	410	95.4	89.4	535	95.7	90.9	3570	3800
	4	315H	5.0	400	50	375	95.4	72.5	495	96.0	81.4	628	96.0	85.0	1485	4145
			4.3	440	60	310	94.9	79.7	430	95.5	85.5	558	95.7	87.2	1780	3185
	6	355H	12.5	400	50	430	93.7	63.7	550	94.7	74.2	690	94.9	78.7	985	4350
			11.3	440	60	350	93.7	72.0	465	94.9	79.7	600	95.0	82.5	1185	3600
	8	355H	17.5	400	50	425	93.5	64.7	545	94.5	74.7	690	94.5	79.2	735	4280
			14.8	440	60	360	93.5	69.7	475	94.5	77.9	610	94.5	81.0	885	3600
400	2	315H	3.0	440	60	330	94.7	85.2	460	95.7	89.7	598	96.0	91.2	3575	4545
	4	355H	10.3	400	50	415	94.9	73.5	560	95.7	81.5	720	95.7	84.5	1480	4320
		315H	5.0	440	60	355	95.0	78.5	485	95.7	84.9	628	95.9	87.0	1780	3835
	6	355H	13.8	400	50	490	94.0	62.7	625	95.0	73.4	780	95.2	78.2	985	4915
			12.5	440	60	400	93.9	70.0	530	95.0	78.5	675	95.2	81.9	1185	4320
	8	355H	19.0	400	50	485	93.7	64.0	620	94.7	74.2	780	94.7	78.7	735	4840
			17.5	440	60	430	93.4	65.5	555	94.5	75.2	700	94.7	79.5	885	4480
450	4	355H	10.3	400	50	470	94.9	73.5	625	95.7	81.5	810	95.7	84.5	1480	4860
	6	355H	15.3	400	50	535	94.4	64.9	685	95.2	75.0	862.5	95.2	79.2	985	5350
			13.8	440	60	450	94.0	70.4	595	95.0	78.7	757.5	95.2	82.0	1185	4850
	8	-	-	400	50	535	94.0	65.0	685	95.0	75.0	862.5	95.2	79.2	740	5265
		355H	19.0	440	60	455	93.9	69.7	600	94.9	77.9	772.5	95.0	81.2	885	4635

Above characteristics are the representative values obtained by the circle diagram method.

Above characteristics are the values during commercial power supply operation.

Table 4.4 Characteristic table of the totally-enclosed fan-cooled squirrel-cage motor (SF-HR)

200/200/220V 50/60/60Hz

Output kW	Number of poles	Frame number	Moment of inertia [kg·m^2]	Voltage V	Frequency Hz	Load characteristic									Speed [r/min]	Starting current A
						50% load			75% load			100% load				
						Current A	Efficiency %	Power factor %	Current A	Efficiency %	Power factor %	Current A	Efficiency %	Power factor %		
0.2	4	63M	0.0013	200	50	0.84	70.3	48.7	0.94	74.5	61.7	1.08	75.2	71.0	1400	5.0
				200	60	0.70	75.0	55.2	0.82	77.8	68.1	0.98	77.5	76.0	1680	4.6
				220	60	0.75	72.4	48.3	0.84	76.7	61.0	0.96	77.8	70.0	1700	5.1
0.4	4	71M	0.0018	200	50	1.40	77.0	53.7	1.61	79.9	67.2	1.91	79.9	75.8	1400	10.4
				200	60	1.17	80.2	61.5	1.43	82.0	73.9	1.76	81.2	80.7	1680	9.5
				220	60	1.29	78.4	52.0	1.48	81.4	65.2	1.74	81.8	73.9	1700	10.5
0.75	4	80M	0.0030	200	50	2.40	81.6	55.4	2.84	83.3	68.5	3.43	82.7	76.4	1400	20.4
				200	60	1.95	85.4	64.9	2.48	85.9	76.2	3.14	84.4	81.6	1680	17.4
				220	60	2.08	83.5	56.8	2.49	85.3	69.5	3.01	85	76.9	1700	19.1
1.5	4	90L	0.0068	200	50	4.99	82.3	52.7	5.86	85.3	65	6.95	86	72.5	1430	47.6
				200	60	3.89	87.2	63.7	4.90	88.8	74.6	6.10	88.7	80	1725	40.0
				220	60	4.23	84.6	55.0	5.03	87.3	67.2	6.00	88.1	74.4	1735	44.0
2.2	4	100L	0.011	200	50	6.08	87.9	59.4	7.45	89.3	71.6	9.09	89.1	78.4	1430	70.0
				200	60	5.12	90.0	69.0	66.5	90.7	79	8.43	90.2	83.5	1725	58.4
				220	60	5.30	89.1	61.1	6.54	90.6	73.1	8.02	90.6	79.5	1735	64.2
3.7	4	112M	0.018	200	50	10.1	88.7	59.4	12.4	89.9	72.0	15.1	89.6	79.0	1440	120
				200	60	8.67	90.3	68.2	11.2	90.9	78.8	14.1	90.2	83.8	1730	101
				220	60	8.93	89.4	60.8	11.0	90.7	73.1	13.4	90.7	79.8	1740	111
5.5	4	132S	0.035	200	50	14.4	90.0	61.1	17.7	91.4	73.6	21.6	91.5	80.4	1460	202
				200	60	12.0	91.4	72.5	15.7	92.3	82.1	19.9	92.2	86.5	1750	174
				220	60	12.5	90.5	64.1	15.5	92.0	75.9	19.0	92.3	82.2	1760	191
7.5	4	132M	0.045	200	50	18.6	91.2	63.8	23.1	92.4	75.9	28.4	92.5	82.3	1460	282
				200	60	15.8	92.4	73.9	20.9	93.1	83.4	26.7	92.8	87.5	1750	242
				220	60	16.2	91.6	66.1	20.4	92.8	77.8	25.3	93.0	83.7	1760	266
11	4	160M	0.095	200	50	27.5	92.0	62.9	34.2	93.0	74.9	42.1	92.9	81.2	1460	369
				200	60	23.4	92.6	73.2	31.0	93.3	82.4	39.5	93.2	86.4	1760	311
				220	60	23.8	92.1	65.7	30.1	93.3	77.1	37.3	93.5	82.9	1760	342
15	4	160L	0.13	200	50	35.6	92.8	65.6	44.9	93.7	77.2	55.6	93.7	83.1	1460	523
				200	60	31.3	93.3	74.3	41.5	94.0	83.3	53.0	93.8	87.1	1760	457
				220	60	31.3	92.7	67.8	39.9	93.8	78.8	49.7	94.0	84.3	1760	503
18.5	4	180M	0.21	200	50	44.3	92.3	65.4	55.6	93.6	76.9	68.6	94.0	82.8	1470	673
				200	60	38.0	92.0	76.4	50.6	93.5	84.6	64.5	93.9	88.1	1770	583
				220	60	38.7	91.6	68.6	49.2	93.4	79.3	61.1	94.0	84.6	1770	641
22	4	180M	0.21	200	50	48.2	93.2	70.6	62.8	94.0	80.7	79.2	93.9	85.3	1470	673
				200	60	42.3	93.7	80.1	58.2	94.3	86.8	75.6	94.2	89.2	1770	583
				220	60	42.3	93.2	73.3	55.7	94.2	82.5	70.6	94.4	86.6	1770	641
30	4	180L	0.28	200	50	68.3	93.4	67.8	87.7	94.1	78.7	110	94.0	83.9	1470	922
				200	60	58.2	93.7	79.4	79.8	94.3	86.4	103	94.1	88.9	1770	822
				220	60	58.3	93.3	72.3	76.4	94.3	81.9	96.8	94.4	86.2	1770	904
37	4	200L	0.38	200	50	73.3	94.1	77.4	99.4	94.5	85.3	128	94.1	88.4	1470	1010
				200	60	66.7	94.0	85.2	94.7	94.3	89.7	125	93.9	90.9	1760	906
				220	60	64.7	93.7	80.1	88.7	94.4	87.0	115	94.4	89.5	1770	997
45	4	200L	0.45	200	50	98.4	93.1	71.0	128	94.0	80.8	162	94.0	85.2	1470	1350
				200	60	82.7	94.1	83.5	116	94.7	88.8	152	94.5	90.5	1770	1240
				220	60	82.7	93.5	76.3	111	94.5	84.5	142	94.7	87.9	1770	1360
55	4	225S	0.63	200	50	124	93.2	68.4	160	94.0	79.0	201	94.0	84.0	1470	1520
				200	60	104	94.2	81.2	144	94.7	87.5	187	94.4	89.7	1770	1350
				220	60	104	93.7	73.9	138	94.6	83.0	175	94.7	87.0	1780	1480

Above characteristics are the representative values obtained by the circle diagram method.

4.6 Brake characteristic

(1) Manufactured models

Motor		Frame number	Brake model	
Output (kW)			150% torque	
4 poles	6 poles		TB type	ESB type
0.2		63M	TB-0.2	
0.4	0.2	71M	TB-0.4	
0.75	0.4	80M	TB-0.75	
1.5	0.75	90L	TB-1.5	
2.2	1.5	100L	TB-2.2	
3.7	2.2	112M	TB-3.7	
5.5	3.7	132S	TB-7.5	
7.5	5.5	132M	TB-7.5	
11	7.5	160M	TB-15	
15	11	160L	TB-15	
18.5	15	180M		ESB-220
22		180M		ESB-220
30	18.5	180L		ESB-220
	22	180L		ESB-250S
37	30	200L		ESB-250S
45		200L		ESB-250S
	37	200L		ESB-250
55	45	225S		ESB-250S(*1)

*1: 130% torque is applied.

(2) Brake characteristic

Model	Rated braking torque (*2)(N·m)	Permissible braking work (kJ/min)	Input voltage	Electromagnet characteristic (20°C)		Electromagnet stroke		Coasting time (*3) (s)	Brake moment of inertia J(kg·m^2)
				Voltage (VDC)	Current (ADC)	Initial value (mm)	Adjustment limit (mm)		
TB-0.2	2	2.3	AC200V	90	0.18	0.15	0.4	0.1 to 0.4	0.000040
TB-0.4	4	2.9		90	0.19	0.15	0.4		0.000042
TB-0.75	7.5	3.2		90	0.24	0.15	0.5		0.000075
TB-1.5	15	5.1		90	0.30	0.20	0.5		0.00031
TB-2.2	22	7.2		90	0.34	0.20	0.5		0.00055
TB-3.7	37	10.1		90	0.44	0.20	0.55		0.0011
TB-7.5	75	11.1		90/23	2.0/0.5	0.25	1.2		0.0016
TB-15	150	21.5		90/23	1.7/0.4	0.25	1.2		0.006
ESB-220	300	11.3	DC90V(*5)	90	0.95	0.7(*6)	1.35(*6)	0.075(*6)	0.0073
ESB-250S	450	14.2		90	1.15	0.7(*6)	1.35(*6)	0.065(*6)	0.013
ESB-250	600	14.2		90	1.15	0.7(*6)	1.35(*6)	0.065(*6)	0.013

*2 Rated braking torque is the static friction torque. (Initial braking torque is about 70% of the rated torque (60% for the ESB series).)

*3 Coasting time (armature release time) is the time when the electromagnetic gaps are the initial values.

*4 Different brakes and power supply devices are used for 400V compared to the ones for 200V. Be careful when sending an order.

*5 A rectifier (power supply device) is required when using 200VAC power supply.

*6 The electromagnet stroke and coasting time are the values when using the power supply device HD-110M3.

● **Braking torque**

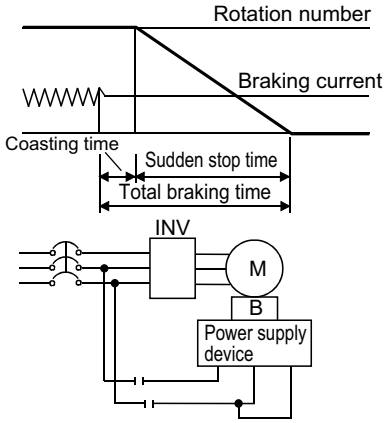
Rated braking torque is indicated by the static friction torque.

150% braking torque to the rated motor torque is the standard.

● **Connection to the power supply and operation characteristic of the brake**

When using a TB brake, connect the brake coil to the input side (commercial power supply) of the inverter as shown in Figure 4.14.

Figure 4.1.4 also shows the operation characteristic.



(Connected external power supply is cutoff separately.)

Figure 4.14 Operation characteristic of an oscilloscope

APPENDIX

1. Operation range of standard and geared motors

This section describes the frequency ranges where standard and geared motors can operate.

(1) Frequency range where a motor can operate (same for constant-torque motors)

The frequency range where a standard motor can operate during inverter operation is shown in the following table.

Table A.1 Frequency range where a standard motor can operate

SF-JR (F and V), SF-HR, and SF-HRCA

Number of poles / Frame number	2	4	6
63	120Hz or less	120Hz or less	120Hz or less
71			
80			
90			
100			
112	90Hz or less		
132			
160	75Hz or less	100Hz or less	
180	65Hz or less		
200	60Hz or less	65Hz or less	65Hz or less
225			
250		60Hz or less	60Hz or less

* For the frequency range where an outdoor-type motor, a water-proof-type motor, or a motor with TB brake can operate, refer to Table A2.

Table A.2 Frequency range where an outdoor-type motor, a water-proof-type motor, or a motor with TB brake can operate

Number of poles / Model/frame number		2	4	6
With TB brake		No applicable model	65Hz or less (Except a vertically-installed motor)	90Hz or less (Except a vertically-installed motor)
Outdoor -type Water - proof -type	63 to 132	65Hz or less	120Hz or less	120Hz or less
	160		100Hz or less	
	180		65Hz or less	90Hz or less
	200	60Hz or less		65Hz or less
	225			
	250		60Hz or less	60Hz or less

* When driving a motor with a TB brake, it may chatter during low speed operation. However, it is not a failure.

(2) Frequency range where a geared motor can operate

The frequency range where a geared motor can operate with an inverter is shown in the following table.

Table A.3 Frequency range where a geared motor can operate

Series		Output (kW)	Number of poles	Isolation	Frequency range where the motor can operate		
					Grease lubricant	Oil lubricant (standard fueling valve)	Oil lubricant (special fueling valve)
Parallel shaft	GM-S	0.1	4	E	3 to 120Hz		
		0.2					
		0.4					
		0.75					
		1.5		B			
		2.2					
	GM-D	0.4	4	E	3 to 120Hz	25 to 70Hz	25 to 120Hz
		0.75					
		1.5		B			
		2.2					
		3.7					
		5.5					25 to 115Hz
		7.5					
Cross shaft	GM-SSY GM-SHY	0.1	4	E	3 to 120Hz		
		0.2					
		0.4					
		0.75					
	GM-SY GM-HY2	1.5	4	B	3 to 120Hz		
		2.2					

- Frequency range where the motor can operate: When driving a geared motor, the driving frequency range is limited by the lubricating status of the teeth, the life of oil seal, and other conditions.
  A motor cannot be driven beyond the driving frequency range. Doing so may damage the teeth and cause the leak of the lubricant.
- When operating at high frequency with oil lubricant, the oil may leak from the fueling valve. Order a special fueling valve (option).
- When operating the motor continuously at 60Hz or higher with an inverter, inspect the oil seal every year or so.
- Note that when the running frequency for a small-capacity low-speed machine is increased to 60Hz or higher, the rotating speed may not increase due to the mechanical losses.
  (Example: When 0.1kW is running at 120Hz with the reduction ratio 1/5 or 1/7.5)

2. Specification of IPM motor (MM-EF series) (excerpt)

Table A.4 IPM motor specification (excerpt)

Series	Output (kW)	Frame number	Rated current (A)		Moment of inertia J(kg·m^2)	Number of poles	Isolation	Rated speed	Maximum speed
			200V class	400V class					
MM-EF	0.4	80M	1.6	0.8	0.00104	6	B	1800r/min (90Hz)	2700r/min (135Hz)
	0.75		3.0	1.5					
	1.5		5.9	3.0	0.00184				
	2.2	90L	8.7	4.4	0.00369				
	3.7	100L	14.4	7.2	0.00512				
	5.5	112M	22	11	0.0125				
	7.5		29	14.5	0.0153				
	11	132S	43	21.5	0.0274				
	15		55	27.5	0.0354				
	18.5	160M	70.5	35	0.0815		F		
	22		83.5	42					
	30	160L	109	57	0.105				
	37	180L	136	68	0.2215	8		1800r/min (120Hz)	2700r/min (180Hz)
	45		162	81	0.24				
	55	200L	195	96.5	0.43				
	75		272	136	0.52				
	90	225S	-	160	0.87				2400r/min (160Hz)
	110		-	197	0.95				

* Use same IPM motor capacity as the inverter capacity (except the combination of FR-F700P-0.75K with MM-EF-0.4kW)

3. Required power calculation

The following section describes how to calculate the required power for different machines and devices.

(1) Basic formula

Calculate the required power P[kW] by

$$P = \frac{T \cdot N}{9550} \quad \text{.....(3.1)}$$

T: Required torque [N·m]

N: Speed [r/min]

(2) General industrial machine

1) Pump

$$P = \frac{Q \cdot H}{6.12\,\eta}\,[\text{kW}] \quad \text{.....(3.2)}$$

Q : Discharge amount from the pump [m^3/min]

H : Lifting height [m]

η : Pumping efficiency (usually 0.55 to 0.85 although it changes by the model)

2) Fan and blower

$$P = \frac{Q \cdot H}{6120\,\eta}\,[\text{kW}] \quad \text{.....(3.3)}$$

Q : Air volume [m^3/min]

H : Wind pressure [mmHg]

η : Blowing efficiency of the fan (usually 0.55 to 0.85 although it changes by the model)

3) Compressor

$$P = \frac{5.83Q\left(P^{0.286} - 1\right)}{\eta}\,[\text{kW}] \quad \text{.....(3.4)}$$

Q : Output air volume [m^3/min]

P : Absolute output pressure [kg/cm^2]

η : Compressing efficiency (0.5 to 0.8)

(3) Cargo-handling machine

1) For hoisting

$$P = \frac{(W + Wcs) \times V}{6120\,\eta}\,[\text{kW}] \quad \text{.....(3.5)}$$

W : Weight [kg]

W_{CS}: Hanger mass [kg]

V : Hoisting speed [m/min]

η : Machine efficiency (0.7 to 0.85)

2) For driving

$$P = \frac{\mu \times (W + Wcs + W_G) \times V}{6120\,\eta}\,[\text{kW}] \quad \text{.....(3.6)}$$

W_G : Crane mass [kg]

μ : Driving resistance

V : Driving speed [m/min]

3) For turning

$$P = \frac{\mu \times (W + W_{G_1}) \times V}{6120\,\eta}\,[\text{kW}] \quad \text{.....(3.7)}$$

W_{G1}: Mass of the crane's turning part [kg]

μ : Driving resistance

V : Driving speed [m/min]

4) When hoisting a load on the slope with α degree to the horizontal surface

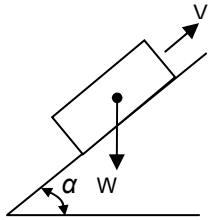
$$P = \frac{W(\sin\alpha + \mu \cdot \cos\alpha)V}{6120\,\eta}\,[\text{kW}] \quad \text{.....(3.8)}$$

W : Mass [kg]

μ : Friction coefficient

η : Hoisting efficiency

V : Hoisting speed [m/min]



(4) Machine tool

Feeding a table

$$P = \frac{\mu \times (W + W_T) \times V}{6120\,\eta}\,[\text{kW}] \quad \text{.....(3.9)}$$

W : Work mass [kg]

W_T : Table mass [kg]

μ : Friction coefficient of the table and the base

V : Feeding speed of the table

(5) Other

1) When driving an inertia body

$$P = \frac{1}{9550} \times \frac{J}{9.55} \times \frac{N^2}{t}\,[\text{kW}] \quad \text{.....(3.10)}$$

N : Speed [r/min]

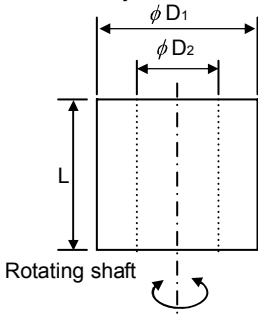
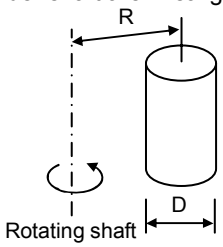
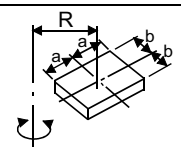
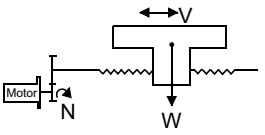
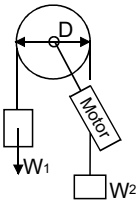
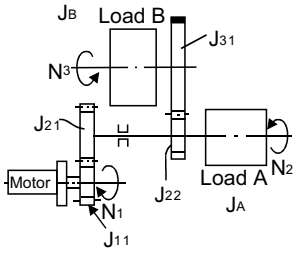
J : Flywheel effect [$kg \cdot m^2$]

t : Acceleration time [s]

4. Calculation method of the load moment of inertia

Table A.5 shows typical calculation formulas for the load moment of inertia.
(Note) Conversion formula of GD^2 is $GD^2 = 4J$.

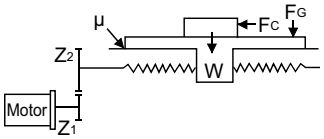
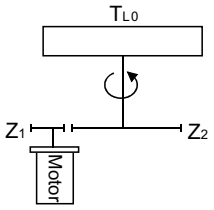
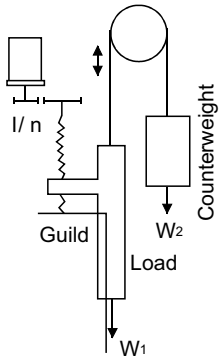
Table A.5 Calculation of load moment of inertia

Type	Structure	Formula
Cylinder	Rotating shaft is the center of the cylinder 	$J_L = \frac{\pi \cdot \rho \cdot L}{32}\left(D_1^4 - D_2^4\right) \times 10^{-4} = \frac{W}{8}\left(D_1^2 + D_2^2\right) \times 10^{-4}$ ..... (4.1) J_L : Load moment of inertia [kg·m^2] ρ : Density of cylinder material[kg/cm^3] L : Cylinder length [cm] D_1 : Cylinder outer diameter [cm] D_2 : Cylinder inner diameter [cm] W : Cylinder mass [kg] Reference data Density of material Iron ……7.8×10^{-3} [kg/cm^3] Aluminium ……2.7×10^{-3} [kg/cm^3] Copper ……8.96×10^{-3} [kg/cm^3]
	When rotating shaft and cylinder shaft are misaligned 	$J_L = \frac{W}{8}\left(D^2 + 8R^2\right) \times 10^{-4}$ ..... (4.2) J_L : Load moment of inertia[kg·m^2] D, R : See the left figure [cm]
Prism		$J_L = W\left(\frac{a^2 + b^2}{3} + R^2\right) \times 10^{-4}$ ..... (4.3) J_L : Load moment of inertia[kg·m^2] a, b, R : See the left figure [cm]
Linearly moving object		$J_L = \frac{W}{4} \times \left(\frac{V}{\pi N}\right)^2 = W \cdot \left(\frac{\Delta S}{20\pi}\right)^2 \times 10^{-4}$ ..... (4.4) J_L : Load moment of inertia at motor shaft [kg·m^2] V : Speed of the linearly moving object [m/min] N : Motor speed [r/min] ΔS : Travel amount in one motor rotation [mm/rev] W : Mass of the linearly moving object [kg]
Hanged object		$J_L = \frac{W \cdot D^2}{4} + J_P$ ..... (4.5) W : Total mass (W_1 +W_2) [kg] J_P : Moment of inertia of the pulley [kg·m^2] D : Diameter of the pulley [m]
Load of which speed is changed		$J_L = J_{11} + \left(J_{21} + J_{22} + J_A\right) \cdot \left(\frac{N_2}{N_1}\right)^2 + \left(J_{31} + J_B\right) \cdot \left(\frac{N_3}{N_1}\right)^2$ ..... (4.6) J_A, J_B : Moment of inertia of the loads A and B [kg·m^2] J_{11} to J_{31} : Moment of inertia of teeth [kg·m^2] N_1 to N_3 : Rotation speed of each axis [r/min]

5. Calculation method for load torque

Table A.6 shows typical calculation formulas for the load torque.

Table A.6 Calculation of load torque [N·m]

Type	Structure	Formula
Linear movement		$T_L = \frac{F}{2\pi\eta} \cdot \left(\frac{V}{N}\right) = \frac{F \cdot \Delta S}{2 \times 10^3 \pi\eta}$ [N·m] ..... (5.1) F : Force toward the shaft of the linearly moving object [N] η : Efficiency of driving parts V : Travel speed [m/min] N : Motor speed [r/min] ΔS : Travel amount in one motor rotation [mm/rev] When moving a table as shown left, F in the above formula can be calculated in the next formula (5.2). $F = F_C + \mu\left(W \cdot g + F_G\right)$ [N] ..... (5.2) F_C : Moving-part force towards the shaft [N] F_G : Tightening force of the table guiding surface [N] W : Total mass of the moving part [kg] g : Gravitational acceleration [9.8m/s^2] μ : Friction coefficient
Circular movement		$T_L = \frac{1}{n} \cdot \frac{1}{\eta} \cdot T_{L0} + T_F$ [N·m] ..... (5.3) T_{L0} : Load torque on the load axis [N·m] T_F : Frictional load torque at motor shaft [N·m] $\frac{1}{n}$: Reduction ratio $\left(\frac{Z_1}{Z_2}\right)$ η : Efficiency of driving parts
Lift movement		For ascending $T_L = T_U + T_F$ [N·m] ..... (5.4) For descending $T_L = -T_U \cdot \eta^2 + T_F$ [N·m] ..... (5.5) T_U : Unbalanced torque [N·m] T_F : Frictional torque of the moving part [N·m] η : Efficiency of driving parts $T_U = \frac{(W_1 - W_2) \cdot g}{2\pi\eta} \cdot \left(\frac{V}{N}\right) = \frac{(W_1 - W_2) \cdot g \cdot \Delta S}{2 \times 10^3 \pi\eta}$ ..... (5.6) $T_F = \frac{\mu \cdot (W_1 + W_2) \cdot g \cdot \Delta S}{2 \times 10^3 \pi\eta}$ ..... (5.7) W_1 : Load mass [kg] W_2 : Counterweight mass [kg] η : Efficiency of driving parts μ : Friction coefficient V : Travel speed [m/min] ΔS : Travel amount in one motor rotation [mm/rev]

~~ MEMO ~~

REVISIONS

*The technical note number is given on the bottom left of the back cover.

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