YASKAWA

Permanent-Magnet Synchronous Motor
SS7-Series Eco PM Motor

Protecting the Future with Technology

In 1997, Yaskawa released the SS5 Series which featured the world's first PM motors with permanent magnets built directly into the rotors. The overwhelmingly high efficiency of these motors made machine downsizing and saving energy possible. Over the years, the need to reduce CO_2 emissions has continued to increase, and in response, Yaskawa has undertaken a new challenge to develop original technologies that will help protect the future of our planet. In response to the introduction of high efficiency standards for industrial motors in 2015 to help reduce CO_2 emissions, Yaskawa has released the SS7 Series, which improves on the efficient and compact SS5 Series.

The SS7 Series of Eco PM Motors promises to meet all your needs in a wide range of applications.

Main Features

1 Extensive Lineup of 2.2 kW to 630 kW (EST4) Motors p8

- 200 V: 2.2 kW to 110 kW (for 1,750 min^{-1})
- 400 V: 2.2 kW to 630 kW (for 1,750 min^{-1})
- Rated speed: 1,150 min^{-1}, 1,450 min^{-1}, or 1,750 min^{-1}

2 High Efficiency p4

Complies* with premium efficiency (IE3) and super premium efficiency (IE4) standards.
Higher efficiency than the SS5 Series.
*: Inquire for estimates.

3 Compact and Lightweight p5

In comparison to induction motors, frames are 1 to 4 frame sizes smaller. Mass has been reduced by 10% to 64%.
This creates more compact machines and saves motor installation space.

4 Resolvers Used as Sensors (Encoders) p6

Resolvers are offered as a standard feature for their high reliability under vibration and heat.
(Optical encoders are optional.)

5 Advanced Machine Control p7

- Combine the SS7 Series with Yaskawa's A1000 AC drives for quick responses to speed references and load disturbances.
- These sensorless drives offer a speed control range of 1:20. You can reduce wiring and increase reliability.
- The rated output range can extend up to 150%* of the rated speed to make alignment with the machine's rated speed easier.

*: 2.2 kW to 75 kW (with sensor)

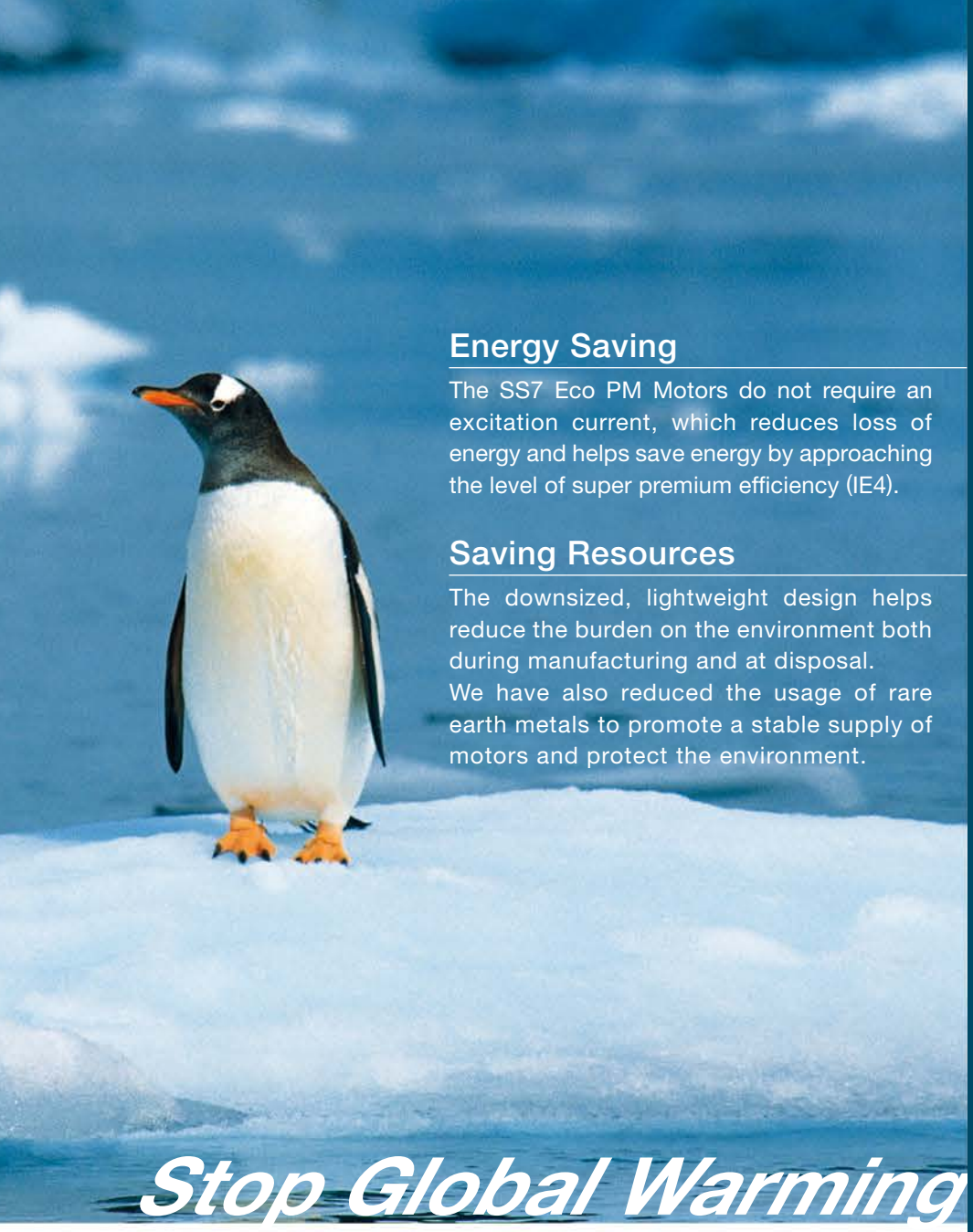
6 Use Either a Coupling or Belt Drive p12

Design work is simplified because the external dimensions and installation dimensions do not depend on the drive method*.

*: Coupling is a standard specification for Frame No. 250LLA and above.

7 Compliance with the EU's CE Marking Safety Standard and the EU's Restriction of Hazardous Substances Directive (RoHS) (Estimates provided on an individual basis.)

ECO PM MOTOR



Energy Saving

The SS7 Eco PM Motors do not require an excitation current, which reduces loss of energy and helps save energy by approaching the level of super premium efficiency (IE4).

Saving Resources

The downsized, lightweight design helps reduce the burden on the environment both during manufacturing and at disposal.
We have also reduced the usage of rare earth metals to promote a stable supply of motors and protect the environment.

Stop Global Warming

Main Applications

- Resin or rubber molding machines (extruders, mulling machines, drawing machines, etc.)
- Cranes
- Compressors
- Metalworking Machines
- Printing Machines
- Fan, Pump

SS7

INDEX

Energy Savings

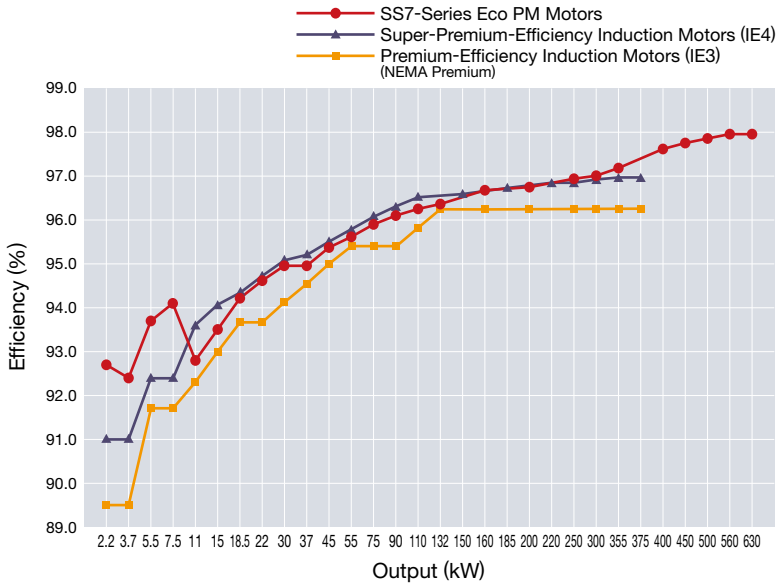
Saving energy to reduce environmental impacts (CO_2) and greatly reduce costs

The high efficiency of the SS7 Series surpasses premium efficiency (IE3) standards and approaches super premium efficiency (IE4) standards.
You can take even greater advantage of the benefits of Eco PM Motors with variable-speed control applications.

High Efficiency

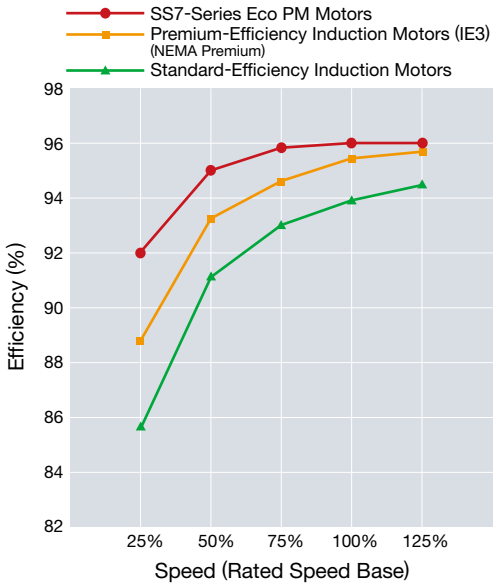
Motor Efficiency (Example for EST4, 1750min^{-1})

High Efficiency Approaching IE4



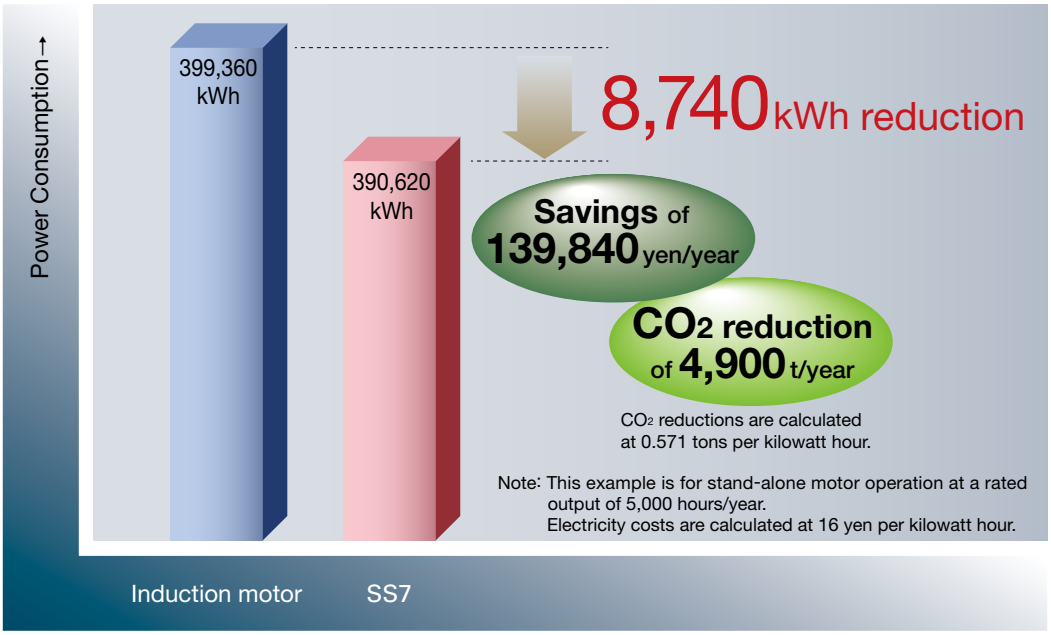
Motor Efficiency for Variable-Speed Control (Example for EST4, 75 kW/1750 min^{-1})

Take Advantage of Benefits with Variable-Speed Control



Reduced Running Costs

Power Consumption and Power Cost Comparison (Example for EST4, 75 kW)



Space Saving

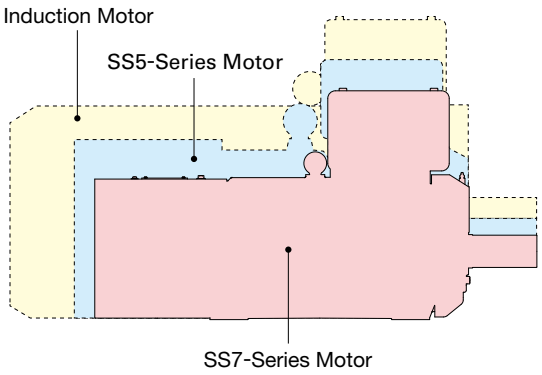
Makes machines more compact and saves resources

You can use the many compact and lightweight models in the SS7 Series to easily convert your machines to environmentally friendly machines.

Compact

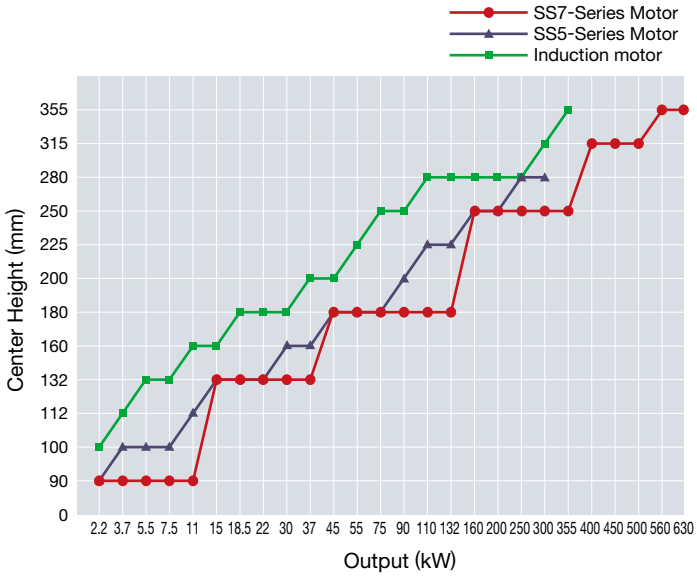
Exterior Comparison
(Example for EST4, 132 kW/1750 min^{-1})

More Compact than SS5 Motors



Frame No. Comparison (EST4, 1750 min^{-1} Model)

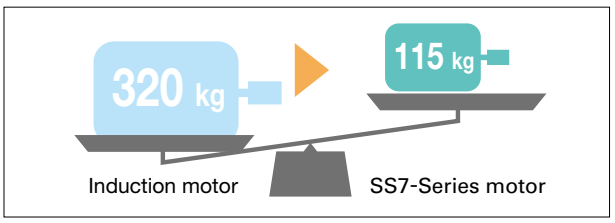
A Reduction of Up to Two Frame Sizes



Lightweight

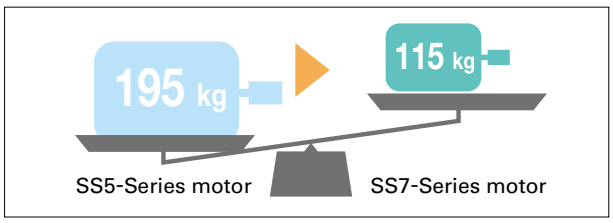
Mass Comparison with Induction Motors
(Example for EST4, 37 kW/1750 min^{-1})

Reduced by Approximately 64%



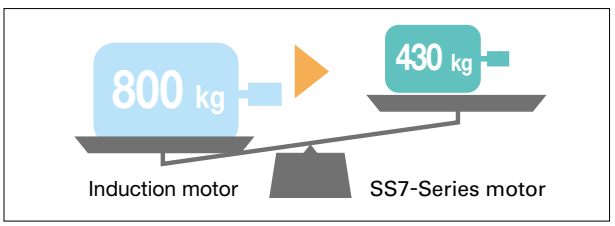
Mass Comparison with SS5-Series Motors
(Example for EST4, 37 kW/1750 min^{-1})

Reduced by Approximately 41%



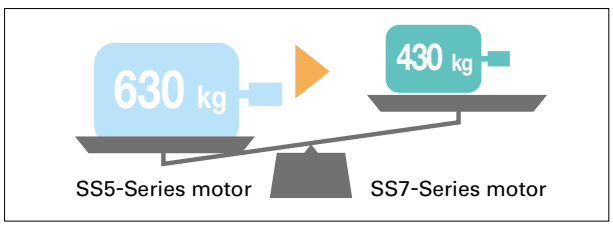
Mass Comparison with Induction Motors
(Example for EST4, 132 kW/1750 min^{-1})

Reduced by Approximately 47%



Mass Comparison with SS5-Series Motors
(Example for EST4, 132 kW/1750 min^{-1})

Reduced by Approximately 32%



Develop a High Performance Drive
SS7-Series Eco PM Motors

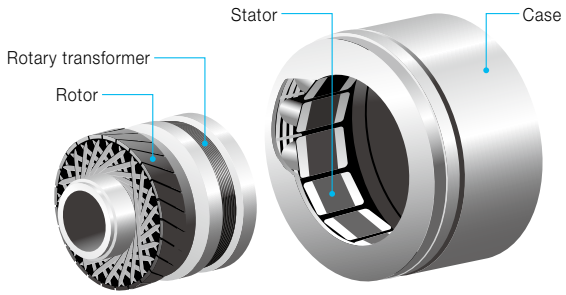
Designed for long-term, dependable operation.
Model selection and adjustments are simple, which reduces commissioning time.

Highly Reliable

Sensor (Encoder)

- Resolvers are offered as a standard feature because of their high reliability for environment and noise resistance.

Note: An optical encoder is offered as an option. Use an optical encoder for applications that require high-precision speed/torque control, such as testing machines and printing machines.



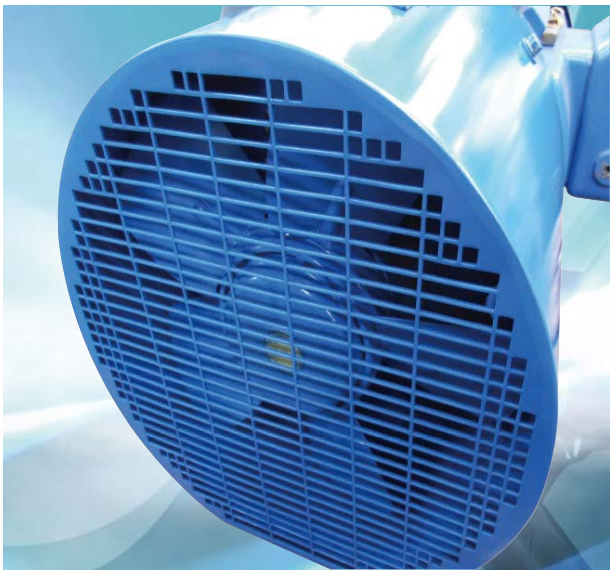
What Is a Resolver?

A resolver consists of a stator and rotor. Similar to transformers, an output voltage is generated (the rotation of the rotor creates a sine-wave output), which is read to detect the angle or speed. The main configurational components are the coil and core. There are no electronic components, so the influences of temperature, noise, and vibration are limited.

Note: An option board is required to operate the Eco PM motor with a resolver.

Fan Cover

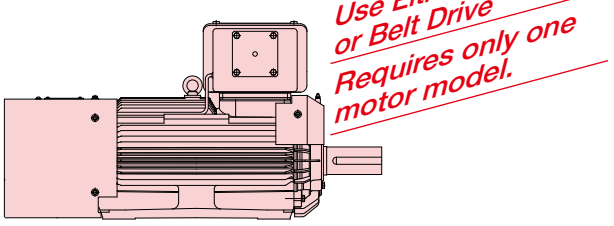
- In response to wide-spread demand, the size of the air holes in the fan cover have been reduced to increase safety (EST4 and EST2).



Simple Selection and Adjustment

Simple Model Selection

- Cylindrical roller bearings have been used for all bearings on the drive end.*1
- You can use a coupling or belt drive with the same motor to simplify model selection.*2

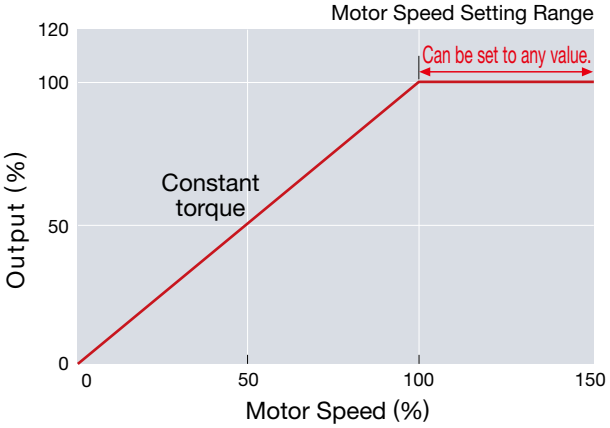


∗1: Frame No. 180SA (45 kW 1750 min^{-1}) and above
∗2: Coupling is a standard specification for Frame No. 250LLA and above.

Simple Motor Speed Adjustment

- The constant output range can be set from 100% to 150% of the rated speed* to make alignment with the machine's rated speed exceptionally easy.

∗: 2.2 kW to 75 kW (with sensor)



Applicable AC Drive: A1000

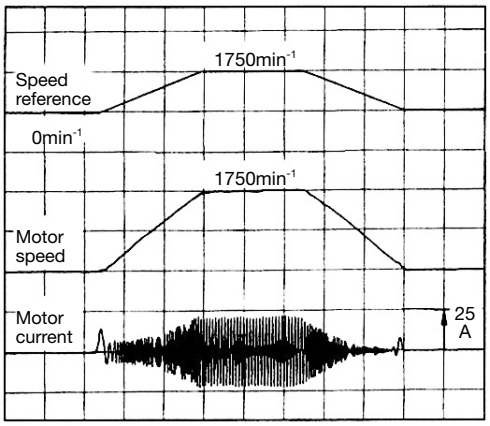
The highly efficient performance of the SS7-Series Eco PM Motors combines with the drive control performance of the A1000 to achieve extraordinary energy-saving results and exceptional drive performance through high precision and high response characteristics.

High Precision — Combine the A1000 with a Sensorless Motor to Achieve High-Precision Drive Performance

You can build a distinctive machine control system with the control functions of a drive that takes advantage of the features of the Eco PM Motors.

Smooth Acceleration and Deceleration

- Acceleration and deceleration are smooth even without a sensor.

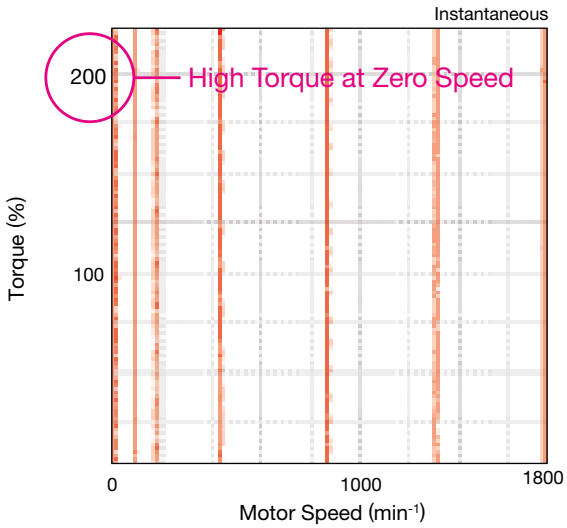


→ Time [1 s/division]

High-Torque Output at Zero Speed

- Even without a sensor, a high torque of 200% or higher can be output at a zero speed.

Note: A larger motor and drive capacity is required to achieve this torque.

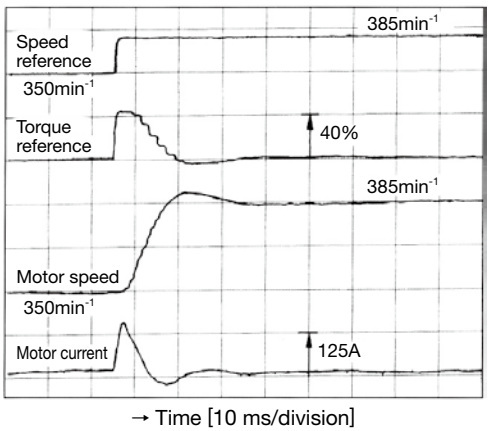


Fast Response — Combine the A1000 with a Sensor-equipped Motor to Achieve High-Speed-Response Drive Performance

Current vector control provides a high-speed response to changes in the speed reference or load conditions which help further improve machine performance.

Response Characteristics for Speed Reference

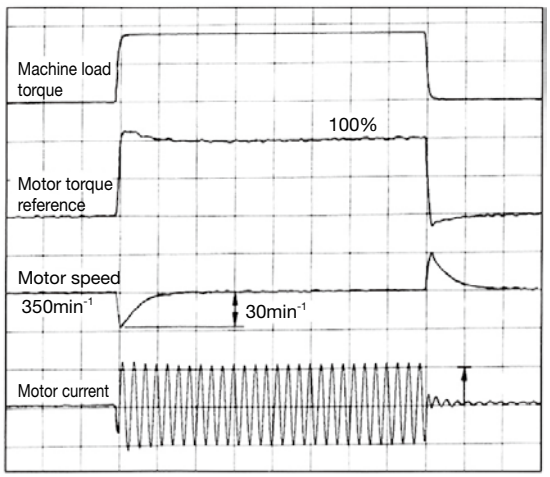
- Quick compliance with reference changes.



→ Time [10 ms/division]

Response Characteristics for Load Disturbances

- Fast speed recovery of the drive load and stable operation even with load changes.



→ Time [200 ms/division]

Product Range and Model Designations

Product Range (Output kW)

Model		With sensor (EST4)*4						Sensorless (EST2)						Sensorless (ESR1)						Mounting Method	Drive Method	Terminal Box Position
Enclosure		Totally-enclosed type*1, Totally-enclosed externally-cooled type						Totally-enclosed type*1, Totally-enclosed externally-cooled type						Totally-enclosed type*1, Totally-enclosed fan-cooled type								
Voltage Class		200 V Class			400 V Class*2			200 V Class			400 V Class			200 V Class			400 V Class					
Motor Speed min-1		1750	1450	1150	1750	1450	1150	1750	1450	1150	1750	1450	1150	1750	1450	1150	1750	1450	1150			
Frame No. 90	90SA*1	2.2	1.5	0.75	2.2	1.5	0.75	2.2	1.5	0.75	2.2	1.5	0.75	2.2	1.5	0.75	2.2	1.5	0.75	Foot-mounted/Flange type	Coupling or V-belt drive	Left/Right/Top*3
	90SB*1	3.7	2.2	1.5	3.7	2.2	1.5	3.7	2.2	1.5	3.7	2.2	1.5	3.7	2.2	1.5	3.7	2.2	1.5			
	90MA*1	5.5	3.7	2.2	5.5	3.7	2.2	5.5	3.7	2.2	5.5	3.7	2.2	5.5	3.7	2.2	5.5	3.7	2.2			
	90MB*1	7.5	5.5	3.7	7.5	5.5	3.7	7.5	5.5	3.7	7.5	5.5	3.7	7.5	5.5	3.7	7.5	5.5	3.7			
	90MB	11	7.5	5.5	11	7.5	5.5	11	7.5	5.5	11	7.5	5.5	11	7.5	5.5	11	7.5	5.5			
Frame No. 132	132SA	15	11	7.5	15	11	7.5	15	11	7.5	15	11	7.5	–	–	–	–	–	–			
	132SB	18.5	15	11	18.5	15	11	18.5	15	11	18.5	15	11	15	11	7.5	15	11	7.5			
	132SC	22	18.5	15	22	18.5	15	22	18.5	15	22	18.5	15	18.5/22	15/18.5	11/15	18.5/22	15/18.5	11/15			
	132MA	30	22	18.5	30	22	18.5	30	22	18.5	30	22	18.5	30	22	18.5	30	22	18.5			
	132MB	37	30	22	37	30	22	37	30	22	37	30	22	37	30	22	37	30	22			
Frame No. 180	180SA	45	37	30	45	37	30	45	37	30	45	37	30	45	37	30	45	37	30			
	180SB	55	45	37	55	45	37	55	45	37	55	45	37	55	45	37	55	45	37			
	180MA	75	55	45	75	55	45	75	55	45	75	55	45	75	55	45	75	55	45			Top/Left
	180MB	90	75	55	90	75	55	90	75	55	90	75	55	90	75	55	90	75	55	Foot-mounted type		
	180LA	110	90	75	110	90	75	110	90	75	110	90	75	110	90	75	110	90	75			
	180LB	–	110	90	132	110	90	–	110	90	132	110	90	–	110	90	132	110	90			
Frame No. 250	250SA	–	–	110	160	132	110	–	–	110	160	132	110	–	–	110	160	132	110			
	250SB	–	–	–	200	160	132	–	–	–	200	160	132	–	–	–	200	160	132			
	250MA	–	–	–	250	200	160	–	–	–	250	200	160	–	–	–	250	200	160			
	250LA	–	–	–	300	250	200	–	–	–	300	250	200	–	–	–	300	250	200			
	250LLA	–	–	–	355	–	–	–	–	–	–	–	–	–	–	–	–	–	–			
	250LLB	–	–	–	–	300	250	–	–	–	–	–	–	–	–	–	–	–	–			
Frame No. 315	315SA	–	–	–	400	–	–	–	–	–	–	–	–	–	–	–	–	–	–			
	315MA	–	–	–	450	355	300	–	–	–	–	–	–	–	–	–	–	–	–			
	315MB	–	–	–	500	400	–	–	–	–	–	–	–	–	–	–	–	–	–			
	315MC	–	–	–	–	–	355	–	–	–	–	–	–	–	–	–	–	–	–			
Frame No. 355	355MA	–	–	–	560	450	400	–	–	–	–	–	–	–	–	–	–	–	–			
	355MB	–	–	–	630	500	–	–	–	–	–	–	–	–	–	–	–	–	–			
	355MC	–	–	–	–	560	450	–	–	–	–	–	–	–	–	–	–	–	–			
	355MD	–	–	–	–	630	500	–	–	–	–	–	–	–	–	–	–	–	–			
	355ME	–	–	–	–	–	560	–	–	–	–	–	–	–	–	–	–	–	–	Coupling		Top

∗1: Models with Frame No. 90SA to 90MB are totally-enclosed type.
∗2: Models with a motor output of 355 kW and above are classified as 300-V class motors (motor input voltage: 360 V).
∗3: The outdoor-type terminal box can only be positioned on top.
∗4: Only optical encoders can be used for sensors of motors with Frame No. 250LLA or larger.

Model Designations

Basic Model Codes: **E S T 4 – 4 3 0 0 A K R**
Application Codes: **S A B A N**

Product Series
ES : SS7 Series

Torque Characteristic
R : Variable torque
T : Constant torque

Speed Control Range
1 : 1:10
2 : 1: 20
4 : 1 : 1500

Voltage Class
2 : 200 V Class
3 : 300 V Class (Motor input voltage: less than 380 V)*1
4 : 400 V Class (Motor input voltage: 380 V or larger)*2
∗1: When the motor input voltage is less than 380 V, the Voltage Class code will be 3.
∗2: Even with a 400-V class power supply voltage, the Voltage Class code will be 3 if the motor input voltage is less than 380 V depending on the drive model and control mode.

Motor Output
2P2 : 2.2 kW
to to
630 : 630 kW

Rated Speed
A : 1750 min-1
B : 1450 min-1
C : 1150 min-1

Protective Enclosure
E : Totally-enclosed type
F : Totally-enclosed fan-cooled type
K : Totally-enclosed externally-cooled type

Sensor (Encoder) Specification
R : Resolver [4,096 P/R] (standard)
A : Optical [1,024 P/R]
N : No encoder

Optional Specification
N: No thermostat (standard)
S: Thermostat for stator (1)
Z: Insulated bearing*
W: Thermostat for stator (1) + insulated bearing*
∗: Insulated bearing can be used only with Frame No. up to 132 and the opposite drive end.

Terminal Box Position and Cable Entrance Direction (See the following table.)

Drive Method
B: Coupling or belt drive (Frame No. 250LA or smaller)
D: Coupling (Frame No. 250 LLA or larger)

Environment
A: Indoor (standard)
O: Outdoor
Q: Outdoor, corrosion-resistant class 2

Mounting Method
S: Foot-mounted type with horizontal shaft (standard)
L: Flange type with horizontal shaft
V: Flange type with vertical downward shaft
U: Flange type with vertical upward shaft
Note: L,V and U are applicable to Frame No.90SA to 180MA.

Terminal Box Position and Cable Entrance Direction (Viewed from the drive end)

Terminal Box Position: Top

Possible for all models.

Code	Terminal Box Position	Cable Entrance Direction	Grease Discharge Outlet*2
A*1	Top	Left	Right
B	Top	Right	Left
C	Top	Left	Left
D	Top	Right	Right

∗1: Code A is standard for Frame No. 180 to 355.
∗2: A grease outlet is applicable to Frame No. 180SA to 355ME.

Terminal Box Position: Side

Applicable to Frame No. 90SA to 180MB
(Terminal box must be on the left for 180SA to 180MB.)

Code	Terminal Box Position	Cable Entrance Direction	Grease Discharge Outlet*2
1	Left	Down	Right
2	Right	Down	Left
5*1	Left	Opposite drive end	Right
6	Right		Left

∗1: Code 5 is standard for Frame No. 90 to 132.
∗2: A grease outlet is applicable to Frame No. 180SA to 180MB.

Note: The outdoor-type terminal box can only be positioned on top.

Combination with AC Drive A1000

Combination with AC Drive A1000

Frame No. 90SA to 132MB

Voltage Class	Output kW	Motor Speed min^{-1}	Motor Model*1 ES□□-	AC Drive A1000 Model CIMR-	AC Drive A1000 Carrier Frequency*2
200 V Class	2.2	1750	22P2AE∗	A□2A0012	5 kHz (4 kHz)
	3.7		23P7AE∗	A□2A0021	
	5.5		25P5AE∗	A□2A0030	
	7.5		27P5AE∗	A□2A0040	
	11		2011A∗∗	A□2A0056	
	15		2015A∗∗	A□2A0069	
	18.5		2018A∗∗	A□2A0081	
	22		2022A∗∗	A□2A0110	
	30		2030A∗∗	A□2A0138	
	37		2037A∗∗	A□2A0169	
	1.5	1450	21P5BE∗	A□2A0010	
	2.2		22P2BE∗	A□2A0012	
	3.7		23P7BE∗	A□2A0021	
	5.5		25P5BE∗	A□2A0030	
	7.5		27P5B∗∗	A□2A0040	
	11		2011B∗∗	A□2A0056	
	15		2015B∗∗	A□2A0069	
	18.5		2018B∗∗	A□2A0081	
	22		2022B∗∗	A□2A0110	
	30		2030B∗∗	A□2A0138	
	0.75	1150	20P7CE∗	A□2A0006	
	1.5		21P5CE∗	A□2A0010	
	2.2		22P2CE∗	A□2A0012	
	3.7		23P7CE∗	A□2A0021	
	5.5		25P5C∗∗	A□2A0030	
	7.5		27P5C∗∗	A□2A0040	
	11		2011C∗∗	A□2A0056	
	15		2015C∗∗	A□2A0069	
	18.5		2018C∗∗	A□2A0081	
	22		2022C∗∗	A□2A0110	
400 V Class	2.2	1750	42P2AE∗	A□4A0007	5 kHz (4 kHz)
	3.7		43P7AE∗	A□4A0011	
	5.5		45P5AE∗	A□4A0018	
	7.5		47P5AE∗	A□4A0023	
	11		4011A∗∗	A□4A0031	
	15		4015A∗∗	A□4A0038	
	18.5		4018A∗∗	A□4A0044	
	22		4022A∗∗	A□4A0058	
	30		4030A∗∗	A□4A0072	
	37		4037A∗∗	A□4A0088	
	1.5	1450	41P5BE∗	A□4A0005	
	2.2		42P2BE∗	A□4A0007	
	3.7		43P7BE∗	A□4A0011	
	5.5		45P5BE∗	A□4A0018	
	7.5		47P5B∗∗	A□4A0023	
	11		4011B∗∗	A□4A0031	
	15		4015B∗∗	A□4A0038	
	18.5		4018B∗∗	A□4A0044	
	22		4022B∗∗	A□4A0058	
	30		4030B∗∗	A□4A0072	
	0.75	1150	40P7CE∗	A□4A0004	
	1.5		41P5CE∗	A□4A0005	
	2.2		42P2CE∗	A□4A0007	
	3.7		43P7CE∗	A□4A0011	
	5.5		45P5C∗∗	A□4A0018	
	7.5		47P5C∗∗	A□4A0023	
	11		4011C∗∗	A□4A0031	
	15		4015C∗∗	A□4A0038	
	18.5		4018C∗∗	A□4A0044	
	22		4022C∗∗	A□4A0058	

∗1: Refer to the Model Designations (page 8) for the alphanumerics that replace and ∗ in the motor model numbers.
∗2: The values in parentheses for the carrier frequency are for sensorless motors. For motors with Frame No.180 or smaller, set the carrier frequency to 4 kHz or above.
∗3: The CIMR-A□2A0415 AC Drive (200 V and 110 kW) has a default carrier frequency setting of 2 kHz. For sensorless motors, set the carrier frequency to 4 kHz.
∗4: Since the models with a motor output of 355 kW and above are used with the A1000, the motor input voltage is 360 V.
∗5: Since there is no HD rated model for the A1000 with 630 kW models, an ND rating (overload tolerance of 120% × 1 minute) is applied.
∗6: Only optical encoders can be used for sensors of motors with Frame No. 250LLA or larger.

Frame No. 180SA to 250LA

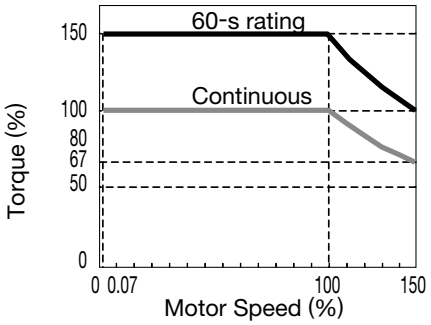
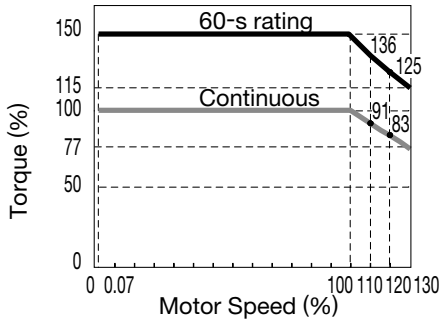
Voltage Class	Output kW	Motor Speed min^{-1}	Motor Model*1 ES□□-	AC Drive A1000 Model CIMR-	AC Drive A1000 Carrier Frequency*2
200 V Class	45	1750	2045A∗∗	A□2A0211	5 kHz (4 kHz)
	55		2055A∗∗	A□2A0250	
	75		2075A∗∗	A□2A0312	
	90		2090A∗∗	A□2A0360	
	110		2110A∗∗	A□2A0415*3	
	37	1450	2037B∗∗	A□2A0169	
	45		2045B∗∗	A□2A0211	
	55		2055B∗∗	A□2A0250	
	75		2075B∗∗	A□2A0312	
	90		2090B∗∗	A□2A0360	
	110		2110B∗∗	A□2A0415*3	
	30	1150	2030C∗∗	A□2A0138	
	37		2037C∗∗	A□2A0169	
	45		2045C∗∗	A□2A0211	
	55		2055C∗∗	A□2A0250	
	75		2075C∗∗	A□2A0312	
	90		2090C∗∗	A□2A0360	
	110		2110C∗∗	A□2A0415*3	
400 V Class	45	1750	4045A∗∗	A□4A0103	5 kHz (4 kHz)
	55		4055A∗∗	A□4A0139	
	75		4075A∗∗	A□4A0165	
	90		4090A∗∗	A□4A0208	
	110		4110A∗∗	A□4A0250	
	132		4132A∗∗	A□4A0296	
	160		4160A∗∗	A□4A0362	2 kHz (2 kHz)
	200		4200A∗∗	A□4A0414	
	250		4250A∗∗	A□4A0515	
	300		4300A∗∗	A□4A0675	
	37	1450	4037B∗∗	A□4A0088	5 kHz (4 kHz)
	45		4045B∗∗	A□4A0103	
	55		4055B∗∗	A□4A0139	
	75		4075B∗∗	A□4A0165	
	90		4090B∗∗	A□4A0208	
	110		4110B∗∗	A□4A0250	
	132		4132B∗∗	A□4A0296	2 kHz (2 kHz)
	160		4160B∗∗	A□4A0362	
	200		4200B∗∗	A□4A0414	
	250		4250B∗∗	A□4A0515	
	30	1150	4030C∗∗	A□4A0072	5 kHz (4 kHz)
	37		4037C∗∗	A□4A0088	
	45		4045C∗∗	A□4A0103	
	55		4055C∗∗	A□4A0139	
	75		4075C∗∗	A□4A0165	
	90		4090C∗∗	A□4A0208	
	110		4110C∗∗	A□4A0250	2 kHz (2 kHz)
	132		4132C∗∗	A□4A0296	
	160		4160C∗∗	A□4A0362	
	200		4200C∗∗	A□4A0414	

Frame No. 250LLA to 355ME*6

Voltage Class	Output kW	Motor Speed min^{-1}	Motor Model*1 EST4-	AC Drive A1000 Model CIMR-	AC Drive A1000 Carrier Frequency*2
400 V Class	355	1750	3355AK∗	A□4A0930	2 kHz
	400		3400AK∗	A□4A0930	
	450		3450AK∗	A□4A0930	
	500		3500AK∗	A□4A1200	
	560		3560AK∗	A□4A1200	
	630*5		3630AK∗	A□4A1200	
	300	1450	4300BK∗	A□4A0675	
	355		3355BK∗	A□4A0930	
	400		3400BK∗	A□4A0930	
	450		3450BK∗	A□4A0930	
	500		3500BK∗	A□4A1200	
	560		3560BK∗	A□4A1200	
	630*5		3630BK∗	A□4A1200	
	250	1150	4250CK∗	A□4A0675	
	300		4300CK∗	A□4A0675	
	355		3355CK∗	A□4A0930	
	400		3400CK∗	A□4A0930	
	450		3450CK∗	A□4A0930	
	500		3500CK∗	A□4A1200	
	560		3560CK∗	A□4A1200	

Specifications and Characteristics of EST4 (with sensor)

Specifications: Model EST4

Output Range			0.75 kW to 11 kW			7.5 kW to 37 kW			30 kW to 132 kW			110 kW to 630 kW	
Frame No.			90SA to 90MB			132SA to 132MB			180SA to 180LB			250SA to 355ME	
Mounting Method			Foot-mounted type, Flange type (Frame No. 180MA or smaller)										
Enclosure			Totally-enclosed type, Totally-enclosed externally-cooled type (IP44)			Totally-enclosed externally-cooled type (IP44)							
Rated Speed (min^{-1})			1750	1450	1150	1750	1450	1150	1750	1450	1150	1750	1450	1150
Output Range (kW)		200 V Class	2.2 to 11	1.5 to 7.5	0.75 to 5.5	15 to 37	11 to 30	7.5 to 22	45 to 110	37 to 110	30 to 110	none		110
		400 V Class	2.2 to 11	1.5 to 7.5	0.75 to 5.5	15 to 37	11 to 30	7.5 to 22	45 to 132	37 to 110	30 to 90	160 to 630	132 to 630	110 to 560
Power Supply	Drive Input Power Supply*1	200 V Class	200 V to 240 V, 50/60 Hz											
		400 V Class	380 V to 480 V, 50/60 Hz											
	Motor Nominal Rated Voltage		200 V Class: 200 V, 400 V Class: 400 V*3											
Motor Poles			90SA to 180LB: 12-pole, 250SA to 355ME: 8-pole											
Speed Control Range			Constant torque 1:1500 Constant output 1:1.5 (Frame No. 180MA or smaller) 1:1.3 (Frame No. 180MB to 250SA) 1:1.2 (Frame No. 250SB or larger) 1:1.1 (Only for 560 kW/1750 min^{-1} and 630 kW/1750 min^{-1} models)											
Number of Sensor (Encoder) Pulses			Resolver*4: 4,096 P/R, Optical encoder : 1,024 P/R											
Time Rating			S1 (continuous)											
Thermal Class			155 (F)											
Application Site			Indoor, non-explosion-proof location (Usage is not possible outdoors or in corrosion-resistant class 2.)											
Ambient Conditions	Temperature		−20° C to 40° C											
	Humidity		90% RH max. (with no condensation)											
	Altitude		1,000 m max.											
Rotation Direction			Counterclockwise viewed from the drive end (Rotation in both directions is also possible.)											
Drive Method			Coupling or V-belt drive (Same model used for both.)*5											
Coating Color			Indoor usage: Munsell 6.0 PB 3.9/11.0											
Compliant Standards			JEC2100											
Applicable AC Drives			Yaskawa A1000 Series											
Allowable Load Characteristics*2 (Based on AC drive A1000.)			Frame No. 90SA to 180MA  Frame No. 180MB to 355ME  Note: The speed control range (constant output) changes depending on the motor models.											

*1: If the drive input voltage is over 440 V or the wiring distance is long, you must consider the motor's insulation tolerance. For details, contact your Yaskawa representative.
*2: The region beyond the 1:1,500 speed control range is the momentary overtorque (150% max.) operation region. Since there is no HD rated model for the A1000 with 630 kW models, an ND rating (overload tolerance of 120% × 1 minute) is applied.
*3: Since the models with a motor output of 355 kW and above are used with the A1000, the motor input voltage is 360 V.
*4: Only optical encoders can be used for sensors of motors with Frame No. 250LLA or larger.
*5: Coupling is a standard specification for Frame No. 250LLA and above (Individual estimates are provided for V-belt drives.)

Characteristics

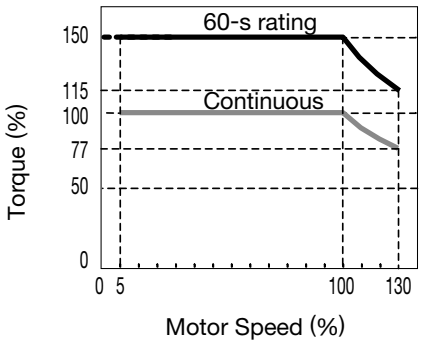
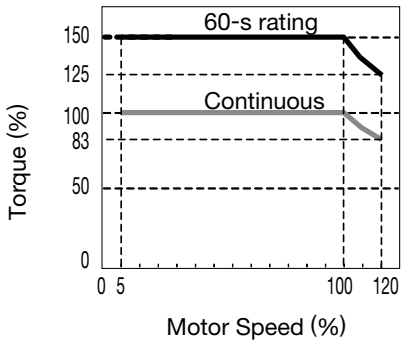
Output	1750 min^{-1}					1450 min^{-1}					1150 min^{-1}				
	Frame No.	Rated Torque	Full Load Current* A		Moment of Inertia J (GD^2/4)	Frame No.	Rated Torque	Full Load Current* A		Moment of Inertia J (GD^2/4)	Frame No.	Rated Torque	Full Load Current* A		Moment of Inertia J (GD^2/4)
kW		N·m	200 V Class	400 V Class	kg·m^2		N·m	200 V Class	400 V Class	kg·m^2		N·m	200 V Class	400 V Class	kg·m^2
0.75											90SA	6.2	3.6	1.8	0.00666
1.5						90SA	9.9	6.9	3.5	0.00666	90SB	12	6.9	3.5	0.00840
2.2	90SA	12	9.7	4.9	0.00666	90SB	14	10	5.0	0.00840	90MA	18	9.6	4.8	0.0120
3.7	90SB	20	16	8.0	0.00840	90MA	24	16	8.0	0.0120	90MB	31	15	7.5	0.0136
5.5	90MA	30	23	12	0.0120	90MB	36	24	12	0.0136	90MB	46	21	11	0.0122
7.5	90MB	41	30	15	0.0136	90MB	49	28	14	0.0122	132SA	62	27	14	0.0310
11	90MB	60	41	21	0.0122	132SA	72	41	21	0.0310	132SB	91	41	21	0.0377
15	132SA	82	56	28	0.0310	132SB	99	56	28	0.0377	132SC	125	56	28	0.0441
18.5	132SB	101	69	35	0.0377	132SC	122	67	34	0.0441	132MA	154	69	35	0.0603
22	132SC	120	80	40	0.0441	132MA	145	79	40	0.0603	132MB	183	79	40	0.0674
30	132MA	164	109	55	0.0603	132MB	198	110	55	0.0674	180SA	249	107	53	0.210
37	132MB	202	132	66	0.0674	180SA	244	138	68	0.210	180SB	307	131	65	0.253
45	180SA	246	153	78.5	0.210	180SB	296	163	81.5	0.253	180MA	374	160	79.5	0.303
55	180SB	300	200	98	0.253	180MA	362	198	99	0.303	180MB	457	190	98	0.342
75	180MA	409	263	129	0.303	180MB	494	253	125	0.342	180LA	623	259	128	0.439
90	180MB	491	296	155	0.342	180LA	593	320	150	0.439	180LB	747	300	157	0.517
110	180LA	600	368	184	0.439	180LB	724	368	184	0.517	250SA	913	384	192	1.14
132	180LB	720	–	230	0.517	250SA	869	–	230	1.14	250SB	1100	–	230	1.53
160	250SA	873	–	279	1.14	250SB	1050	–	280	1.53	250MA	1330	–	279	1.83
200	250SB	1090	–	349	1.53	250MA	1320	–	349	1.83	250LA	1660	–	349	2.15
250	250MA	1360	–	437	1.83	250LA	1650	–	436	2.15	250LLB	2080	–	440	2.81
300	250LA	1640	–	524	2.15	250LLB	1980	–	502	2.81	315MA	2490	–	529	5.38
355	250LLA	1940	–	621	2.76	315MA	2340	–	620	5.38	315MC	2950	–	622	6.16
400	315SA	2180	–	686	5.28	315MB	2630	–	690	5.78	355MA	3320	–	680	10.5
450	315MA	2460	–	771	5.38	355MA	2960	–	758	10.5	355MC	3740	–	756	12.7
500	315MB	2730	–	859	5.78	355MB	3290	–	858	11.6	355MD	4150	–	853	13.8
560	355MA	3060	–	1000	10.5	355MC	3690	–	944	12.7	355ME	4650	–	1004	14.9
630	355MB	3440	–	1148	11.6	355MD	4150	–	1073	13.8					

*: The full load currents of the motors are for the following motor input voltages. For other voltages, calculate the characteristics using the inverse proportion to the voltage.
- 300 kW or less : 200 V Class: 190 V, 400 V Class: 380 V
- 355 kW or more: 300 V Class: 360 V

When used in combination with the U1000 Matrix Converter, the input voltage for the motor is assumed to be set to the following values. Select the U1000 so that its capacity is 1.12 times larger than the full load current value.
- 200 V Class: 170 V, 400 V Class: 340 V

Specifications and Characteristics of EST2 (sensorless)

Specifications: Model EST2

Output Range			0.75 kW to 11 kW			7.5 kW to 37 kW			30 kW to 132 kW			110 kW to 300 kW	
Frame No.			90SA to 90MA			132SA to 132MB			180SA to 180LB			250SA to 250LA	
Mounting Method			Foot-mounted type, Flange type (Frame No. 180MA or smaller)										
Enclosure			Totally-enclosed type, Totally-enclosed externally-cooled type (IP44)			Totally-enclosed externally-cooled type (IP44)							
Rated Speed (min^{-1})			1750	1450	1150	1750	1450	1150	1750	1450	1150	1750	1450	1150
Output Range (kW)		200 V Class	2.2 to 11	1.5 to 7.5	0.75 to 5.5	15 to 37	11 to 30	7.5 to 22	45 to 110	37 to 110	30 to 110	none		110
		400 V Class	2.2 to 11	1.5 to 7.5	0.75 to 5.5	15 to 37	11 to 30	7.5 to 22	45 to 132	37 to 110	30 to 90	160 to 300	132 to 250	110 to 200
Power Supply	Drive Input Power Supply*1	200 V Class	200 V to 240 V, 50/60 Hz											
		400 V Class	380 V to 480 V, 50/60 Hz											
	Motor Nominal Rated Voltage		200 V Class: 200 V, 400 V Class: 400 V											
Motor Poles			90SA to 180LB: 12-pole, 250SA to 250LA: 8-pole											
Speed Control Range			Constant torque 1:20 Constant output 1:1.3 (Frame No. 250SA or smaller) 1:1.2 (Frame No. 250SB or larger)											
Time Rating			S1 (continuous)											
Thermal Class			155 (F)											
Application Site			Indoor, non-explosion-proof location (Usage is not possible outdoors or in corrosion-resistant class 2.)											
Ambient Conditions	Temperature		−20˚C to 40˚C											
	Humidity		90% RH max. (with no condensation)											
	Altitude		1,000 m max.											
Rotation Direction			Counterclockwise viewed from the drive end (Rotation in both directions is also possible.)											
Drive Method			Coupling or V-belt drive (Same model used for both.)											
Coating Color			Indoor usage: Munsell 6.0 PB 3.9/11.0											
Compliant Standards			JEC2100											
Applicable AC Drives			Yaskawa A1000 Series*3											
Allowable Load Characteristics*2 (Based on AC drive A1000.)			Frame No. 90SA to 250SA  Frame No. 250SB to 250LA 											

*1: If the drive input voltage is over 440 V or the wiring distance is long, you must consider the motor's insulation tolerance. For details, contact your Yaskawa representative.
*2: The bold lines in the allowable load characteristics indicate the momentary operation region.
*3: When used in combination with the U1000 Matrix Converter with a capacity equivalent to 200 kW or larger (CIMR-U□4□0477 to 4□0930), select a motor with a sensor.

Characteristics

Output	1750 min^{-1}					1450 min^{-1}					1150 min^{-1}				
	Frame No.	Rated Torque	Full Load Current* A		Moment of Inertia J (GD^2/4)	Frame No.	Rated Torque	Full Load Current* A		Moment of Inertia J (GD^2/4)	Frame No.	Rated Torque	Full Load Current* A		Moment of Inertia J (GD^2/4)
kW		N·m	200 V Class	400 V Class	kg·m^2		N·m	200 V Class	400 V Class	kg·m^2		N·m	200 V Class	400 V Class	kg·m^2
0.75											90SA	6.2	3.6	1.8	0.00666
1.5						90SA	9.9	6.9	3.5	0.00666	90SB	12	6.9	3.5	0.00840
2.2	90SA	12	9.7	4.9	0.00666	90SB	14	10	5.0	0.00840	90MA	18	9.6	4.8	0.0120
3.7	90SB	20	16	8.0	0.00840	90MA	24	16	8.0	0.0120	90MB	31	15	7.5	0.0136
5.5	90MA	30	23	12	0.0120	90MB	36	24	12	0.0136	90MB	46	21	11	0.0122
7.5	90MB	41	30	15	0.0136	90MB	49	28	14	0.0122	132SA	62	27	14	0.0310
11	90MB	60	41	21	0.0122	132SA	72	41	21	0.0310	132SB	91	41	21	0.0377
15	132SA	82	56	28	0.0310	132SB	99	56	28	0.0377	132SC	125	56	28	0.0441
18.5	132SB	101	69	35	0.0377	132SC	122	67	34	0.0441	132MA	154	69	35	0.0603
22	132SC	120	80	40	0.0441	132MA	145	79	40	0.0603	132MB	183	79	40	0.0674
30	132MA	164	109	55	0.0603	132MB	198	110	55	0.0674	180SA	249	107	53	0.210
37	132MB	202	132	66	0.0674	180SA	244	138	68	0.210	180SB	307	131	65	0.253
45	180SA	246	153	78.5	0.210	180SB	296	163	81.5	0.253	180MA	374	160	79.5	0.303
55	180SB	300	200	98	0.253	180MA	362	198	99	0.303	180MB	457	190	98	0.342
75	180MA	409	263	129	0.303	180MB	494	253	125	0.342	180LA	623	259	128	0.439
90	180MB	491	296	155	0.342	180LA	593	320	150	0.439	180LB	747	300	157	0.517
110	180LA	600	368	184	0.439	180LB	725	368	184	0.517	250SA	913	384	192	1.14
132	180LB	720	–	230	0.517	250SA	869	–	230	1.14	250SB	1100	–	230	1.53
160	250SA	873	–	279	1.14	250SB	1050	–	280	1.53	250MA	1330	–	279	1.83
200	250SB	1090	–	349	1.53	250MA	1320	–	349	1.83	250LA	1660	–	349	2.15
250	250MA	1360	–	437	1.83	250LA	1650	–	436	2.15					
300	250LA	1640	–	524	2.15										

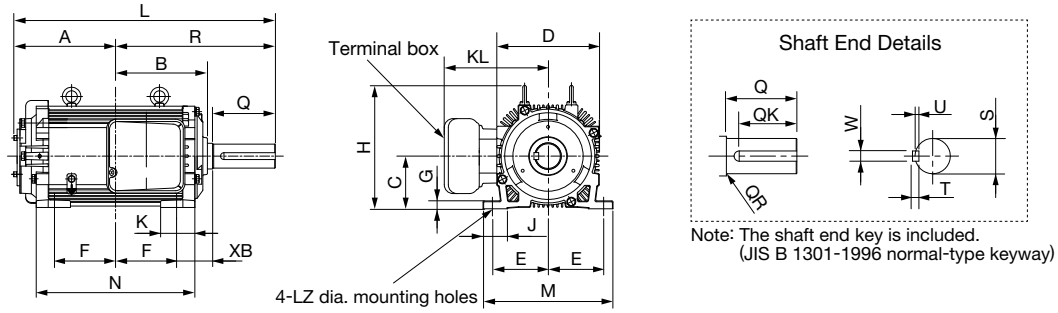
*: The full load currents of the motors are for the following motor input voltages. For other voltages, calculate the characteristics using the inverse proportion to the voltage.
· 200 V Class: 190 V, 400 V Class: 380 V

When used in combination with the U1000 Matrix Converter, the input voltage for the motor is assumed to be set to the following values. Select the U1000 so that its capacity is 1.12 times larger than the full load current value.
· 200 V Class: 170 V, 400 V Class: 340 V

Dimensions (unit: mm)

Frame No. 90SA to 132MB Foot-mounted type

Figure 1



Note: The shaft end key is included.
(JIS B 1301-1996 normal-type keyway)

Figure 2

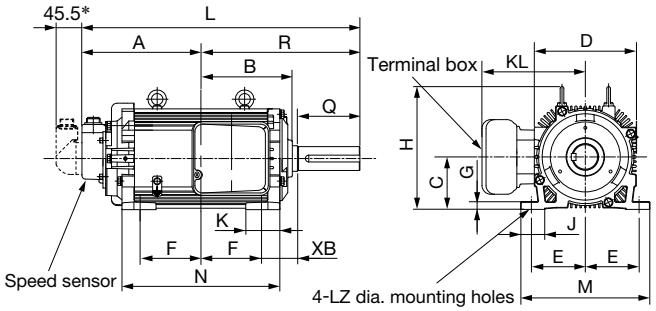
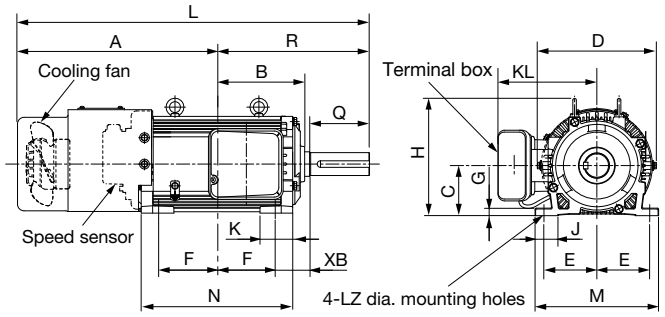


Figure 3



∗: For an optical encoder, the overall length increases by 45.5 mm.
Note: For mounting motor with Frame No. 90SA to 132MB, use grade 12.9 bolts.
Use plain washers because the mounting surface is aluminum.

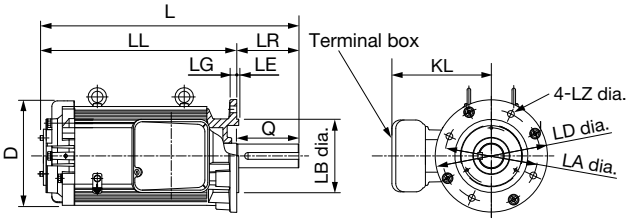
Drive Method	Sensor	Output kW 1750 min⁻¹	Output kW 1450 min⁻¹	Output kW 1150 min⁻¹	Figure	Frame No.	Dimensions mm A	B	C $^{0}_{-0.5}$	D	E	F	G	H	J	K	KL	L	M	N	R	XB	Z
Coupling or Belt Drive	With sensor	2.2	1.5	0.75	1	90SA	151	136	90	195	95	82	12	211	40	60	178	356	220	228	205	63	12
		3.7	2.2	1.5		90SB	151	136	90	195	95	82	12	211	40	60	178	376	220	228	225	63	12
		5.5	3.7	2.2		90MA	176	161	90	195	95	107	12	211	40	60	178	426	220	278	250	63	12
		7.5	5.5	3.7		90MB	176	161	90	195	95	107	12	211	40	60	178	426	220	278	250	63	12
	Without sensor	2.2	1.5	0.75	2	90SA	184.5	136	90	195	95	82	12	211	40	60	178	389.5	220	228	205	63	12
		3.7	2.2	1.5		90SB	184.5	136	90	195	95	82	12	211	40	60	178	409.5	220	228	225	63	12
		5.5	3.7	2.2		90MA	209.5	161	90	195	95	107	12	211	40	60	178	459.5	220	278	250	63	12
		7.5	5.5	3.7		90MB	209.5	161	90	195	95	107	12	211	40	60	178	459.5	220	278	250	63	12
	With/without sensor	11	7.5	5.5	3	90MB	366	161	90	214	95	107	12	211	40	60	178	646	220	278	280	63	12
		15	11	7.5		132SA	405	190.5	132	272	127	115	18	299	45	80	290	719	300	313	314	89	14.5
		18.5	15	11		132SB	405	190.5	132	272	127	115	18	299	45	80	290	719	300	313	314	89	14.5
		22	18.5	15		132SC	405	190.5	132	272	127	115	18	299	45	80	290	719	300	313	314	89	14.5
		30	22	18.5		132MA	450	235.5	132	272	127	160	18	299	45	80	290	809	300	403	359	89	14.5
		37	30	22		132MB	450	235.5	132	272	127	160	18	299	45	80	290	839	300	403	389	89	14.5

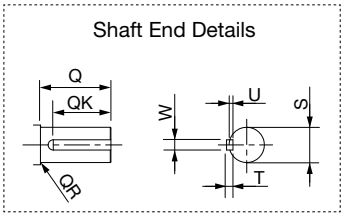
Drive Method	Sensor	Output kW 1750 min⁻¹	Output kW 1450 min⁻¹	Output kW 1150 min⁻¹	Figure	Frame No.	Shaft End Dimensions mm Q	QK	QR	S	T	U	W	Approx. Mass kg	Allowable Radial Shaft Load* N
Coupling or Belt Drive	With sensor	2.2	1.5	0.75	1	90SA	60	45	0.5	$28^{+0.009}_{-0.004}$	7	4	8	27	3,220
		3.7	2.2	1.5		90SB	80	60	0.5		8	5	10	30	3,120
		5.5	3.7	2.2		90MA	80	60	0.5	$38^{+0.018}_{+0.002}$	8	5	10	36	3,190
		7.5	5.5	3.7		90MB	80	60	0.5		8	5	10	39	3,180
	Without sensor	2.2	1.5	0.75	2	90SA	60	45	0.5	$28^{+0.009}_{-0.004}$	7	4	8	27	3,220
		3.7	2.2	1.5		90SB	80	60	0.5		8	5	10	30	3,120
		5.5	3.7	2.2		90MA	80	60	0.5	$38^{+0.018}_{+0.002}$	8	5	10	36	3,190
		7.5	5.5	3.7		90MB	80	60	0.5		8	5	10	39	3,180
	With/without sensor	11	7.5	5.5	3	90MB	110	90	0.5	$42^{+0.018}_{+0.002}$	8	5	12	38	3,090
		15	11	7.5		132SA	110	90	2		8	5	12	68	5,460
		18.5	15	11		132SB	110	90	2	$48^{+0.018}_{+0.002}$	9	5.5	14	77	5,900
		22	18.5	15		132SC	110	90	2		9	5.5	14	86	5,950
		30	22	18.5		132MA	110	90	2	$55^{+0.030}_{+0.011}$	10	6	16	106	6,070
		37	30	22		132MB	140	120	3	$60^{+0.030}_{+0.011}$	11	7	18	115	5,900

∗ : The allowable value is given when only a radial load is applied. Inquire if a thrust load will be applied at the same time.
It is assumed that the load point is in the middle of shaft dimension Q.

Frame No. 90SA to 132MB Flange type

Figure 1





Note: The shaft end key is included.
(JIS B 1301-1996 normal-type keyway)

Figure 2

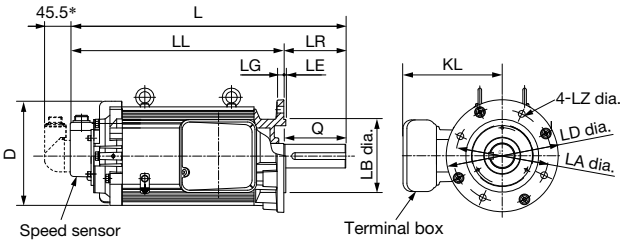
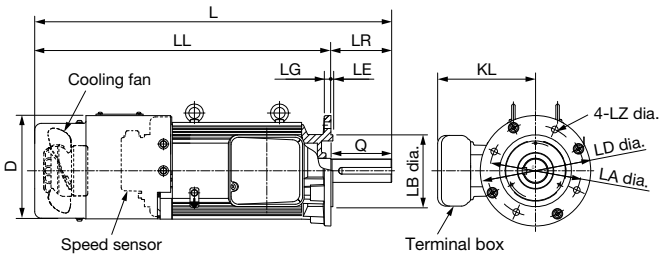


Figure 3



∗: For an optical encoder, the overall length increases by 45.5 mm.
Note: For mounting motor with Frame No. 90SA to 132MB, use grade 12.9 bolts.
Use plain washers because the mounting surface is aluminum.

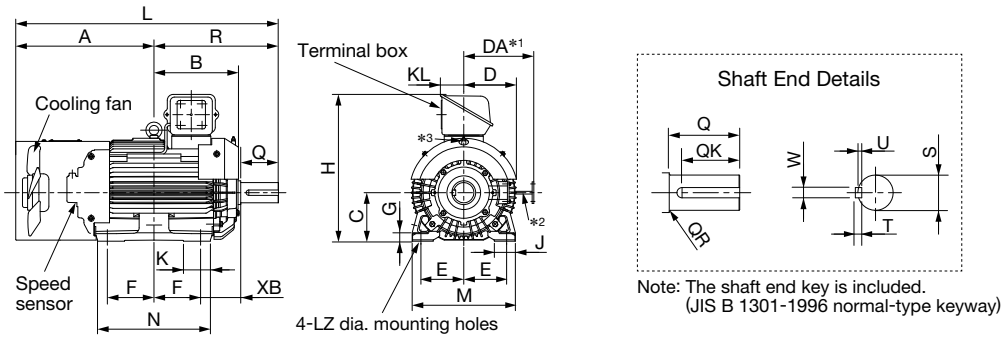
Drive Method	Sensor	Output kW 1750 min⁻¹	Output kW 1450 min⁻¹	Output kW 1150 min⁻¹	Figure	Frame No.	Dimensions mm D	L	LL	LR	LG	LE	LB	LA	LD	LZ	KL
Coupling or Belt Drive	With sensor	2.2	1.5	0.75	1	90SA	187.5	356	296	60	12	3.5	$130^{+0.014}_{-0.011}$	165	200	12	178
		3.7	2.2	1.5		90SB	187.5	376	296	80	12	3.5		165	200	12	178
		5.5	3.7	2.2		90MA	187.5	426	346	80	12	3.5		165	200	12	178
		7.5	5.5	3.7		90MB	187.5	426	346	80	12	3.5		165	200	12	178
	Without sensor	2.2	1.5	0.75	2	90SA	187.5	389.5	329.5	60	12	3.5	$130^{+0.014}_{-0.011}$	165	200	12	178
		3.7	2.2	1.5		90SB	187.5	409.5	329.5	80	12	3.5		165	200	12	178
		5.5	3.7	2.2		90MA	187.5	459.5	379.5	80	12	3.5		165	200	12	178
		7.5	5.5	3.7		90MB	187.5	459.5	379.5	80	12	3.5		165	200	12	178
	With/without sensor	11	7.5	5.5	3	90MB	200	646	536	110	12	3.5	$130^{+0.014}_{-0.011}$	165	200	12	178
		15	11	7.5		132SA	272	719	609	110	20	4	$230^{+0.016}_{-0.013}$	265	300	14.5	290
		18.5	15	11		132SB	272	719	609	110	20	4		265	300	14.5	290
		22	18.5	15		132SC	272	719	609	110	20	4		265	300	14.5	290
		30	22	18.5		132MA	272	809	699	110	20	4		265	300	14.5	290
		37	30	22		132MB	272	839	699	140	20	4		265	300	14.5	290

Drive Method	Sensor	Output kW 1750 min⁻¹	Output kW 1450 min⁻¹	Output kW 1150 min⁻¹	Figure	Frame No.	Shaft End Dimensions mm Q	QK	QR	S	T	U	W	Approx. Mass kg	Allowable Radial Shaft Load* N
Coupling or Belt Drive	With sensor	2.2	1.5	0.75	1	90SA	60	45	0.5	$28^{+0.009}_{-0.004}$	7	4	8	26	3,220
		3.7	2.2	1.5		90SB	80	60	0.5	$38^{+0.018}_{+0.002}$	8	5	10	29	3,120
		5.5	3.7	2.2		90MA	80	60	0.5		8	5	10	36	3,190
		7.5	5.5	3.7		90MB	80	60	0.5		8	5	10	39	3,180
	Without sensor	2.2	1.5	0.75	2	90SA	60	45	0.5	$28^{+0.009}_{-0.004}$	7	4	8	26	3,220
		3.7	2.2	1.5		90SB	80	60	0.5	$38^{+0.018}_{+0.002}$	8	5	10	29	3,120
		5.5	3.7	2.2		90MA	80	60	0.5		8	5	10	36	3,190
		7.5	5.5	3.7		90MB	80	60	0.5		8	5	10	39	3,180
	With/without sensor	11	7.5	5.5	3	90MB	110	90	0.5	$42^{+0.018}_{+0.002}$	8	5	12	38	3,090
		15	11	7.5		132SA	110	90	2		8	5	12	68	5,460
		18.5	15	11		132SB	110	90	2	$48^{+0.018}_{+0.002}$	9	5.5	14	77	5,900
		22	18.5	15		132SC	110	90	2		9	5.5	14	86	5,950
		30	22	18.5		132MA	110	90	2	$55^{+0.030}_{+0.011}$	10	6	16	104	6,070
		37	30	22		132MB	140	120	3	$60^{+0.030}_{+0.011}$	11	7	18	113	5,900

∗ : The allowable value is given when only a radial load is applied. Inquire if a thrust load will be applied at the same time.
It is assumed that the load point is in the middle of shaft dimension Q.

Dimensions (unit: mm)

Frame No. 180SA to 250LA Foot-mounted type



Note: The shaft end key is included.
(JIS B 1301-1996 normal-type keyway)

∗1: Required dimensions at grease exhaust ∗2: Grease exhaust bar ∗3: Grease inlet
Note: There is no air guide on the drive end of Frame No. 180.

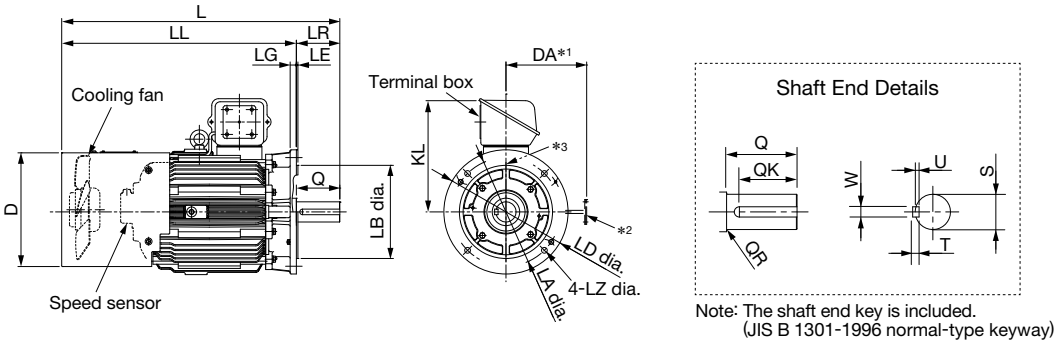
Drive Method	Sensor	Output kW			Frame No.	Dimensions mm																	
		1750 min-1	1450 min-1	1150 min-1		A	B	$C_{-0.5}^{0}$	D	DA	E	F	G	H	J	K	KL	L	M	N	R	XB	Z
Coupling or Belt Drive	With/without sensor	45	37	30	180SA	473.5	275	180	195	260	159	133.5	28	545	75	100	88	896	380	340	422.5	149	24
		55	45	37	180SB	473.5	275	180	195	260	159	133.5	28	545	75	100	88	896	380	340	422.5	149	24
		75	55	45	180MA	513	314	180	195	260	159	173	28	545	75	100	88	975	380	419	462	149	24
		90	75	55	180MB	513	314	180	195	260	159	173	28	545	75	100	88	975	380	419	462	149	24
		110	90	75	180LA	593	394	180	195	260	159	253	28	610	75	100	280	1165	380	579	572	149	24
		132	110	90	180LB	593	394	180	195	260	159	253	28	610	75	100	280	1165	380	579	572	149	24
		160	132	110	250SA	644	372	250	266	400	228.5	209.5	28	750	110	130	280	1191.5	560	500	547.5	168	24
		200	160	132	250SB	644	372	250	266	400	228.5	209.5	28	750	110	130	280	1191.5	560	500	547.5	168	24
		250	200	160	250MA	715	391	250	266	400	228.5	228.5	28	750	110	130	280	1281.5	560	538	566.5	168	24
		300	250	200	250LA	805	391	250	266	400	228.5	228.5	28	750	110	130	280	1371.5	560	538	566.5	168	24

Drive Method	Sensor	Output kW			Frame No.	Shaft End Dimensions mm							Approx. Mass	Allowable Radial Shaft Load*
		1750 min-1	1450 min-1	1150 min-1		Q	QK	QR	S	T	U	W	kg	N
Coupling or Belt Drive	With/without sensor	45	37	30	180SA	140	120	3	$60^{+0.030}_{+0.011}$	11	7	18	250	9,220
		55	45	37	180SB	140	120	1	$65^{+0.030}_{+0.011}$	11	7	18	260	
		75	55	45	180MA	140	110	1	$75^{+0.030}_{+0.011}$	12	7.5	20	300	12,100
		90	75	55	180MB	140	110	1		12	7.5	20	310	
		110	90	75	180LA	170	140	1.2	$85^{+0.035}_{+0.013}$	14	9	22	410	14,400
		132	110	90	180LB	170	140	1.2		14	9	22	430	
		160	132	110	250SA	170	140	1.2	$95^{+0.035}_{+0.013}$	14	9	25	620	20,400
		200	160	132	250SB	170	140	1.2		14	9	25	700	
		250	200	160	250MA	170	140	1.2	$105^{+0.035}_{+0.013}$	16	10	28	800	23,500
		300	250	200	250LA	170	140	1.2		16	10	28	900	28,300

∗: The allowable value is given when only a radial load is applied. Inquire if a thrust load will be applied at the same time.
It is assumed that the load point is in the middle of shaft dimension Q.

Note: For a motor with a sensor, the external motor dimensions are the same regardless of whether a resolver or optical encoder is selected.

Frame No. 180SA to 180MA Flange type



Note: The shaft end key is included.
(JIS B 1301-1996 normal-type keyway)

*1: Required dimensions at grease exhaust *2: Grease exhaust bar *3: Grease inlet

Drive Method	Sensor	Output kW			Frame No.	Dimensions mm											
		1750 min^{-1}	1450 min^{-1}	1150 min^{-1}		D	L	LL	LR	LG	LE	LB	LA	LD	LZ	KL	DA
Coupling or Belt Drive	With/ without sensor	45	37	30	180SA	381	896	756	140	20	5	$300^{+0.016}_{-0.016}$	350	400	18.5	365	260
		55	45	37	180SB	381	896	756	140	20	5		350	400	18.5	365	260
		75	55	45	180MA	381	975	835	140	20	5		350	400	18.5	365	260

Drive Method	Sensor	Output kW			Frame No.	Shaft End Dimensions mm							Approx. Mass	Allowable Radial Shaft Load*
		1750 min^{-1}	1450 min^{-1}	1150 min^{-1}		Q	QK	QR	S	T	U	W	kg	N
Coupling or Belt Drive	With/ without sensor	45	37	30	180SA	140	120	3	$60^{+0.030}_{+0.011}$	11	7	18	250	9,220
		55	45	37	180SB	140	120	1	$65^{+0.030}_{+0.011}$	11	7	18	260	
		75	55	45	180MA	140	110	1	$75^{+0.030}_{+0.011}$	12	7.5	20	300	12,100

* : The allowable value is given when only a radial load is applied. Inquire if a thrust load will be applied at the same time.It is assumed that the load point is in the middle of shaft dimension Q.

Note: For a motor with a sensor, the external motor dimensions are the same regardless of whether a resolver or optical encoder is selected.

Dimensions (unit: mm)

Frame No. 250LLA to 355ME Foot-mounted type

Figure 1

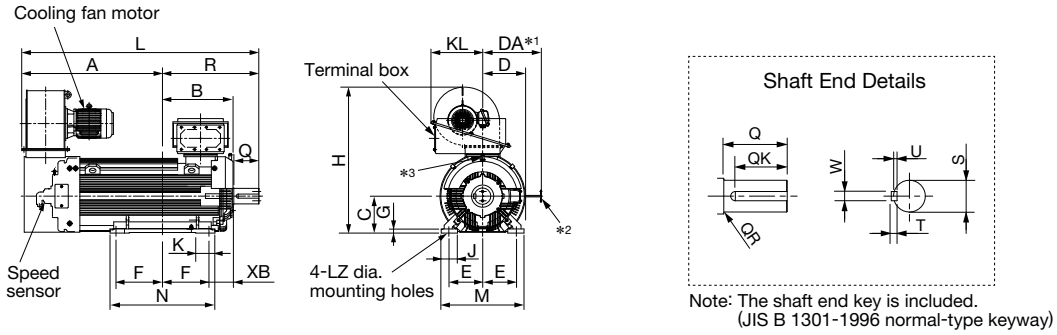


Figure 2

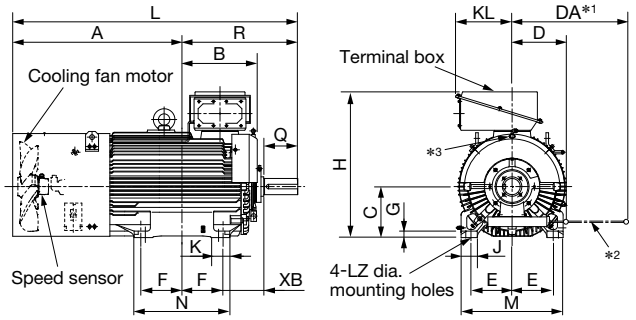
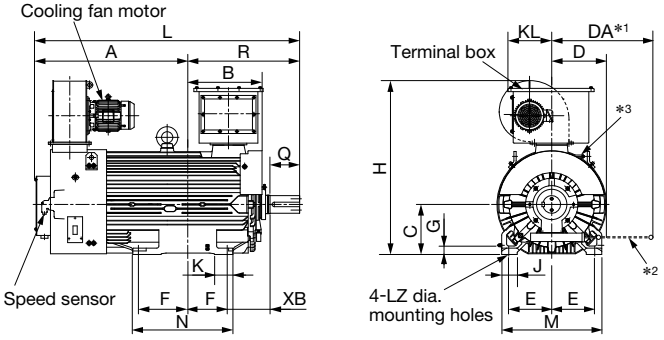


Figure 3



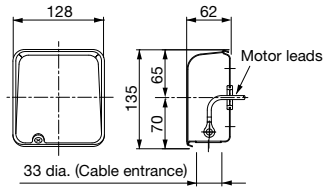
∗1: Required dimensions at grease exhaust ∗2: Grease exhaust bar ∗3: Grease inlet

Drive Method	Sensor	Output kW 1750 min⁻¹	Output kW 1450 min⁻¹	Output kW 1150 min⁻¹	Figure	Frame No.	Dimensions mm A	B	C	D	DA	E	F	G	H	J	K	KL	L	M	N	R	XB	Z
Coupling	With sensor	355	–	–	1	250LLA	952.5	478	250	288.5	400	228.5	314.5	28	988	110	130	350	1605	560	710	652.5	168	24
		–	300	250	2	250LLB	989	478	250	266	400	228.5	314.5	28	750	110	130	280	1641.5	560	710	652.5	168	24
		400	–	–	1	315SA	855	413	315	338.5	719.5	254	203	40	1103	110	120	350	1519	630	490	664	251	28
		–	355	300	2	315MA	1045	465	315	335	719.5	254	254	40	900	100	115	350	1760	630	590	715	251	28
		450	–	–			954	465	315	338.5	719.5	254	254	40	1144	100	115	311	1669	630	590	715	251	28
		500	–	–	3	315MB	954	465	315	338.5	719.5	254	254	40	1144	100	115	311	1669	630	590	715	251	28
		–	400	–			954	465	315	338.5	719.5	254	254	40	1144	100	115	350	1669	630	590	715	251	28
		–	–	355	2	315MC	1045	465	315	338.5	719.5	254	254	40	900	100	115	350	1760	630	590	715	251	28
		560	–	–		355MA	1049	562	355	388.5	768.5	305	315	45	1250	110	130	311	1878	710	710	829	304	28
		–	450	400			1049	562	355	388.5	768.5	305	315	45	1234	110	130	311	1878	710	710	829	304	28
		630	–	–		355MB	1049	562	355	388.5	768.5	305	315	45	1250	110	130	311	1878	710	710	829	304	28
		–	500	–			1049	562	355	388.5	768.5	305	315	45	1234	110	130	311	1878	710	710	829	304	28
		–	560	–	3	355MC	1049	562	355	388.5	768.5	305	315	45	1250	110	130	311	1878	710	710	829	304	28
		–	–	450			1049	562	355	388.5	768.5	305	315	45	1234	110	130	311	1878	710	710	829	304	28
		–	630	–		355MD	1049	562	355	388.5	768.5	305	315	45	1250	110	130	311	1878	710	710	829	304	28
		–	–	500			1049	562	355	388.5	768.5	305	315	45	1234	110	130	311	1878	710	710	829	304	28
		–	–	560		355ME	1049	562	355	388.5	768.5	305	315	45	1250	110	130	311	1878	710	710	829	304	28

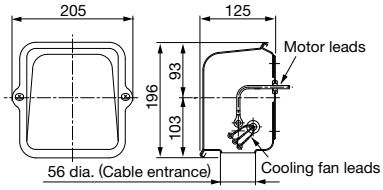
Drive Method	Sensor	Output kW 1750 min⁻¹	Output kW 1450 min⁻¹	Output kW 1150 min⁻¹	Figure	Frame No.	Shaft End Dimensions mm Q	QK	QR	S	T	U	W	Approx. Mass kg
Coupling	With sensor	355	–	–	1	250LLA	170	140	1.2	$95^{+0.035}_{+0.013}$	14	9	25	1100
		–	300	250	2	250LLB	170	140	1.2		14	9	25	1150
		400	–	–	1	315SA	210	180	2.5	$105^{+0.035}_{+0.013}$	16	10	28	1500
		–	355	300	2	315MA	210	180	2.5		16	10	28	1600
		450	–	–										1650
		500	–	–	3	315MB	210	180	2.5		16	10	28	1750
		–	400	–										1750
		–	–	355	2	315MC	210	180	2.5		16	10	28	1800
		560	–	–		355MA	210	180	2.5	$110^{+0.035}_{+0.013}$	16	10	28	2100
		–	450	400										2100
		630	–	–		355MB	210	180	2.5		16	10	28	2200
		–	500	–										2200
		–	560	–	3	355MC	210	180	2.5		18	11	32	2300
		–	–	450										2300
		–	630	–		355MD	210	180	2.5	$125^{+0.040}_{+0.015}$	18	11	32	2400
		–	–	500										2400
		–	–	560		355ME	210	180	2.5		18	11	32	2450

Dimensions of Terminal Boxes

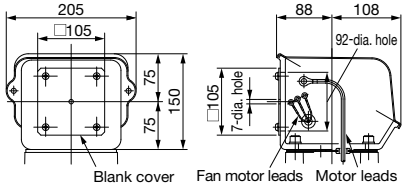
● Figure 1 (Frame No. 90)



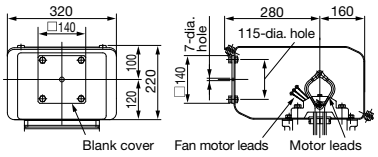
● Figure 2 (Frame No. 132)



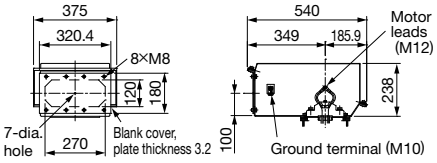
● Figure 3 (Frame No. 180SA to 180MB)



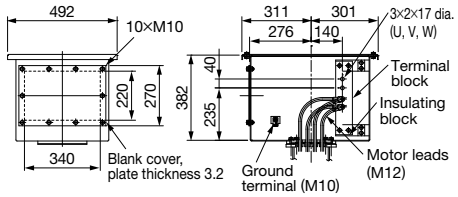
● Figure 4
(Frame No. 180LA to 250LA, 250LLB)



● Figure 5 (Models of 400 kW or less,
Frame No. 250LLA, 315SA to 315MC)



● Figure 6 (Models of 450 kW or more,
Frame No. 315MA, 315MB, 355MA to 355ME)



Note:1 The standard direction for the terminal cable entrance is opposite the drive end (for figures 1 and 2) and left (for figures 3 to 6).
2 For figures 3 to 6, change the hole size in the middle of the cover to match the connecting conduit tube.

Bearing Types

Drive Method	Frame No.	Drive End	Opposite Drive End
Coupling or Belt Drive	90 to 132	Ball bearing (sealed)	Ball bearing (sealed)
	180	Cylindrical roller bearing (regreasable)	Ball bearing (sealed)
	250SA to 250LA	Cylindrical roller bearing (regreasable)	Ball bearing (regreasable)
Coupling	250LLA to 355	Cylindrical roller bearing (regreasable)	Ball bearing (regreasable)

Specifications of Cooling Fan Motors

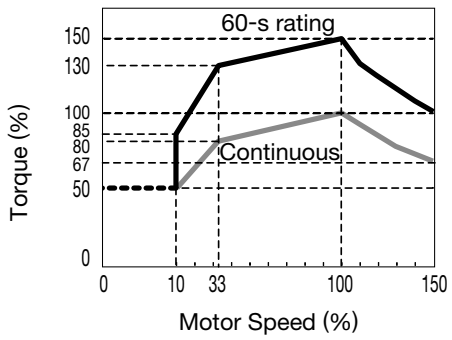
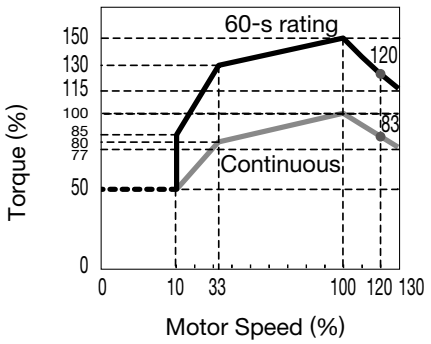
Output kW 1750 min⁻¹	Output kW 1450 min⁻¹	Output kW 1150 min⁻¹	Frame No.	Cooling Fan Motor
11	7.5	5.5	90MB	Voltage Class: 200 V Class; Model: TR155P5H-3-E22; Rated Voltage V: 200 220 200 220; Frequency Hz: 50 60; Rated Input W: 16 17 23 24; Rated Current A: 0.11 0.12 0.11 0.12 Voltage Class: 400 V Class; Model: TR155P9H-340-E22; Rated Voltage V: 380 400 440 380 400 440; Frequency Hz: 50 60; Rated Input W: 18 19 20 23 25 27; Rated Current A: 0.06 0.06 0.07 0.06 0.06 0.07
15	11	7.5	132SA	Voltage Class: 200 V Class; Model: T200P59H-3-A18; Rated Voltage V: 200 220 200 220; Frequency Hz: 50 60; Rated Input W: 44 46 60 65; Rated Current A: 0.21 0.23 0.24 0.25 Voltage Class: 400 V Class; Model: T200P99H-340-A18; Rated Voltage V: 380 400 440 380 400 440; Frequency Hz: 50 60; Rated Input W: 43 44 46 55 60 65; Rated Current A: 0.10 0.11 0.12 0.11 0.12 0.13
18.5	15	11	132SB	
22	18.5	15	132SC	
30	22	18.5	132MA	
37	30	22	132MB	
45	37	30	180SA	Voltage Class: 200 V Class; Model: T350P549H-3-A20; Rated Voltage V: 200 220 200 220; Frequency Hz: 50 60; Rated Input W: 80 85 110 115; Rated Current A: 0.46 0.50 0.45 0.50 Voltage Class: 400 V Class; Model: T350P949H-340-A20; Rated Voltage V: 380 400 440 380 400 440; Frequency Hz: 50 60; Rated Input W: 75 80 85 100 110 115; Rated Current A: 0.20 0.23 0.25 0.21 0.23 0.25
55	45	37	180SB	
75	55	45	180MA	
90	75	55	180MB	
110	90	75	180LA	
132	110	90	180LB	

Output kW 1750 min⁻¹	Output kW 1450 min⁻¹	Output kW 1150 min⁻¹	Frame No.	Cooling Fan Motor
160	132	110	250SA	Voltage Class: 200 V Class; Model: T450P549H-3-A73; Rated Voltage V: 200 220 200 220; Frequency Hz: 50 60; Rated Input W: 170 185 230 245; Rated Current A: 0.83 0.91 0.87 0.88 Voltage Class: 400 V Class; Model: T450P949H-340-A73; Rated Voltage V: 380 400 440 380 400 440; Frequency Hz: 50 60; Rated Input W: 160 170 185 215 232 245; Rated Current A: 0.41 0.43 0.45 0.43 0.45 0.46
200	160	132	250SB	
250	200	160	250MA	
300	250	200	250LA	
–	300	250	250LLB	
–	355	300	315MA	Voltage Class: 400 V Class; Model: A6D560-AK01-03; Rated Voltage V: 380 400 440 380 400 440; Frequency Hz: 50 60; Rated Input W: 365 375 390 540 540 570; Rated Current A: 0.84 0.84 0.89 1.01 1.01 1.00
–	–	355	315MC	
355 (1.5)	–	–	250LLA	Voltage Class: 400 V Class; Model: FELQ-5H3, 4P, 1.5kW / FELQ-5H3, 4P, 2.2kW; Rated Voltage V: 400 400 440 400 400 440; Frequency Hz: 50 60 50 60; Rated Input kW: 1.75 1.74 1.72 2.53 2.46 2.46; Rated Current A: 3.27 3.02 2.89 4.45 4.18 3.94
400 (1.5)	–	–	315SA	
450 (2.2)	–	–	315MA	
500 (2.2)	400 (1.5)	–	315MB	
560 (3.7)	450 (2.2)	400 (2.2)	355MA	
630 (3.7)	500 (2.2)	–	355MB	Voltage Class: 400 V Class; Model: FELQ-5H3OU, 4P, 3.7kW; Rated Voltage V: 400 400 440; Frequency Hz: 50 60; Rated Input kW: 4.18 4.14 4.14; Rated Current A: 7.35 7.10 6.60
–	560 (3.7)	450 (2.2)	355MC	
–	630 (3.7)	500 (2.2)	355MD	
–	–	560 (3.7)	355ME	

✻: The values in parentheses are for cooling fan motor capacities for the sirocco fan.

Specifications and Characteristics of ESR1 (sensorless)

Specifications: Model ESR1

Output Range			0.75 kW to 11 kW			7.5 kW to 37 kW			30 kW to 132 kW			110 kW to 300 kW		
Frame No.			90SA to 90MA			132SB to 132MB			180SA to 180LB			250SA to 250LA		
Mounting Method			Foot-mounted type, Flange type (Frame No. 180MA or smaller)											
Enclosure			Totally-enclosed type, Totally-enclosed fan-cooled type (IP44)			Totally-enclosed fan-cooled type (IP44)								
Rated Speed (min^{-1})			1750	1450	1150	1750	1450	1150	1750	1450	1150	1750	1450	1150
Output Range (kW)		200 V Class	2.2 to 11	1.5 to 7.5	0.75 to 5.5	15 to 37	11 to 30	7.5 to 22	45 to 110	37 to 110	30 to 110	none		110
		400 V Class	2.2 to 11	1.5 to 7.5	0.75 to 5.5	15 to 37	11 to 30	7.5 to 22	45 to 132	37 to 110	30 to 90	160 to 300	132 to 250	110 to 200
Power Supply	Drive Input Power Supply*1	200 V Class	200 V to 240 V, 50/60 Hz											
		400 V Class	380 V to 480 V, 50/60 Hz											
	Motor Nominal Rated Voltage		200 V Class: 200 V, 400 V Class: 400 V											
Motor Poles			90SA to 180LB: 12-pole, 250SA to 250LA: 8-pole											
Speed Control Range			Variable torque 1:20 Constant output 1:1.5 (Frame No. 180MA or smaller) 1:1.3 (Frame No. 180MB to 250SA) 1:1.2 (Frame No. 250SB or larger)											
Time Rating			S1 (continuous)											
Thermal Class			155 (F)											
Application Site			Indoor, non-explosion-proof location (Specify if the motor will be used outdoors.)											
Ambient Conditions	Temperature		−20˚C to 40˚C											
	Humidity		90% RH max. (with no condensation)											
	Altitude		1,000 m max.											
Rotation Direction			Counterclockwise viewed from the drive end (Rotation in both directions is also possible.)											
Drive Method			Coupling or V-belt drive (Same model used for both.)											
Coating Color			Indoor usage: Munsell 6.0 PB 3.9/11.0 Outdoor usage: Munsell N7											
Compliant Standards			JEC2100											
Applicable AC Drives			Yaskawa A1000 Series*3											
Allowable Load Characteristics*2 (Based on AC drive A1000.)			Frame No. 90SA to 180MA 						Frame No. 180MB to 250LA  Note: The speed control range (constant output) changes depending on the motor models.		

*1: If the drive input voltage is over 440 V or the wiring distance is long, you must consider the motor's insulation tolerance. For details, contact your Yaskawa representative.

*2: The bold lines in the allowable load characteristics indicate the momentary operation region.

*3: When used in combination with the U1000 Matrix Converter with a capacity equivalent to 200 kW or larger (CIMR-U□4□0477 to 4□0930), select a motor with a sensor.

Characteristics

Output	1750 min^{-1}					1450 min^{-1}					1150 min^{-1}				
	Frame No.	Rated Torque	Full Load Current* A		Moment of Inertia J (GD^2/4)	Frame No.	Rated Torque	Full Load Current* A		Moment of Inertia J (GD^2/4)	Frame No.	Rated Torque	Full Load Current* A		Moment of Inertia J (GD^2/4)
kW		N·m	200 V Class	400 V Class	kg·m^2		N·m	200 V Class	400 V Class	kg·m^2		N·m	200 V Class	400 V Class	kg·m^2
0.75											90SA	6.2	3.6	1.8	0.00666
1.5						90SA	9.9	6.9	3.5	0.00666	90SB	12	6.9	3.5	0.00840
2.2	90SA	12	9.7	4.9	0.00666	90SB	14	10	5.0	0.00840	90MA	18	9.6	4.8	0.0120
3.7	90SB	20	16	8.0	0.00840	90MA	24	16	8.0	0.0120	90MB	31	15	7.5	0.0136
5.5	90MA	30	23	12	0.0120	90MB	36	24	12	0.0136	90MB	46	21	11	0.0124
7.5	90MB	41	30	15	0.0136	90MB	49	28	14	0.0124	132SB	62	27	14	0.0382
11	90MB	60	41	21	0.0124	132SB	72	41	21	0.0382	132SC	91	41	21	0.0448
15	132SB	82	56	28	0.0382	132SC	99	56	28	0.0448	132SC	125	56	28	0.0448
18.5	132SC	101	69	35	0.0448	132SC	122	67	34	0.0448	132MA	154	69	35	0.0610
22	132SC	120	80	40	0.0448	132MA	145	79	40	0.0610	132MB	183	79	40	0.0681
30	132MA	164	109	55	0.0610	132MB	198	110	55	0.0681	180SA	249	107	53	0.213
37	132MB	202	132	66	0.0681	180SA	244	138	68	0.213	180SB	307	131	65	0.256
45	180SA	246	153	78.5	0.213	180SB	296	163	81.5	0.256	180MA	374	160	79.5	0.306
55	180SB	300	200	98	0.256	180MA	362	198	99	0.306	180MB	457	190	98	0.345
75	180MA	409	263	129	0.306	180MB	494	253	125	0.345	180LA	623	259	128	0.442
90	180MB	491	296	155	0.345	180LA	593	320	150	0.442	180LB	747	300	157	0.520
110	180LA	600	368	184	0.442	180LB	725	368	184	0.520	250SA	913	384	192	1.15
132	180LB	720	–	230	0.520	250SA	869	–	230	1.15	250SB	1100	–	230	1.54
160	250SA	873	–	279	1.15	250SB	1050	–	280	1.54	250MA	1330	–	279	1.84
200	250SB	1090	–	349	1.54	250MA	1320	–	349	1.84	250LA	1660	–	349	2.16
250	250MA	1360	–	437	1.84	250LA	1650	–	436	2.16					
300	250LA	1640	–	524	2.16										

*: The full load currents of the motors are for the following motor input voltages. For other voltages, calculate the characteristics using the inverse proportion to the voltage.
· 200 V Class: 190 V, 400 V Class: 380 V

When used in combination with the U1000 Matrix Converter, the input voltage for the motor is assumed to be set to the following values. Select the U1000 so that its capacity is 1.12 times larger than the full load current value.
· 200 V Class: 170 V, 400 V Class: 340 V

Dimensions (unit: mm)

Frame No. 90SA to 132MB Foot-mounted type

Figure 1: Indoors (Totally-enclosed)

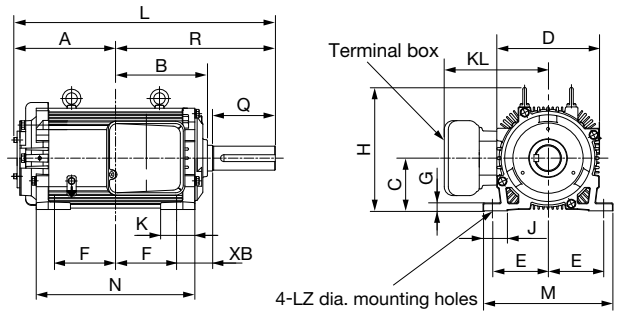


Figure 2: Indoors (Totally-enclosed fan-cooled)

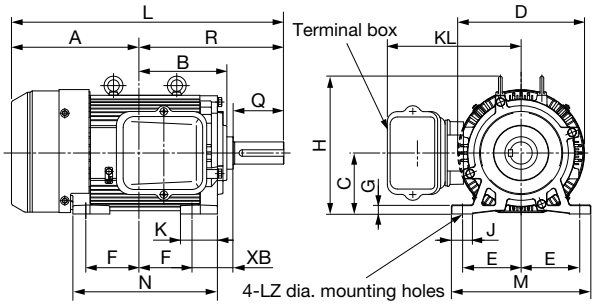


Figure 3: Outdoors (Totally-enclosed)

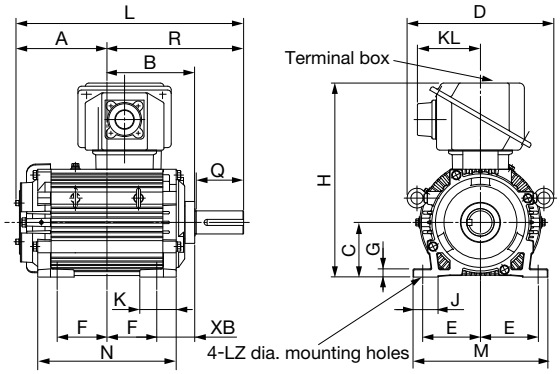
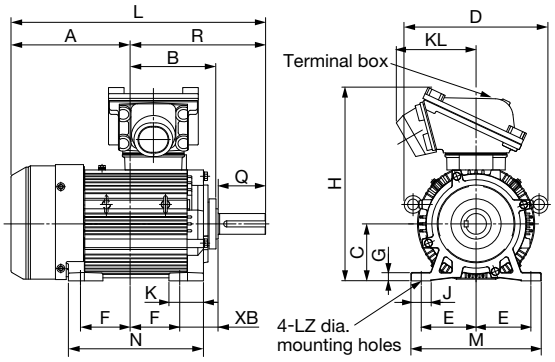
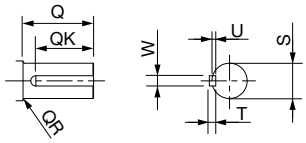


Figure 4: Outdoors (Totally-enclosed fan-cooled)



Note: For mounting motor with Frame No. 90SA to 132MB, use grade 12.9 bolts.
Use plain washers because the mounting surface is aluminum.

Shaft End Details



Note: The shaft end key is included.
(JIS B 1301-1996 normal-type keyway)

Drive Method	Output kW 1750 min⁻¹	Output kW 1450 min⁻¹	Output kW 1150 min⁻¹	Frame No.	Dimensions mm A	B Fig. 1	B Fig. 2	B Fig. 3	B Fig. 4	C $^{0}_{-0.5}$	D	E	F	G	H Fig. 1	H Fig. 2	H Fig. 3	H Fig. 4	J	K	KL Fig. 1	KL Fig. 2	KL Fig. 3	KL Fig. 4	L	M	N	R	XB	Z
Coupling or Belt Drive	2.2	1.5	0.75	90SA	151	136	–	144.5	–	90	195	95	82	12	211	–	320	–	40	60	178	–	104	–	356	220	228	205	63	12
	3.7	2.2	1.5	90SB	151	136	–	144.5	–	90	195	95	82	12	211	–	320	–	40	60	178	–	104	–	376	220	228	225	63	12
	5.5	3.7	2.2	90MA	176	161	–	169.5	–	90	195	95	107	12	211	–	320	–	40	60	178	–	104	–	426	220	278	250	63	12
	7.5	5.5	3.7	90MB	176	161	–	169.5	–	90	195	95	107	12	211	–	320	–	40	60	178	–	104	–	426	220	278	250	63	12
	11	7.5	5.5	90MB	240	–	161	–	169.5	90	212	95	107	12	–	211	–	320	40	60	–	178	–	104	520	220	278	280	63	12
	15	11	7.5	132SB	276	–	190.5	–	199	132	275	127	115	18	–	299	–	448	45	80	–	290	–	185	590	300	313	314	89	14.5
	18.5/22	15/18.5	11/15	132SC	276	–	190.5	–	199	132	275	127	115	18	–	299	–	448	45	80	–	290	–	185	590	300	313	314	89	14.5
	30	22	18.5	132MA	321	–	235.5	–	244	132	275	127	160	18	–	299	–	448	45	80	–	290	–	185	680	300	403	359	89	14.5
	37	30	22	132MB	321	–	235.5	–	244	132	275	127	160	18	–	299	–	448	45	80	–	290	–	185	710	300	403	389	89	14.5

Drive Method	Output kW 1750 min⁻¹	Output kW 1450 min⁻¹	Output kW 1150 min⁻¹	Frame No.	Shaft End Dimensions mm Q	QK	QR	S	T	U	W	Approx. Mass kg Fig. 1	Fig. 2	Fig. 3	Fig. 4	Allowable Radial Shaft Load* N
Coupling or Belt Drive	2.2	1.5	0.75	90SA	60	45	0.5	$28^{+0.009}_{+0.004}$	7	4	8	27	–	30	–	3,220
	3.7	2.2	1.5	90SB	80	60	0.5		8	5	10	30	–	33	–	3,120
	5.5	3.7	2.2	90MA	80	60	0.5	$38^{+0.018}_{+0.002}$	8	5	10	36	–	39	–	3,190
	7.5	5.5	3.7	90MB	80	60	0.5		8	5	10	39	–	42	–	3,180
	11	7.5	5.5	90MB	110	90	0.5	$42^{+0.018}_{+0.002}$	8	5	12	–	36	–	39	3,090
	15	11	7.5	132SB	110	90	2	$42^{+0.018}_{+0.002}$	8	5	12	–	67	–	75	5,900
	18.5/22	15/18.5	11/15	132SC	110	90	2	$48^{+0.018}_{+0.002}$	9	5.5	14	–	76	–	84	5,950
	30	22	18.5	132MA	110	90	2	$55^{+0.030}_{+0.011}$	10	6	16	–	96	–	104	6,070
	37	30	22	132MB	140	120	3	$60^{+0.030}_{+0.011}$	11	7	18	–	105	–	113	5,900

∗ : The allowable value is given when only a radial load is applied. Inquire if a thrust load will be applied at the same time.
It is assumed that the load point is in the middle of shaft dimension Q.

Frame No. 90SA to 132MB Flange type

Figure 1: Indoors (Totally-enclosed)

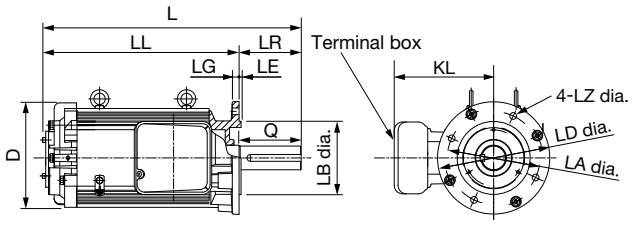


Figure 2: Indoors (Totally-enclosed fan-cooled)

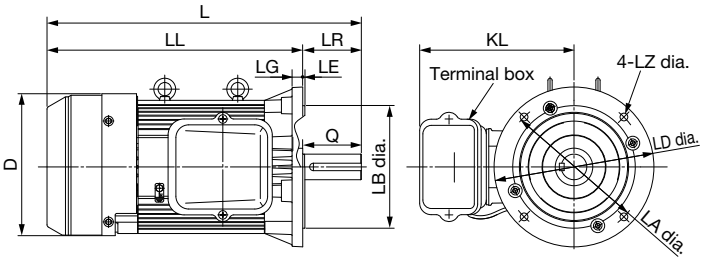


Figure 3: Outdoors (Totally-enclosed)

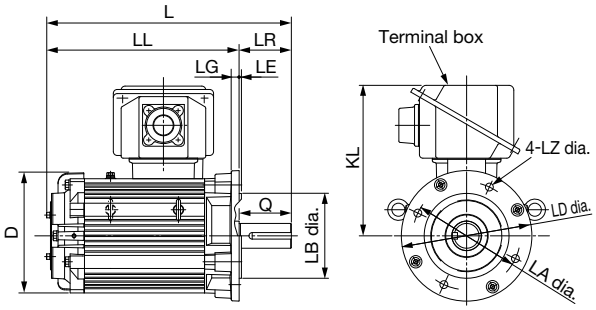
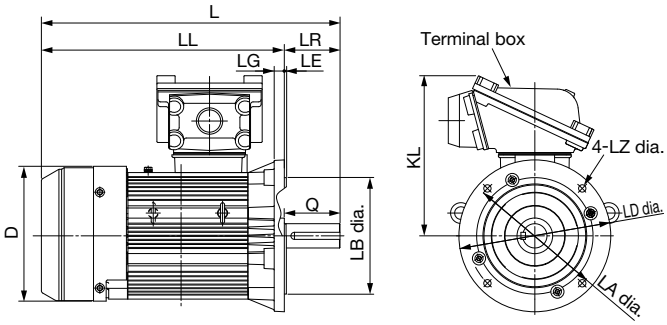
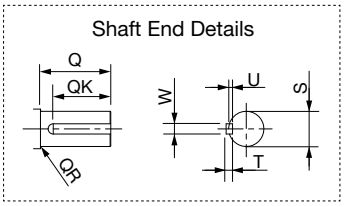


Figure 4: Outdoors (Totally-enclosed fan-cooled)



Note: For mounting motor with Frame No. 90SA to 132MB, use grade 12.9 bolts.
Use plain washers because the mounting surface is aluminum.



Note: The shaft end key is included.
(JIS B 1301-1996 normal-type keyway)

Drive Method	Output kW			Frame No.	Dimensions mm													
	1750 min^{-1}	1450 min^{-1}	1150 min^{-1}		D	L	LL	LR	LG	LE	LB	LA	LD	LZ	KL Fig. 1	KL Fig. 2	KL Fig. 3	KL Fig. 4
Coupling or Belt Drive	2.2	1.5	0.75	90SA	187.5	356	296	60	12	3.5	$130^{+0.014}_{-0.011}$	165	200	12	178	–	231	–
	3.7	2.2	1.5	90SB	187.5	376	296	80	12	3.5		165	200	12	178	–	231	–
	5.5	3.7	2.2	90MA	187.5	426	346	80	12	3.5		165	200	12	178	–	231	–
	7.5	5.5	3.7	90MB	187.5	426	346	80	12	3.5		165	200	12	178	–	231	–
	11	7.5	5.5	90MB	197	520	410	110	12	3.5		165	200	12	–	178	–	231
	15	11	7.5	132SB	275	590	480	110	20	4	$230^{+0.016}_{-0.013}$	265	300	14.5	–	290	–	317
	18.5/22	15/18.5	11/15	132SC	275	590	480	110	20	4		265	300	14.5	–	290	–	317
	30	22	18.5	132MA	275	680	570	110	20	4		265	300	14.5	–	290	–	317
	37	30	22	132MB	275	710	570	140	20	4		265	300	14.5	–	290	–	317

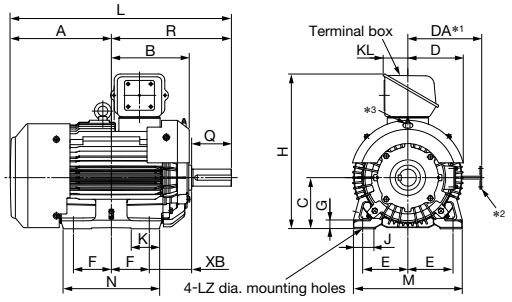
Drive Method	Output kW			Frame No.	Shaft End Dimensions mm							Approx. Mass kg				Allowable Radial Shaft Load* N
	1750 min^{-1}	1450 min^{-1}	1150 min^{-1}		Q	QK	QR	S	T	U	W	Fig. 1	Fig. 2	Fig. 3	Fig. 4	
Coupling or Belt Drive	2.2	1.5	0.75	90SA	60	45	0.5	$28^{+0.009}_{-0.004}$	7	4	8	26	–	29	–	3,220
	3.7	2.2	1.5	90SB	80	60	0.5	$38^{+0.018}_{+0.002}$	8	5	10	29	–	32	–	3,120
	5.5	3.7	2.2	90MA	80	60	0.5		8	5	10	36	–	39	–	3,190
	7.5	5.5	3.7	90MB	80	60	0.5		8	5	10	39	–	42	–	3,180
	11	7.5	5.5	90MB	110	90	0.5	$42^{+0.018}_{+0.002}$	8	5	12	–	36	–	39	3,090
	15	11	7.5	132SB	110	90	2	$42^{+0.018}_{+0.002}$	8	5	12	–	67	–	75	5,900
	18.5/22	15/18.5	11/15	132SC	110	90	2	$48^{+0.018}_{+0.002}$	9	5.5	14	–	76	–	84	5,950
	30	22	18.5	132MA	110	90	2	$55^{+0.030}_{+0.011}$	10	6	16	–	96	–	104	6,070
	37	30	22	132MB	140	120	3	$60^{+0.030}_{+0.011}$	11	7	18	–	105	–	113	5,900

∗ : The allowable value is given when only a radial load is applied. Inquire if a thrust load will be applied at the same time.
It is assumed that the load point is in the middle of shaft dimension Q.

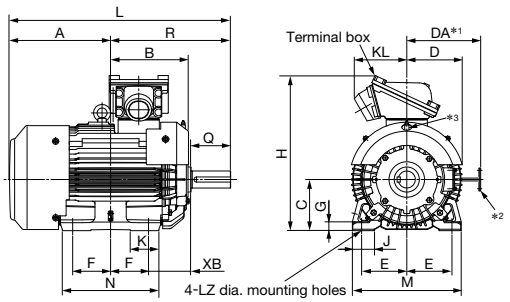
Dimensions (unit: mm)

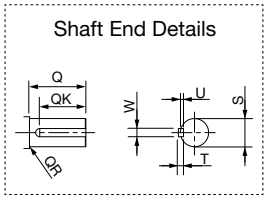
Frame No. 180SA to 250LA Foot-mounted type

● Figure 1: Indoors (Totally-enclosed fan-cooled)



● Figure 2: Outdoors (Totally-enclosed fan-cooled)





Note: The shaft end key is included. (JIS B 1301-1996 normal-type keyway)

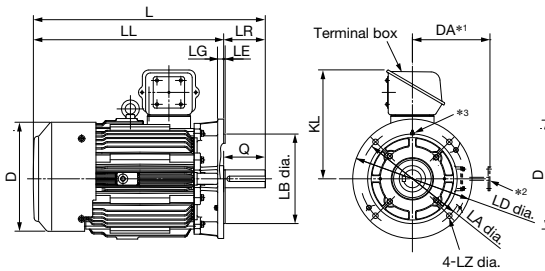
∗1: Required dimensions at grease exhaust ∗2: Grease exhaust bar ∗3: Grease inlet
Note: There is no air guide on the drive end of Frame No. 180.

Drive Method	Output kW 1750 min⁻¹	1450 min⁻¹	1150 min⁻¹	Frame No.	Dimensions mm A	B Fig. 1	B Fig. 2	C $^{0}_{-0.5}$	D	DA	E	F	G	H Fig. 1	H Fig. 2	J	K	KL Fig. 1	KL Fig. 2	L	M	N	R	XB	Z	Shaft End Dimensions mm Q	QK	QR	S	T	U	W	Approx. Mass kg Fig. 1	Fig. 2	Allowable Radial Shaft Load* N
Coupling or Belt Drive	45	37	30	180SA	355.5	275	281	180	195	260	159	133.5	28	545	547	75	100	88	185	778	380	340	422.5	149	24	140	120	3	$60^{+0.030}_{+0.011}$	11	7	18	240	249	9,220
	55	45	37	180SB	355.5	275	281	180	195	260	159	133.5	28	545	547	75	100	88	185	778	380	340	422.5	149	24	140	120	1	$65^{+0.030}_{+0.011}$	11	7	18	250	259	
	75	55	45	180MA	395	314	320	180	195	260	159	173	28	545	547	75	100	88	185	857	380	419	462	149	24	140	110	1	$75^{+0.030}_{+0.011}$	12	7.5	20	290	299	12,100
	90	75	55	180MB	395	314	320	180	195	260	159	173	28	545	547	75	100	88	185	857	380	419	462	149	24	140	110	1		12	7.5	20	300	309	
	110	90	75	180LA	475	394	400	180	195	260	159	253	28	610	613	75	100	280	230	1047	380	579	572	149	24	170	140	1.2	$85^{+0.035}_{+0.013}$	14	9	22	400	415	14,400
	132	110	90	180LB	475	394	400	180	195	260	159	253	28	610	613	75	100	280	230	1047	380	579	572	149	24	170	140	1.2		14	9	22	420	435	
	160	132	110	250SA	526	372	376.5	250	266	400	228.5	209.5	28	750	753	110	130	280	230	1073.5	560	500	547.5	168	24	170	140	1.2	$95^{+0.035}_{+0.013}$	14	9	25	610	625	20,400
	200	160	132	250SB	526	372	376.5	250	266	400	228.5	209.5	28	750	753	110	130	280	230	1073.5	560	500	547.5	168	24	170	140	1.2		14	9	25	690	705	
	250	200	160	250MA	597	391	395.5	250	266	400	228.5	228.5	28	750	770	110	130	280	359	1163.5	560	538	566.5	168	24	170	140	1.2	$105^{+0.035}_{+0.013}$	16	10	28	790	805	23,500
	300	250	200	250LA	687	391	395.5	250	266	400	228.5	228.5	28	750	770	110	130	280	359	1253.5	560	538	566.5	168	24	170	140	1.2		16	10	28	890	905	28,300

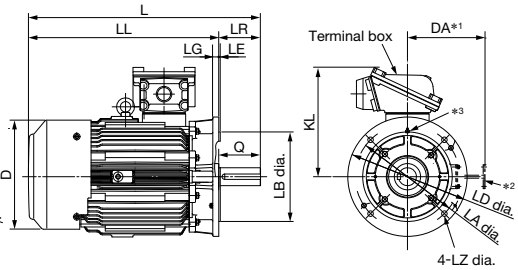
∗: The allowable value is given when only a radial load is applied. Inquire if a thrust load will be applied at the same time.
It is assumed that the load point is in the middle of shaft dimension Q.

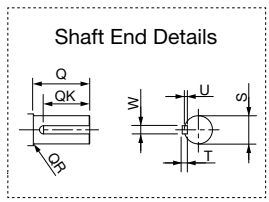
Frame No. 180SA to 180MA Flange type

● Figure 1: Indoors (Totally-enclosed fan-cooled)



● Figure 2: Outdoors (Totally-enclosed fan-cooled)





Note: The shaft end key is included. (JIS B 1301-1996 normal-type keyway)

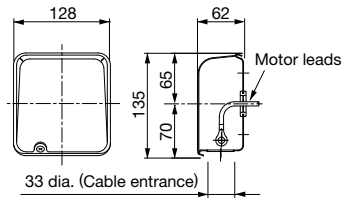
∗1: Required dimensions at grease exhaust ∗2: Grease exhaust bar ∗3: Grease inlet

Drive Method	Output kW 1750 min⁻¹	1450 min⁻¹	1150 min⁻¹	Frame No.	Dimensions mm D	L	LL	LR	LG	LE	LB	LA	LD	LZ	KL Fig. 1	KL Fig. 2	DA	Shaft End Dimensions mm Q	QK	QR	S	T	U	W	Approx. Mass kg Fig. 1	Fig. 2	Allowable Radial Shaft Load* N
Coupling or Belt Drive	45	37	30	180SA	404	778	638	140	20	5	$300^{+0.016}_{-0.016}$	350	400	18.5	365	367	260	140	120	3	$60^{+0.030}_{+0.011}$	11	7	18	250	259	9,220
	55	45	37	180SB	404	778	638	140	20	5		350	400	18.5	365	367	260	140	120	1	$65^{+0.030}_{+0.011}$	11	7	18	260	269	
	75	55	45	180MA	404	857	717	140	20	5		350	400	18.5	365	367	260	140	110	1	$75^{+0.030}_{+0.011}$	12	7.5	20	300	309	12,100

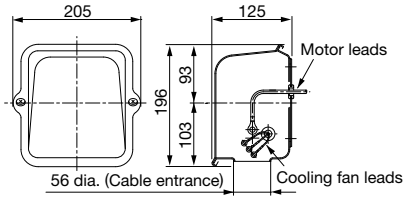
∗ : The allowable value is given when only a radial load is applied. Inquire if a thrust load will be applied at the same time.
It is assumed that the load point is in the middle of shaft dimension Q.

Dimensions of Terminal Boxes

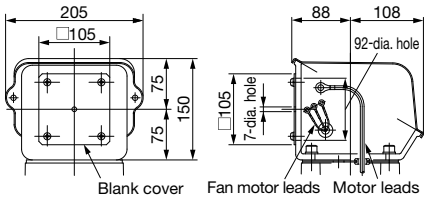
● Figure 1
(Frame No. 90: Indoors)



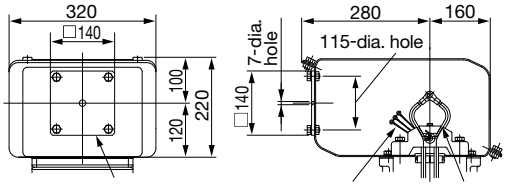
● Figure 2
(Frame No. 132: Indoors)



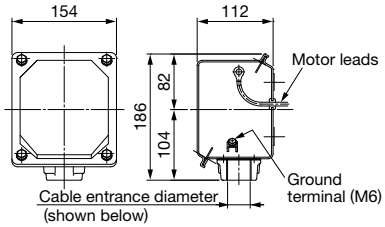
● Figure 3
(Frame No. 180SA to 180MB: Indoors)



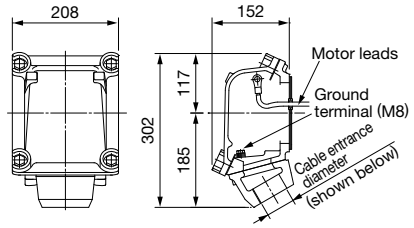
● Figure 4
(Frame No. 180LA to 250LA: Indoors)



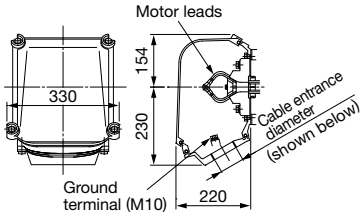
● Figure 5
(Frame No. 90SA to 90MB: Outdoors)



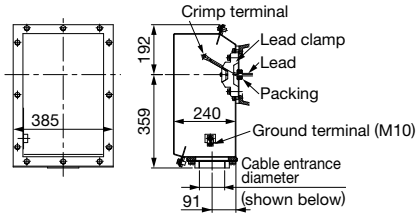
● Figure 6
(Frame No. 132SA to 180MB: Outdoors)



● Figure 7
(Frame No. 180LA to 250SB: Outdoors)



● Figure 8
(Frame No. 250MA to 250LA: Outdoors)



Note: 1 The standard direction for the terminal cable entrance is opposite the drive end (for figures 1 and 2) and left (for figures 3 to 8).
2 For figures 3 and 4, change the hole size in the middle of the cover to match the connecting conduit tube.

● Cable Entrance Diameter (Outdoors, 200 V Class)

Output kW			Frame No.	Terminal Box Figure	Cable Entrance Diameter mm
1750 min^{-1}	1450 min^{-1}	1150 min^{-1}			
2.2	1.5	0.75	90SA	5	PF1-1/4
3.7	2.2	1.5	90SB		
5.5	3.7	2.2	90MA		
7.5	5.5	3.7	90MB		
11	7.5	5.5	90MB		
15	11	7.5	132SB	6	PF2
18.5/22	15/18.5	11/15	132SC		
30	22	18.5	132MA		
37	30	22	132MB		
45	37	30	180SA		PF2-1/2
55	45	37	180SB		
75	55	45	180MA		PF3
90	75	55	180MB		
110	90	75	180LA	7	PF4
–	110	90	180LB		
–	–	110	250SA		

● Cable Entrance Diameter (Outdoors, 400 V Class)

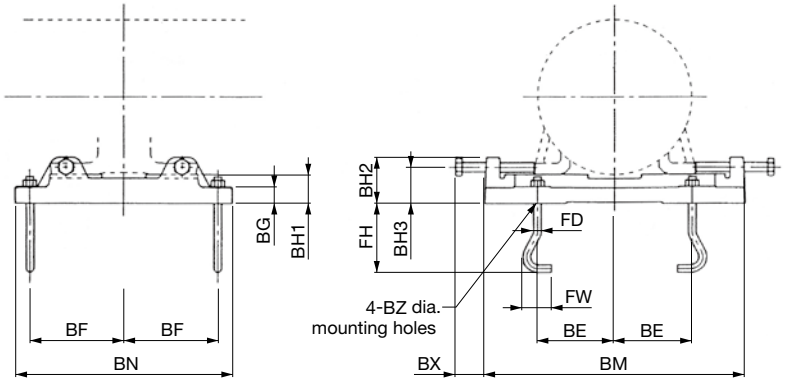
Output kW			Frame No.	Terminal Box Figure	Cable Entrance Diameter mm
1750 min^{-1}	1450 min^{-1}	1150 min^{-1}			
2.2	1.5	0.75	90SA	5	PF1-1/4
3.7	2.2	1.5	90SB		
5.5	3.7	2.2	90MA		
7.5	5.5	3.7	90MB		
11	7.5	5.5	90MB		
15	11	7.5	132SB	6	PF2
18.5/22	15/18.5	11/15	132SC		
30	22	18.5	132MA		
37	30	22	132MB		
45	37	30	180SA		PF2-1/2
55	45	37	180SB		
75	55	45	180MA		
90	75	55	180MB		
110	90	75	180LA	7	
132	110	90	180LB		
160	132	110	250SA		PF3
200	160	132	250SB		PF4
250	200	160	250MA	8	
300	250	200	250LA		

Bearing Types

Drive Method	Frame No.	Drive End	Opposite Drive End
Coupling or Belt Drive	90 to 132	Ball bearing (sealed)	Ball bearing (sealed)
	180	Cylindrical roller bearing (regreasable)	Ball bearing (sealed)
	250	Cylindrical roller bearing (regreasable)	Ball bearing (regreasable)

Motor Options

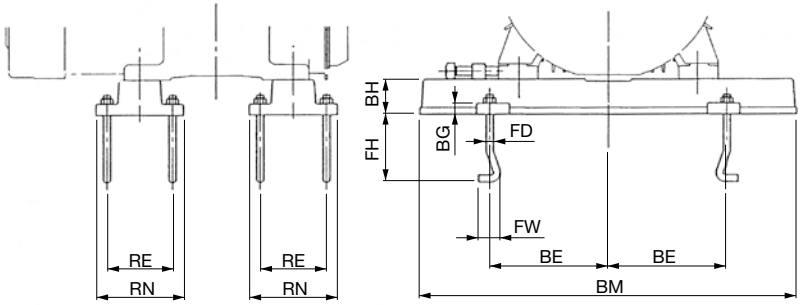
Slide Bases (For Belt Drive)



Slide Base No.	Applicable Motor Frame No.	Dimensions mm													Motor Movement Distance	Approx. Slide Base Mass
		BE	BF	BG	BH1	BH2	BH3	BM	BN	BX	BZ	FD	FH	FW	mm	kg
SB-90SES	90SA to 90SB	110	122.5	20	40	58	48	342	285	5 to 65	13	10	90	40	60	15
SB-90MES	90MA to 90MB	110	147.5	20	40	58	48	342	335	5 to 65	13	10	90	40	60	16
SB-132SES	132SA to 132SC	140	173.5	35	55	85	68	480	402	18 to 103	15	12	110	50	85	33
SB-132MES	132MA to 132MB	140	217.5	35	55	85	68	480	490	18 to 103	15	12	110	50	85	36

Note: Coating Color: Munsell 6.0 PB 3.9/11.0

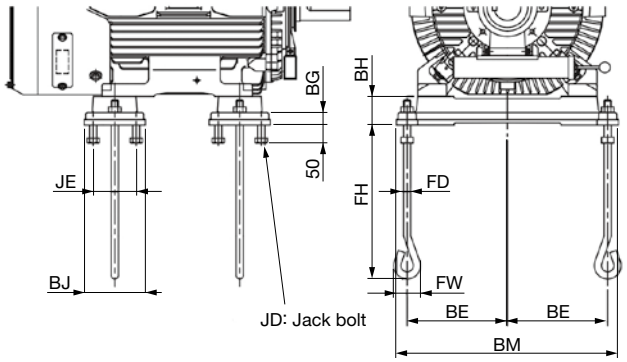
Slide Rails (For Belt Drive)



Slide Rail No.	Applicable Motor Frame No.	Dimensions mm									Motor Movement Distance	Approx. Slide Rail Mass
		BE	BH	BM	BG	FD	FH	FW	RE	RN	mm	kg
R-65SS	180	180	70	650	25	16	150	50	120	170	560-M	56
R-86AB	250 SA to 250 LA	270	80	860	25	16	155	50	150	200	755-M	70

Note: Coating Color: R-65SS : Munsell 6.0 PB 3.9/11.0
R-86AB : Munsell 7.5 BG 4/1.5

Sole Plate (Coupling)

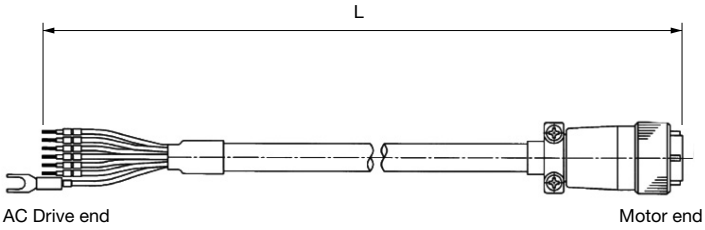


Sole Plate No.	Applicable Motor Frame No.	Dimensions mm										Approx. Mass kg
		BE	BG	BH	BJ	BM	FD	FH	FW	JD	JE	
B-67AC	250	305	35	80	170	670	20	430	75	M20	120	35
B-73AC	315	335	35	90	170	730	20	430	75	M20	120	45
B-88AC	355	400	45	90	190	880	24	560	100	M24	140	60

Electrolytic Corrosion Countermeasures

Contact your Yaskawa representative for an estimate on insulating bearings and grounding brushes.

Resolver Cables

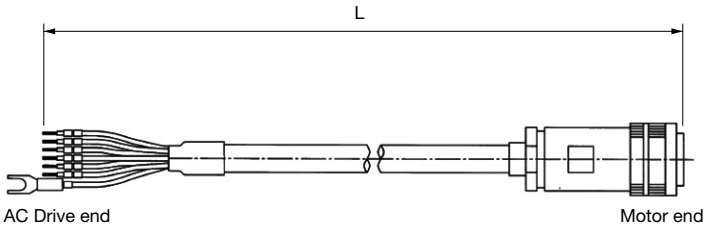


Applicable AC Drive
A1000*

*: You can also connect to the U1000 and GA700.

Motor Models	Name	Code Number	Length L (m)
EST4-□□□□□□R (Motor with an encoder code of R)	Resolver Cables	SS7RSC-010-E	10
		SS7RSC-030-E	30
		SS7RSC-050-E	50
		SS7RSC-100-E	100

Encoder Cables



Applicable AC Drive
A1000*

*: You can also connect to the U1000 and GA700.

Motor Models	Name	Code Number	Length L (m)
EST4-□□□□□□A (Motor with an encoder code of A)	Encoder Cables	72616-W5501	10
		72616-W5502	30
		72616-W5503	50
		72616-W5504	100

AC Drive Option: PG Card

An AC Drive option must be prepared to operate with a sensor.

Motor Models	Encoder Type	AC Drive Option: PG Card		
		Name	Code Number	Remarks
EST4-□□□□□□R (Motor with an encoder code of R)	Resolver: TS2640N1511E64 manufactured by Tamagawa Seiki Co. Ltd. (or product with equivalent electrical characteristics)	Resolver Interface	PG-RT3	・Excitation voltage: 7 Vrms AC, 10 kHz ・Transformer ratio [K]: 0.5 ±5% ・Input current: 100 mArms Note: This Card cannot be used for the CIMR-A□4A0930 or CIMR-A□4A1200.
EST4-□□□□□□A (Motor with an encoder code of A)	Optical encoder: LMA-102.4BM-S324C manufactured by HEIDENHAIN	Line-driver PG Interface	PG-X3	・Phase A, B, and Z pulse (differential pulse) inputs ・Maximum input frequency: 300 kHz ・Power supply output for PG: 12 VDC, Maximum current: 200 mA

(1) Applying a V-Belt and V-Pulley

If the motor is coupled to the machine with a V-belt, the V-belt tension and usage of V-pulleys greatly affects the motor shaft strength and bearing service life.

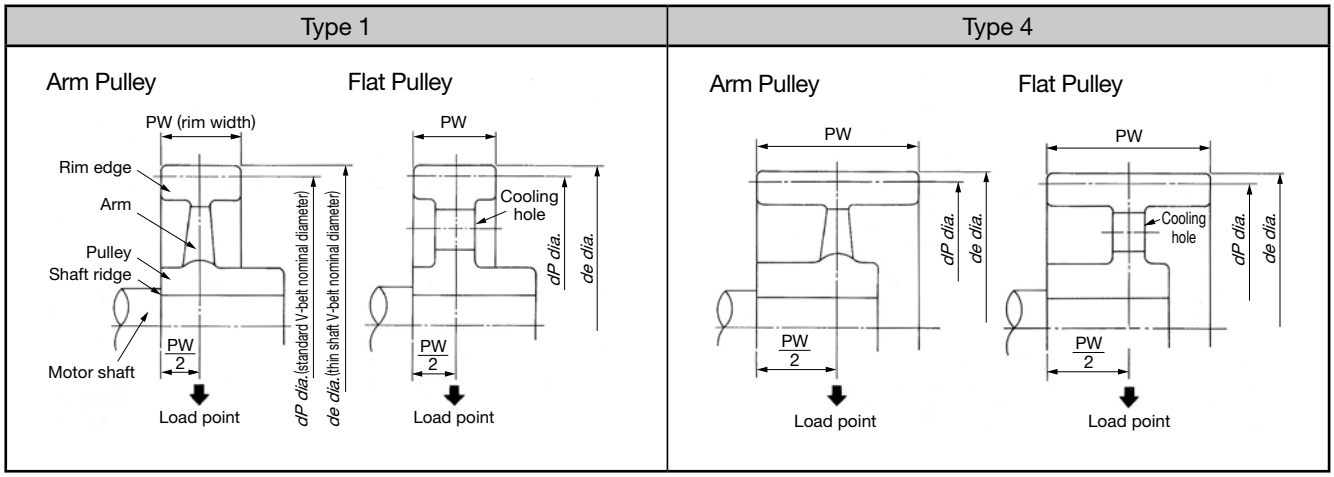
- If the V-belt is loose, increased V-belt slipping will reduce the mechanical efficiency of power transmission and belt vibration will lead to bearing damage.
- If the V-belt is too tight, an excessive load will be placed on the shaft, leading to shaft damage, bearing burning, reduced V-belt service life, etc.

If you plan to use a V-belt and V-pulleys, refer to table labeled V-Belt and V-Pulley Application and Tension Loads on the next page and set up the system within the specified ranges. A special design may be required for applications outside of the specified ranges. Inquire if you need to exceed these ranges.

Installing V-Pulleys

1 Normally arm pulleys are used as the V-pulleys for motors so as not to interfere with air cooling of the motors. If you use a flat pulley, create as large of an air hole as possible as shown in the following diagrams.

2 When you attach the V-pulley to the motor, the shaft load point resulting from V-pulley tension must be placed as close to the motor as possible to minimize the load on the motor shaft ridge and bearings. Therefore, attach the V-pulley so that the edge of the V-pulley rim is at the ridge on the shaft as shown in the following diagrams.



Tightening the V-Belt

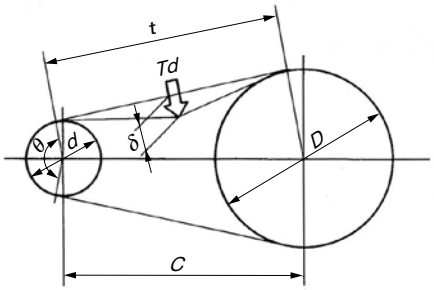
V-belt tension loading is used to achieve a suitable V-belt tension. Suitable tension must be applied to the V-belt as described below.

Use the following formula to calculate the distance between contact points for the belt and V-belt pulley: $t = \sqrt{C^2 - \left(\frac{D-d}{2}\right)^2}$

Find the center of t and apply a vertical load on the V-belt at that center point. Find the tension load Td (N/belt) that will produce a slack δ with the following value.

$\delta = 0.016 \times t$ (mm) (See diagram at right.)

[For example, if the belt contact distance is 1 m, the slack would be 0.016 × 1,000 = 16 mm.]



δ : Slack (mm)
θ : Contact angle (degrees)
D : Large V-pulley diameter (mm)
d : Small V-pulley diameter (mm)
C : Distance between shafts (mm)
Td : Tension load (N/belt)

Adjust the belt tension so that the average vertical load for all of the belts is within the tension load Td range given in the table below.

If more than one V-belt is used, used a matched set with the same belt circumferences.
Use a V-belt-V-pulley contact angle of 140˚ or greater.
The tension loads (Td) given in the following table are for a V-belt-V-pulley contact angle of 140˚ or greater.
If a different contact angle is used, reduce the tension load with the following correction factor.

$Td\,\theta = K\theta \times Td$

Contact angle θ	140˚	150˚	190˚	170˚	180˚
Correction factor K θ	1.0	0.98	0.94	0.91	0.90

Where, Td θ : V-belt tension load after contact angle correction
Td : V-belt tension load at contact angle of 140˚ (from following table)
K θ : Contact angle correction factor for tension load

V-Belt and V-Pulley Application and Tension Loads

(Contact angle: 140°, Speed ratio: 2.04)

Output	Motor Speed	Standard V-Belts							Narrow V-Belts						
		Pulley Dimensions mm		Belts		Belt Load	Belt Tension Load *Td* (N/belt)		Pulley Dimensions mm		Belts		Belt Load	Belt Tension Load *Td* (N/belt)	
		Min.	Max.	Type	Qty	Point	When	When	Min.	Max.	Type	Qty	Point	When	When
kW	min^{-1}	pitch dia.	width			mm	replacing	readjusting	pitch dia.	width			mm	replacing	readjusting
2.2	1150	100	50	A	3	25	11.8 to 12.7	8.8 to 11.8	90	27.7	3V	2	13.9	18.6 to 20.6	14.7 to 18.6
	1450	100	35	A	2	17.5	13.7 to 15.7	10.8 to 13.7	75	27.7	3V	2	13.9	17.6 to 20.6	13.7 to 17.6
	1750	90	35	A	2	17.5	11.8 to 13.7	8.8 to 11.8	75	27.7	3V	2	13.9	14.7 to 17.6	11.8 to 14.7
3.7	1150	125	63	B	3	31.5	15.7 to 17.6	12.7 to 15.7	100	38	3V	3	19	18.6 to 21.6	14.7 to 18.6
	1450	112	50	A	3	25	13.7 to 15.7	10.8 to 13.7	100	27.7	3V	2	13.9	22.5 to 25.5	17.6 to 22.5
	1750	112	50	A	3	25	11.8 to 13.7	9.8 to 11.8	100	27.7	3V	2	13.9	18.6 to 21.6	14.7 to 18.6
5.5	1150	150	63	B	3	31.5	19.6 to 21.6	14.7 to 19.6	140	38	3V	3	19	19.6 to 22.5	15.7 to 19.6
	1450	125	63	B	3	31.5	18.6 to 21.6	14.7 to 18.6	100	38	3V	3	19	21.6 to 25.5	16.7 to 21.6
	1750	125	63	B	3	31.5	16.7 to 18.6	12.7 to 16.7	100	38	3V	3	19	18.6 to 21.6	14.7 to 18.6
7.5	1150	150	82	B	4	41	19.6 to 22.5	15.7 to 19.6	140	48.3	3V	4	24.1	20.6 to 23.5	15.7 to 20.6
	1450	150	63	B	3	31.5	21.6 to 24.5	16.7 to 21.6	125	38	3V	3	19	23.5 to 27.4	18.6 to 23.5
	1750	150	63	B	3	31.5	19.6 to 22.5	14.7 to 19.6	125	38	3V	3	19	20.6 to 23.5	15.7 to 20.6
11	1150	170	101	B	5	50.5	20.2 to 23.5	15.7 to 20.2	140	58.6	3V	5	29.3	23.5 to 26.5	18.6 to 23.5
	1450	160	82	B	4	41	22.5 to 25.5	17.6 to 22.5	125	48.3	3V	4	24.1	26.5 to 30.4	20.6 to 26.5
	1750	160	82	B	4	41	20.6 to 23.5	15.7 to 20.6	125	48.3	3V	4	24.1	22.5 to 25.5	17.6 to 22.5
15	1150	224	101	B	5	50.5	22.5 to 25.5	17.6 to 22.5	160	68.9	3V	6	34.4	23.5 to 26.5	18.6 to 23.5
	1450	170	101	B	5	50.5	23.5 to 26.5	17.6 to 23.5	125	68.9	3V	6	34.4	23.5 to 27.4	18.6 to 23.5
	1750	170	101	B	5	50.5	21.6 to 24.5	16.7 to 21.6	125	68.9	3V	6	34.4	20.6 to 23.5	15.7 to 20.6
18.5	1150	224	110.5	C	4	55.2	35.3 to 40.2	27.4 to 35.3	180	60.4	5V	3	30.2	52.9 to 59.8	41.2 to 52.9
	1450	200	101	B	5	50.5	25.5 to 28.4	19.6 to 25.5	140	68.9	3V	6	34.4	26.5 to 30.4	20.6 to 26.5
	1750	200	101	B	5	50.5	23.5 to 26.5	18.6 to 23.5	140	68.5	3V	6	34.2	22.5 to 25.5	17.6 to 22.5
22	1150	224	136	C	5	68	34.3 to 39.2	26.5 to 34.3	180	77.9	5V	4	38.9	47.0 to 53.9	37.2 to 47.0
	1450	224	101	B	5	50.5	27.4 to 31.4	21.6 to 27.4	160	68.9	3V	6	34.4	27.4 to 31.4	21.6 to 27.4
	1750	224	101	B	5	50.5	25.5 to 29.4	19.6 to 25.5	160	68.9	3V	6	34.4	23.5 to 27.4	18.6 to 23.5
30	1150	265	136	C	5	68	40.2 to 46.1	31.4 to 40.2	224	77.9	5V	4	38.9	51.9 to 59.8	41.2 to 51.9
	1450	224	136	C	5	68	39.2 to 45.1	30.4 to 39.2	180	77.9	5V	4	38.9	51.9 to 59.8	41.2 to 51.9
	1750	224	136	C	5	68	38.2 to 44.1	30.4 to 38.2	180	77.9	5V	4	38.9	46.1 to 51.9	36.3 to 46.1
37	1150	265	161.5	C	6	80.7	41.2 to 47.0	32.3 to 41.2	224	77.9	5V	4	38.9	62.7 to 72.5	49.0 to 62.7
	1450	224	161.5	C	6	80.7	40.2 to 46.1	31.4 to 40.2	200	77.9	5V	4	38.9	57.8 to 66.6	45.1 to 57.8
	1750	224	161.5	C	6	80.7	39.2 to 45.1	30.4 to 39.2	200	77.9	5V	4	38.9	51.0 to 57.8	40.2 to 51.0
45	1150	280	187	C	7	93.5	41.2 to 48.0	32.3 to 41.2	224	95.4	5V	5	47.7	61.7 to 70.6	48.0 to 61.7
	1450	265	161.5	C	6	80.7	44.1 to 51.0	34.3 to 44.1	224	77.9	5V	4	38.9	62.7 to 72.5	49.0 to 62.7
	1750	265	161.5	C	6	80.7	44.1 to 51.0	34.3 to 44.1	224	77.9	5V	4	38.9	55.9 to 63.7	43.1 to 55.9
55	1150	300	212.5	C	8	106.2	43.1 to 49.0	33.3 to 43.1	250	112.9	5V	6	56.4	56.8 to 65.7	45.1 to 56.8
	1450	265	187	C	7	93.5	46.1 to 52.9	46.1 to 52.9	224	95.4	5V	5	47.7	61.7 to 70.6	48.0 to 61.7
	1750	265	187	C	7	93.5	46.1 to 52.9	46.1 to 52.9	224	95.4	5V	5	47.7	54.9 to 62.7	43.1 to 54.9
75	1150	355	233	D	6	116.5	76.4 to 87.2	59.8 to 76.4	315	112.9	5V	6	56.4	63.7 to 72.5	50.0 to 63.7
	1450	315	212.5	C	8	106.2	51.0 to 58.8	39.2 to 51.0	250	112.9	5V	6	56.4	63.7 to 73.5	50.0 to 63.7
	1750	315	212.5	C	8	106.2	52.9 to 60.8	41.2 to 52.9	250	112.9	5V	6	56.4	56.8 to 65.7	45.1 to 56.8
90	1150	-	-	-	-	-	-	-	355	95.4	5V	5	47.7	82.2 to 94.3	63.9 to 82.2
	1450	-	-	-	-	-	-	-	280	112.9	5V	6	56.4	70.4 to 80.7	54.8 to 70.4
	1750	-	-	-	-	-	-	-	280	95.4	5V	5	47.7	73 to 83.8	56.9 to 73
110	1150	400	270	D	7	135	88.2 to 101.2	68.7 to 88.2	355	130.4	5V	7	65.2	73 to 83.7	56.9 to 73
	1450	-	-	-	-	-	-	-	315	112.9	5V	6	56.4	77.4 to 88.8	60.2 to 77.4
	1750	-	-	-	-	-	-	-	315	112.9	5V	6	56.4	69.9 to 80.2	54.5 to 69.9
132	1150	475	270	D	7	135	100.5 to 115.4	78.1 to 100.5	400	123.8	8V	4	61.9	145.1 to 166.5	113.1 to 145.1
	1450	-	-	-	-	-	-	-	355	130.4	5V	7	65.2	73.9 to 84.8	57.5 to 73.9
	1750	-	-	-	-	-	-	-	315	130.4	5V	7	65.2	71.4 to 82	55.7 to 71.4
160	1150	-							450	123.8	8V	4	61.9	159.9 to 183.5	124.4 to 159.9
	1450	-							355	147.9	5V	8	73.9	77.5 to 89	60.3 to 77.5
	1750	-							315	147.9	5V	8	73.9	74.9 to 85.9	58.3 to 74.9
200	1150	-							450	152.4	8V	6	76.2	159.9 to 183.5	124.4 to 159.9
	1450	-							450	147.9	5V	8	73.9	83.1 to 95.4	64.6 to 83.1
	1750	-							355	165.4	5V	9	82.7	77.3 to 88.7	60.2 to 77.3
250	1150	-							-						
	1450	-							450	182.9	5V	10	91.4	83.1 to 95.4	81.4 to 93.4
	1750	-							400	182.9	5V	10	91.4	64.6 to 83.1	63.3 to 81.4

Note: Inquire about the blank table cells.

(2) Calculating the Motor Rated Output

The following formulas illustrate how to find the required power for different applications.

General Formula

$$P = \frac{T \cdot N}{974} \text{ (kW)}$$

P : Required power (kW)
T : Required torque [kg·m (N·m/9.8)]
N : Motor speed (min^{-1})

Pump

$$P = \frac{\gamma \cdot Q \cdot H}{6.12\eta} \text{ (kW)}$$

γ : Liquid specific gravity (kg/ℓ)
Q : Pump discharge volume (m^3/min)
H : Lifting height (m)
η : Pump efficiency*

* : Although it depends on the model, the value is approximately 0.6.

You can use Figure 1 to find the approximate required output if the liquid is water.

Example: If the liquid is water, the discharge volume is 3 m^3/min, and the total lifting height is 10 m, a 7.5-kW motor would be required for the pump.

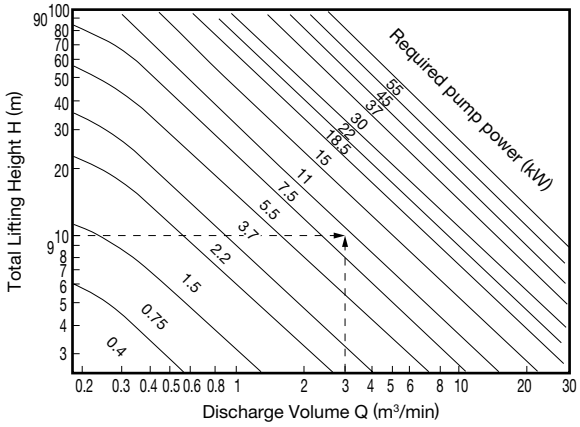


Fig.1 Diagram to Find Approximate Required Output from Lifting Height and Discharge Volume (Liquid: Water)

Note: The pump discharge volume Q is proportional to the motor speed and the total lifting height H is proportional to the square of the motor speed. Therefore, the pump output P is proportional to the cube of the motor speed.

Fans and Blowers

$$P = \frac{Q \cdot H}{6120\eta} \cdot k \text{ (kW)}$$

Q : Air flow (m^3/min)
H : Air pressure (mm of water)
η : Fan/blower efficiency
k : Slack factor

Efficiency η and Slack factor k

Fan Type	Efficiency η	Slack factor k
Propeller Fan	0.5 to 0.75	1.3
Desktop Fan	0.3 to 0.5	1.5
Sirocco Fan	0.45 to 0.55	1.2 to 1.3
Turbo Fan	0.6 to 0.7	1.2 to 1.3

Compressors

You can calculate the theoretical output P for an air compressor with the following formula.

$$P = 343P_1 \cdot Q \left(\left(\frac{P_2}{P_1} \right)^{0.286} - 1 \right) \text{ (kW)}$$

Q : Gas volume before compression (m^3/s)
P_1 : Pressure before compression (N/m^2)
P_2 : Pressure after compression (N/m^2)

A diagram for the above formula is provided in Figure 2.

Example: If the discharge pressure is 7 kg/cm^2 and the discharge volume is 0.3m^3/min, a 1.5-kW motor would be required for the air compressor.

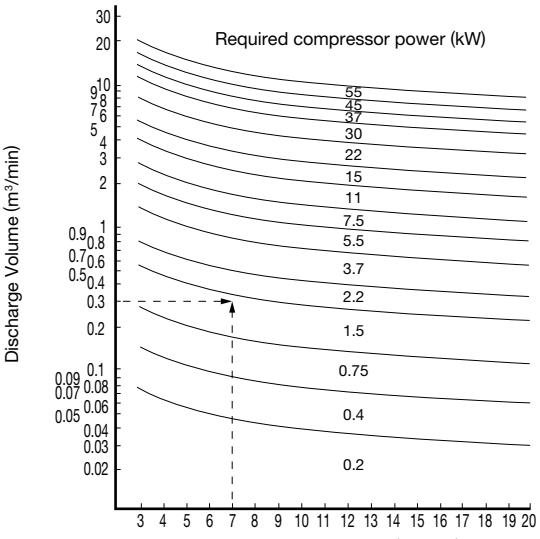


Fig.2 Theoretical Output from Air Compressor

Materials Handling Equipment

You can use the following formulas to calculate the required power for cranes, hoists, chain blocks, and other materials handling equipment.

Hoisting

$$P = \frac{(W+h_0)\cdot V}{6.12\eta}\ (kW)$$

W	: Load	(t)
h_0	: Hanging tool mass	(t)
V	: Hoisting speed	(m/min)
η	: Mechanical efficiency	Estimated as 0.75.

Traversing

$$P = \frac{(W+h_0+C_0)\cdot \mu_1 \cdot V_1}{6.12\eta}\ (kW)$$

W	: Load	(t)
h_0	: Hanging tool mass	(t)
C_0	: Mass of crab	(t)
μ_1	: Resistance to travel	Estimated as approximately 10/1,000.
V_1	: Traverse speed	(m/min)
η	: Mechanical efficiency	Estimated as 0.75.

Traveling

$$P = \frac{(W+R)\cdot \mu_2 \cdot V_2}{6.12\eta}\ (kW)$$

W	: Load	(t)
R	: Total mass of crane	(t)
μ_2	: Resistance to travel	Estimated as approximately 10/1,000.
V_2	: Travel speed	(m/min)
η	: Mechanical efficiency	Estimated as 0.75.

Turning

$$P = \frac{(W+R_1)\cdot \mu_3 \cdot V_3}{6.12\eta}\ (kW)$$

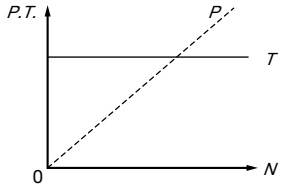
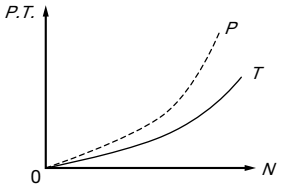
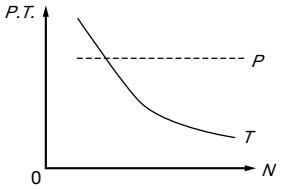
W	: Load	(t)
R_1	: Mass of turning structure	(t)
μ_3	: Resistance to travel	Estimated as approximately 10/1,000.
V_3	: Turning speed	(m/min)
η	: Mechanical efficiency	Estimated as 0.75.

(3) General Explanation of Motors

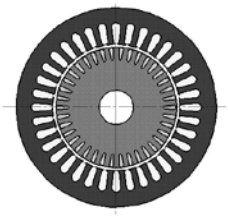
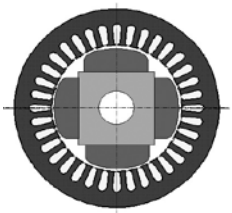
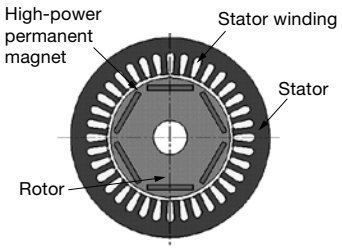
Load Torque Characteristic

Classifications based on torque characteristics are given in the following table as one more type of applicable mechanical load classification.

P : Output, *T* : Torque, *N* : Motor speed

Constant Torque Load	Variable Torque Load	Constant Output Load
		
The load torque is constant regardless of the motor speed. The required power is proportional to the motor speed.	The load diminishes in proportion to the square of the motor speed. Fluid-type application is a typical example. The required power is proportional to the cube of the motor speed.	The load is inversely proportional to the motor speed. The required power is constant and not related to the motor speed. A high load torque is required in the low-speed area, which requires special motor selection.
Application Examples ・Machine tools feed ・Traverse operation of conveyors and cranes ・Printing machines	**Application Examples** ・Fans ・Pumps	**Application Examples** ・Machine tool spindles ・Woodworking machines and mixers ・Gate operation

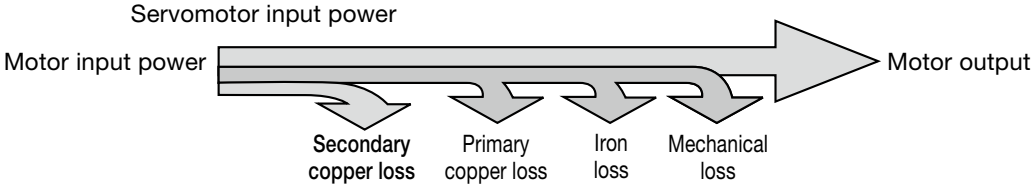
Motor Structures and Features

Type		Induction Motor	SPM Motor	IPM Motor
Structure				
Features	Efficiency	Poor	Good	Good
	Compact	Poor	Good	Good
	High Speed	Good	Medium	Good
	Maximum Torque	Good	Good	Medium
	Torque Component	Induction	Magnetism	Magnetism + Reluctance

Motor Loss Mechanisms

The motor loss is the difference between the motor input power and motor output. The lower the loss is, the higher the motor efficiency is. PM motors have high efficiency because they have no secondary copper loss.

Motor input power = Motor output + Primary copper loss + Iron loss + Mechanical loss + Secondary copper loss



(4) Application Notes

Variable-speed drives for PM motors are synchronous motors that use a permanent magnet for the rotor.
Observe the following precautions when using this type of motor.

1 Synchronous motors cannot be started directly from line power. Applications requiring line power to start should use an induction motor with the drive.

2 A single drive is not capable of running multiple synchronous motors at the same time. Use a standard induction motors for such setups.

3 When the power to a drive running a PM motor is shut off, voltage continues to be generated at the motor terminals while the motor coasts to stop. Take the precautions described below when handling charged sections.
- Make sure that the motor is stopped before performing maintenance, inspections, or wiring.
- Applications where the load can rotate the motor even when the power to the drive is shut off (e.g., fans or blowers) should have a load switch installed to the output side of the drive. Yaskawa recommends manual load switches from the AICUT LB Series by Aichi Electric Works Co., Ltd. When you inspect the drive, electrically isolate the motor.
- Do not connect to a load that could potentially rotate the motor faster than the maximum allowable speed even when the drive has been shut off.

4 Do not use a sensorless drive in applications that require restarting a coasting motor at 50% or greater of the rated speed. Restarting a coasting motor at 50% to 100% of the rated speed will activate overcurrent or overvoltage protection, and operation cannot be continued.
If restarting a coasting motor at a speed that exceeds the rating of the sensorless drive, the drive may be damaged.

5 When you use a sensorless drive, confirm the motor starting torque, allowable load characteristics, impact load tolerance, and speed control range in advance and use the drive within the specified ranges.
If using a sensorless drive for general machines other than machines for fluid-type application, you must check the load moment of inertia and other machine specifications.
For example, for loads with high inertia and high starting torque, such as centrifuges, startup failure may occur even for applications within the motor' s allowable load characteristics. In such cases, you must use a drive with a PG.
If these machine specifications are not known, use a drive with a PG, or combine an induction motor with a general-purpose drive. Inquire for details.

6 If the drive input voltage is high (i.e., over 440 V) or the wiring distance is long, you must consider the motor's insulation voltage. For details, contact your Yaskawa representative.

7 In applications involving constant speed over long periods, such as fans, pumps, extruders, and textile machinery, the life of the motor bearing may be shortened. The installation of a zero-phase reactor between the drive and motor, and the utilization of a motor with insulated bearings are effective countermeasures. Details can be found in the technical documentation. Contact your YASKAWA representative for more information.

A1000 High-Performance Vector Control Drive

*: CE and UL approval still pending for some models

Features

A1000 Catalog No. KAEPC71061622

The Most Advanced Drive Technology

- Capable of driving any kind of motors (IM and PM)
- Switch easily between motor types with a single parameter setting.

Sensorless Position Control

- Visual programming in DriveWorksEZ lets the user easily create a customized position control sequence, without the use of a motor encoder.

Cutting-Edge Torque Characteristics

- Powerful torque at 0 Hz, without a motor sensor.

Loaded with Auto-Tuning Features

- Auto-Tuning features optimize drive parameters for operation with induction motors as well as synchronous motors to achieve the highest performance levels possible.

Tackling Power Loss and Recovery

- Momentary power loss can be handled by selecting either speed searching or KEB (kinetic energy backup).

Next-Generation Energy Saving

- Loaded with the most advanced energy-saving control technology for either IM or PM motors.

Safety Regulations

- The products comply with ISO/EN13849-1 Cat.3 PLd and IEC/EN61508 SIL2 (two safety inputs and one EDM output).

Even More and More Compact

- Yaskawa continues to make applications even smaller by combining the world's smallest drive in its class with the light, efficient design of a synchronous motor.
- Dual Rating (Normal Duty or Heavy Duty operation) allows for an even more compact setup.

Easy Maintenance

- The first terminal board with a parameter backup function enables rapid recovery of system operations should the drive fails.
- You can manage the parameter settings for all drives right on your PC to simplify drive adjustment and maintenance.

Standard Specifications

Parameter C6-01 sets the drive for Normal Duty or Heavy Duty performance (default).
Perform Rotational Auto-Tuning to achieve specifications listed for Open Loop Vector Control.

200 V Class

ND : Normal Duty, HD : Heavy Duty

Model CIMR-AA2A			0006	0010	0012	0021	0030	0040	0056	0069	0081	0110	0138	0169	0211	0250	0312	0360	0415
Max. Applicable Motor Capacity*1 kW		ND	1.1	2.2	3	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	110
		HD	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
Input	Rated Input Current A	ND	7.3	10.8	13.9	24	37	52	68	80	92	111	136	164	200	271	324	394	394
		HD	5.8	7.5	11	18.9	28	37	52	68	80	82	111	136	164	200	271	324	394
Output	Rated Output Capacity*2 kVA	ND*3	2.3	3.7	4.6	8	11.4	15.2	21	26	31	42	53	64	80	95	119	137	158
		HD	1.9*4	3*4	4.2*4	6.7*4	9.5*4	12.6*4	17.9*4	23*4	29*4	32*4	44*4	55*5	69*5	82*5	108*5	132*5	158*5
	Rated Output Current A	ND*3	6	9.6	12	21	30	40	56	69	81	110	138	169	211	250	312	360	415
		HD	5*4	8*4	11*4	17.5*4	25*4	33*4	47*4	60*4	75*4	85*4	115*4	145*5	180*5	215*5	283*5	346*5	415*5
	Overload Tolerance		ND Rating*6: 120% of rated output current for 60 s, HD Rating*6: 150% of rated output current for 60 s (Derating may be required for repetitive loads)																
	Carrier Frequency		1 to 15 kHz*6											1 to 10 kHz*6					
	Max. Output Voltage		Three-phase 200 to 240 V (relative to input voltage)																
	Max. Output Frequency		400 Hz*6																
Power	Rated Voltage/ Rated Frequency		Three-phase AC power supply: 200 to 240 Vac 50/60 Hz, DC power supply: 270 to 340 Vdc*7																
	Allowable Voltage Fluctuation		−15% to +10%																
	Allowable Frequency Fluctuation		±5%																
	Power Supply*8 kVA	ND	3.3	4.9	6.4	11	17	24	31	37	42	51	62	75	91	124	148	180	215
		HD	2.7	3.4	5.0	8.6	13	17	24	31	37	37	51	62	75	91	124	148	180
Harmonic Suppression	DC Reactor		Option									Built-in							
Braking Function	Braking Resistor		Built-in											Option					

400 V Class

ND : Normal Duty, HD : Heavy Duty

Model CIMR-AA4A			0004	0005	0007	0011	0018	0023	0031	0038	0044	0058	0072	0088	0103	0139	0165	0208	0250	0296	0362	0414	0515	0675	0930	1200
Max. Applicable Motor Capacity*9 kW		ND	1.5	2.2	3	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	185	220	250	355	500	630
		HD	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	185	220	315	450	560
Input	Rated Input Current A	ND	4.3	5.9	8.1	14	20	24	38	44	52	58	71	86	105	142	170	207	248	300	346	410	465	657	922	1158
		HD	3.2	4.4	6	10.4	15	20	29	39	44	43	58	71	86	105	142	170	207	248	300	346	410	584	830	1031
Output	Rated Output Capacity*10 kVA	ND*3	3.1	4.1	5.3	8.5	13.3	17.5	24	29	34	44	55	67	78	106	126	159	191	226	276	316	392	514	709	915
		HD	2.6*4	3.7*4	4.2*4	7*4	11.3*4	13.7*4	18.3*4	24*4	30*4	34*4	46*4	57*4	69*4	85*5	114*5	137*5	165*5	198*5	232*5	282*5	343*3	461*3	617*3	831*3
	Rated Output Current A	ND*3	4.1	5.4	6.9	11.1	17.5	23	31	38	44	58	72	88	103	139	165	208	250	296	362	414	515	675	930	1200
		HD	3.4*4	4.8*4	5.5*4	9.2*4	14.8*4	18*4	24*4	31*4	39*4	45*4	60*4	75*4	91*4	112*5	150*5	180*5	216*5	260*5	304*5	370*5	450*3	605*3	810*3	1090*3
	Overload Tolerance		ND Rating*6: 120% of rated output current for 60 s, HD Rating*6: 150% of rated output current for 60 s (Derating may be required for repetitive loads)																							
	Carrier Frequency		1 to 15 kHz*6													1 to 10 kHz*6							1 to 5 kHz*6			
	Max. Output Voltage		Three-phase 380 to 480 V (relative to input voltage)																							Input voltage ×0.95
	Max. Output Frequency		400 Hz*6																							
Power	Rated Voltage/ Rated Frequency		Three-phase AC power supply: 380 to 480 Vac 50/60 Hz, DC power supply: 510 to 680 Vdc*7																							
	Allowable Voltage Fluctuation		−15 to +10%																							
	Allowable Frequency Fluctuation		±5%																							
	Power Supply*11 kVA	ND	3.9	5.4	7.4	12.8	18.3	22	35	40	48	53	65	79	96	130	155	189	227	274	316	375	425	601	843	1059
		HD	2.9	4.0	5.5	10	13.7	18.3	27	36	40	39	53	65	79	96	130	155	189	227	274	316	375	534	759	943
Harmonic Suppression	DC Reactor		Option													Built-in										
Braking Function	Braking Resistor		Built-in													Option										

∗1: The motor capacity (kW) refers to a Yaskawa 4-pole, 60 Hz, 200 V motor. The rated output current of the drive output amps should be equal to or greater than the motor rated current.
∗2: Rated output capacity is calculated with a rated output voltage of 220 V.
∗3: This value assumes a carrier frequency of 2 kHz. Increasing the carrier frequency requires a reduction in current.
∗4: This value assumes a carrier frequency of 8 kHz. Increasing the carrier frequency requires a reduction in current.
∗5: This value assumes a carrier frequency of 5 kHz. Increasing the carrier frequency requires a reduction in current.
∗6: Carrier frequency can be set by the user.
∗7: Not compliant with the UL standards when using a DC power supply.
∗8: Rated input capacity is calculated with a power line voltage of 240 V × 1.1.
∗9: The motor capacity (kW) refers to a Yaskawa 4-pole, 60 Hz, 400 V motor. The rated output current of the drive output amps should be equal to or greater than the motor rated current.
∗10: Rated output capacity is calculated with a rated output voltage of 440 V.
∗11: Rated input capacity is calculated with a power line voltage of 480 V × 1.1.

Common Specifications

Item		Specifications
Control Characteristics	Control Method	V/f Control, V/f Control with PG, Open Loop Vector Control, Closed Loop Vector Control, Open Loop Vector Control for PM, Advanced Open Loop Vector Control for PM, Closed Loop Vector Control for PM
	Frequency Control Range	0.01 to 400 Hz
	Frequency Accuracy (Temperature Fluctuation)	Digital reference: within ±0.01% of the max. output frequency (−10 to +40°C) Analog reference: within ±0.1% of the max. output frequency (25 ±10°C)
	Frequency Setting Resolution	Digital reference: 0.01 Hz, Analog reference: 0.03 Hz / 60 Hz (11 bit)
	Output Frequency Resolution	0.001 Hz
	Frequency Setting Signal	Main frequency reference: −10 to +10 Vdc, 0 to 10 Vdc (20 kΩ), 4 to 20 mA (250 Ω), 0 to 20 mA (250 Ω) Main speed reference: Pulse train input (max. 32 kHz)
	Starting Torque	150%/3 Hz (V/f Control and V/f Control with PG), 200%/0.3 Hz (Open Loop Vector Control*1), 200%/0 min^{-1} (Closed Loop Vector Control*1, Closed Loop Vector Control for PM*1, and Advanced Open Loop Vector Control for PM*1,*2), 100%/5% speed (Open Loop Vector Control for PM)
	Speed Control Range*4	1 : 1500 (Closed Loop Vector Control and Closed Loop Vector Control for PM) 1 : 200 (Open Loop Vector Control) 1 : 40 (V/f Control and V/f Control with PG) 1 : 20 (Open Loop Vector Control for PM) 1 : 100*2 *3 (Advanced Open Loop Vector Control for PM)
	Speed Control Accuracy*5	±0.2% in Open Loop Vector Control (25 ±10°C), ±0.02% in Closed Loop Vector Control (25 ±10°C)
	Speed Response	10 Hz in Open Loop Vector Control (25 ±10°C), 50 Hz in Closed Loop Vector Control (25 ±10°C) (excludes temperature fluctuation when performing Rotational Auto-Tuning)
	Torque Limit	All vector control modes allow separate settings in four quadrants
	Accel/Decel Time	0.00 to 6000.0 s (4 selectable combinations of independent acceleration and deceleration settings)
	Braking Torque*6	①Short-time decel torque*7 : over 100% for 0.4/ 0.75 kW motors, over 50% for 1.5 kW motors, and over 20% for 2.2 kW and above motors (Overexcitation Deceleration, High Slip Braking: approx. 40%) ②Continuous regen. torque: approx. 20% (approx. 125% with dynamic braking resistor option*8: 10% ED,10 s)
	V/f Characteristics	User-selected programs and V/f preset patterns possible
	Main Control Functions	Torque Control, Droop Control, Speed/Torque Control switch, Feed Forward Control, Zero Servo Control, Momentary Power Loss Ride-Thru, Speed Search, Overtorque detection, torque limit, 17 Step Speed (max.), accel/decel time switch, S-curve accel/decel, 3-wire sequence, Auto-Tuning (rotational, stationary), Online Tuning, Dwell, cooling fan on/off switch, slip compensation, torque compensation, Frequency Jump, Upper/lower limits for frequency reference, DC Injection Braking at start and stop, Overexcitation Deceleration, High Slip Braking, PID control (with Sleep function), Energy Saving Control, MEMOBUS/Modbus (RTU mode) comm. (RS-485/422, max. 115.2 kbps), Fault Restart, Application Presets, DriveWorksEZ (customized functions), Removable Terminal Block with Parameter Backup...
Protection Function	Motor Protection	Motor overheat protection based on output current
	Momentary Overcurrent Protection	Drive stops when output current exceeds 200%*9 of the HD output current.
	Overload Protection	Drive stops after 60 s at 150% of rated output current (when set for Heavy Duty performance)*10
	Overvoltage Protection	200 V class: Stops when DC bus exceeds approx. 410 V, 400 V class: Stops when DC bus exceeds approx. 820 V
	Undervoltage Protection	200 V class: Stops when DC bus exceeds approx. 190 V, 400 V class: Stops when DC bus exceeds approx. 380 V (approx. 350 V when the power supply voltage is less than 400 V)
	Momentary Power Loss Ride-Thru	Stops immediately after 15 ms or longer power loss (default). Continuous operation during power up to 2 s (standard).*11
	Heatsink Overheat Protection	Thermistor
	Braking Resistance Overheat Protection	Overheat sensor for braking resistor (optional ERF-type, 3% ED)
	Stall Prevention	Stall prevention during acceleration/deceleration and constant speed operation
	Ground Fault Protection	Protection by electronic circuit *12
	Charge LED	Charge LED remains lit until DC bus has fallen below approx. 50 V
Environment	Area of Use	Indoors
	Ambient Temperature	−10 to +50°C (open-chassis), −10 to +40°C (enclosure)
	Humidity	95% RH or less (no condensation)
	Storage Temperature	−20 to +60°C (short-term temperature during transportation)
	Altitude	Up to 1000 meters (derating required at altitudes from 1000 m to 3000 m)
	Shock	10 Hz to 20 Hz, 9.8 m/s^2 max. (5.9 m/s^2 for models larger than 400 V 450 kW (when set for Heavy Duty performance)) 20 Hz to 55 Hz, 5.9 m/s^2 (200 V: 45 kW or more, 400 V: 75 kW or more (when set for Heavy Duty performance)) or 2.0 m/s^2 max. (200 V: 55 kW or less, 400 V: 90 kW or less (when set for Heavy Duty performance))
Standards Compliance		・UL508C ・IEC/EN61800-3, IEC/EN61800-5-1 ・Two Safe Disable inputs and 1EDM output according to ISO/EN13849-1 Cat.3 PLd, IEC/EN61508 SIL2
Protection Design		IP00 open-chassis, IP20 UL Type 1 enclosure *13

∗1: The capacity of the drive and motor must be considered to achieve this torque output.
∗2: Set n8-57 to 1 [High frequency injection is enabled]. When driving a non-Yaskawa PM motor, you must also perform Rotational Auto-Tuning.
∗3: Speed control range 1:100 is valid in the momentary operation region. The capacity of the drive and motor must be considered when operating the motor continuously.
∗4 : The rated current is derated if the output frequency is less than 6 Hz (linear derating from 50%/0 Hz to 100%/6 Hz). The capacity of the drive must be considered to achieve this output frequency.
∗5: Speed control accuracy may vary slightly depending on installation conditions or motor used. Contact Yaskawa for consultation.
∗6: Varies by motor characteristics.
∗7: Short-time average deceleration torque refers to the torque required to decelerate the motor (uncoupled from the load) from the rated motor speed down to zero in the shortest time. Actual specifications may vary according to motor characteristics.
∗8: Set L3-04 to 0 [Stall Prevention during Decel = Disabled] when using a braking unit, a braking resistor, or a braking resistor unit. If L3-04 is set to 1 [Enabled] (default setting), the drive may not stop within the specified deceleration time. Drives of 200/400 V 30 kW (CIMR-AA2A0138/AA4A0072) or less have a built-in braking transistor.
∗9: 200% is the target value. The value varies depending on the capacity.
∗10: Overload protection may be triggered before 60 s when operating with 150% of the rated output current if the output frequency is less than 6 Hz.
∗11: Varies in accordance with drive capacity and load. Drives with a capacity of smaller than 11 kW in the 200 V (model: CIMR- AA2A0056) or 400 V (model: CIMR- AA4A0031) require a separate Momentary Power Loss Recovery Unit to continue operating during a momentary power loss of 2 s or longer.
∗12: Protection is provided when the motor is grounded during Run. Protection may not be provided under the following conditions:
・ Low resistance to ground from the motor cable or terminal block.
・ Drive already has a short-circuit when the power is turned on.
∗13: Removing the top cover of changes the drive's UL Type 1 rating to IP20 (models 2A0004 to 2A0081 and 4A0002 to 4A0044).

Enclosures

Enclosures of standard products vary depending on the model. Refer to the table below.

200 V Class

ND : Normal Duty, HD : Heavy Duty

Model CIMR-AA2A		0006	0010	0012	0021	0030	0040	0056	0069	0081	0110	0138	0169	0211	0250	0312	0360	0415
Max. Applicable Motor Capacity (kW)	ND	1.1	2.2	3	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	110
	HD	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
Enclosure Panel【UL Type 1】		Standard									Made to order*1							*2
Open-Chassis		Remove top cover of wall-mount enclosure for IP20 rating									IP00 standard						Made to order	

400 V Class

ND : Normal Duty, HD : Heavy Duty

Model CIMR-AA4A		0004	0005	0007	0009	0011	0018	0023	0031	0038	0044	0058	0072	0088	0103	0139	0165	0208	0250	0296	0362	0414	0515	0675	0930	1200
Max. Applicable Motor Capacity (kW)	ND	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	185	220	250	355	500	630
	HD	0.75	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	185	220	315	450	560
Enclosure Panel【UL Type 1】		Standard										Made to order*1										*2				
Open-Chassis		Remove top cover of wall-mount enclosure for IP20 rating										IP00 standard										Made to order				

*1: Contact a Yaskawa for UL Type 1 Kit availability.
*2: UL Type 1 is not available for this capacity.

Dimensions mm

Enclosure Panel【UL Type 1】

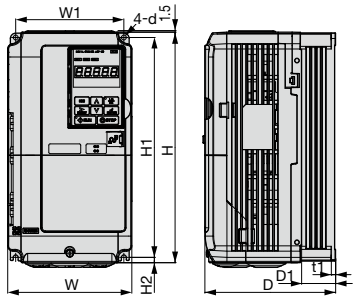


Figure 1

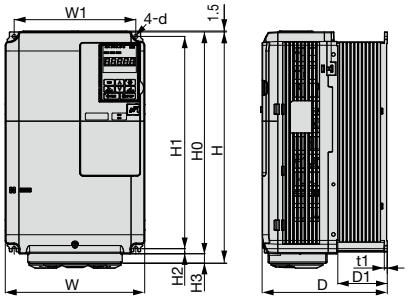


Figure 2

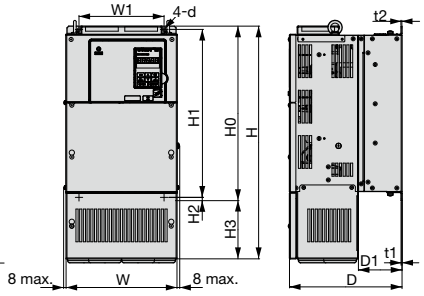


Figure 3

200 V Class

Model CIMR-AA2A	Max. Applicable Motor Capacity (kW) Normal Duty	Max. Applicable Motor Capacity (kW) Heavy Duty	Fig.	Dimensions mm W	H	D	W1	H0	H1	H2	H3	D1	t1	t2	d	Weight kg	Cooling
0006	1.1	0.75	1	140	260	147	122	–	248	6	–	38	5	–	M5	3.1	Self cooling
0010	2.2	1.5														3.2	
0012	3.0	2.2															
0021	5.5	3.7		140	260	164	122	–	248		–	55	5	–		3.5	Fan cooled
0030	7.5	5.5				167										4	
0040	11	7.5															
0056	15	11		180	300	187	160	–	284	8	–	75	5	–		5.6	
0069	18.5	15		220	350	197	192	–	335	8	–	78	5	–	M6	8.7	
0081	22	18.5	2	220	365	197	192	350	335	8	15	78	5	–		9.7	
0110	30	22	3	254	534	258	195	400	385	7.5	134	100	2.3	2.3		23	
0138	37	30		279	614		220	450	435		164					28	
0169	45	37		329	730	283	260	550	535		180	110				41	
0211	55	45														42	
0250	75	55		456	960	330	325	705	680	12.5	255	130	3.2	3.2	M10	83	
0312	90	75														88	
0360	110	90		504	1168	350	370	800	773	13	368	130	4.5	4.5	M12	108	

400 V Class

Model CIMR-AA4A	Max. Applicable Motor Capacity (kW) Normal Duty	Max. Applicable Motor Capacity (kW) Heavy Duty	Fig.	Dimensions mm W	H	D	W1	H0	H1	H2	H3	D1	t1	t2	d	Weight kg	Cooling
0004	1.5	0.75	1	140	260	147	122	–	248	6	–	38	5	–	M5	3.2	Self cooling
0005	2.2	1.5															
0007	3.0	2.2		140	260	164	122	–	248	6	–	55	5	–		3.4	Fan cooled
0011	5.5	3.7														3.5	
0018	7.5	5.5				167										3.9	
0023	11	7.5															
0031	15	11		180	300	167	160	–	284	8	–	55	5	–		5.4	
0038	18.5	15				187						75				5.7	
0044	22	18.5		220	350	197	192	–	335	8	–	78	5	–		8.3	
0058	30	22	3	254	465	258	195	400	385	7.5	65	100	2.3	2.3	M6	23	Fan cooled
0072	37	30		279	515	258	220	450	435							27	
0088	45	37		329	630	258	260	510	495		120	105				39	
0103	55	45															
0139	75	55			730	283		550	535		180	110				45	
0165	90	75														46	
0208	110	90		456	960	330	325	705	680	12.5	255	130	3.2	3.2	M10	87	
0250	132	110		504	1168	350	370	800	773	13	368	130	4.5	4.5	M12	106	
0296	160	132														112	
0362	185	160														117	

● **Open-Chassis【IP00】** Note: The enclosure type of figure 1 and figure 2 is IP20.

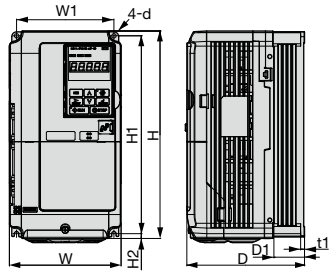


Figure 1

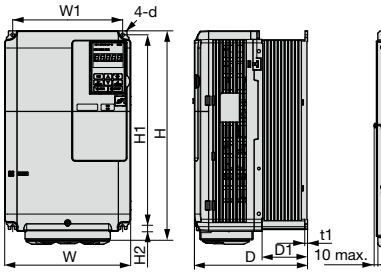


Figure 2

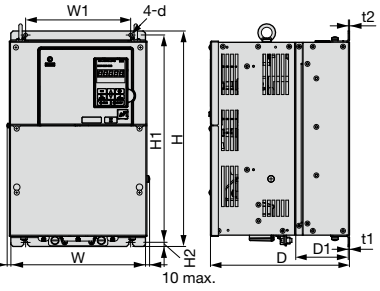


Figure 3

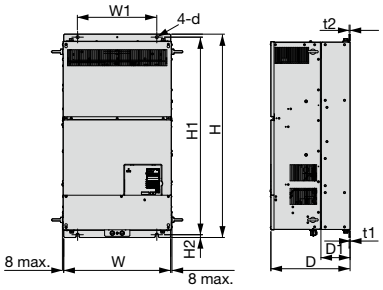


Figure 4

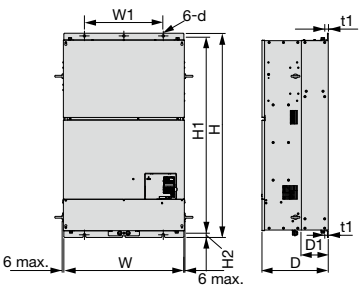


Figure 5

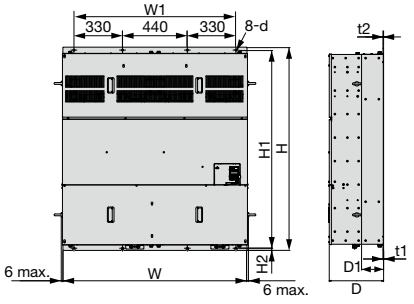


Figure 6

200 V Class

Model CIMR-AA2A	Max. Applicable Motor Capacity (kW)		Fig.	Dimensions mm										Weight kg	Cooling
	Normal Duty	Heavy Duty		W	H	D	W1	H1	H2	D1	t1	t2	d		
0006	1.1	0.75	1	140	260	147	122	248	6	38	5	–	M5	3.1	Self cooling
0010	2.2	1.5												3.2	
0012	3	2.2													
0021	5.5	3.7				164								3.5	Fan cooled
0030	7.5	5.5													
0040	11	7.5				167				55				4	
0056	15	11		180	300	187	160	284	8	75	5	–		5.6	
0069	18.5	15		220	350	197	192	335	8	78	5	–	M6	8.7	
0081	22	18.5	2	220	365	197	192	335	8	78	5	–		9.7	
0110	30	22	3	250	400	258	195	385	7.5	100	2.3	2.3		21	
0138	37	30		275	450		220	435						25	
0169	45	37	4	325	550	283	260	535	7.5	110	2.3	2.3		37	
0211	55	45												38	
0250	75	55		450	705	330	325	680	12.5	130	3.2	3.2	M10	76	
0312	90	75												80	
0360	110	90		500	800	350	370	773	13	130	4.5	4.5	M12	98	
0415	110	110												99	

400 V Class

Model CIMR-AA4A	Max. Applicable Motor Capacity (kW)		Fig.	Dimensions mm										Weight kg	Cooling
	Normal Duty	Heavy Duty		W	H	D	W1	H1	H2	D1	t1	t2	d		
0004	1.5	0.75	1	140	260	147	122	248	6	38	5	–	M5	3.2	Self cooling
0005	2.2	1.5													
0007	3	2.2		140	260	164	122	248	6	55	5	–		3.4	Fan cooled
0011	5.5	3.7												3.5	
0018	7.5	5.5		140	260	167	122	248	6	55	5	–		3.9	
0023	11	7.5													
0031	15	11		180	300	167	160	284	8	55	5	–		5.4	
0038	18.5	15				187				75				5.7	
0044	22	18.5		220	350	197	192	335	8	78	5	–	M6	8.3	
0058	30	22	3	250	400	258	195	385	7.5	100	2.3	2.3		21	
0072	37	30		275	450		220	435						25	
0088	45	37		325	510	258	260	495	7.5	105	2.3	3.2		36	
0103	55	45													
0139	75	55	4	325	550	283	260	535		110		2.3		41	
0165	90	75												42	
0208	110	90		450	705	330	325	680	12.5	130	3.2	3.2	M10	79	
0250	132	110		500	800	350	370	773	13	130	4.5	4.5	M12	96	
0296	160	132												102	
0362	185	160												107	
0414	220	185		500	950	370	370	923	13	135	4.5	4.5	M12	125	
0515	250	220	5	670	1140		440	1110	15	150				221	
0675	355	315													
0930	500	450	6	1250	1380	370	1100	1345	15	150	4.5	4.5	M12	545	
1200	630	560												555	

Checklist for PM Motor (Three-Phase Permanent-Magnet Synchronous Motor) Drive Specifications

Customer : _____ Application: _____

Location of application : _____ Load characteristics: ☐ Constant torque ☐ Variable torque

Item	Qty	Specifications
1		**PM Motor (Three-Phase Permanent-Magnet Synchronous Motor)**

Model _____ – _____

Rated output _____ kW

Motor speed _____ min^{-1}

Rated voltage
☐ 200 V class (power supply voltage: 200 to 230 V)
☐ 400 V class (power supply voltage: 400 to 460 V)
☐ Other ( )

Time rating
■ Continuous
☐ Other ( )

Speed control range
☐ 1 : 10
☐ 1 : 20
☐ 1 : 1500
☐ Other ( )

Installation location
■ Indoors
☐ Outdoors

Mounting method
☐ Foot-mounted type
☐ Flange type Note: Selectable motor Frame No. 90SA to 180MA

Load coupling
☐ Coupling
☐ V belt : Belt type : _____
No. of belts : _____
Pulley PCD (mm) _____
(Pulley diameters (mm) : At motor : _____ , At machine : _____)

Rotation direction
■ Counterclockwise viewed from the drive end (Rotation in both directions is also possible.)

Terminal box position and Cable entrance direction

Frame No.	Terminal box position (viewed from the drive end)	Cable Entrance Direction (viewed from the drive end)
90 to 132	☐Top	☐Left ☐Right
	■Left ☐Right	☐Down (Flange type) ■Opposite drive end
180	■Top	■Left ☐Right
	☐Left (180SA to 180MB)	☐Down ☐Opposite drive end
250 to 355	■Top	■Left ☐Right

Coating Color
■ Standard — Indoors : Munsell 6.0 PB 3.9/11.0, Outdoors: Munsell N7
☐ Specified color — Munsell _____

Options
☐ Thermostat (1)

2		**Options** ☐ Slide base (Frame No. 90 to 132) ☐ Slide rail (Frame No. 180 or larger) ☐ Sole plate (Frame No. 250 or larger) Other specifications [ ]
3		**AC Drive** ☐ A1000 ☐ Other ( )

Note: ■: Indicates standard specifications. If no specification is made, the standard specification will be used.

Warranty Information

■ Warranty Period

The period is 12 months from the date the product is first used by the buyer, or 18 months from the date of shipment, whichever occurs first.

■ Post-Warranty Repair Period

The post-warranty repair period applies to products that are not in the standard warranty period.
During the post-warranty repair period, Yaskawa will repair or replace damaged parts for a fee.
There is a limit to the period during which Yaskawa will repair or replace damaged parts.
Contact Yaskawa or your nearest sales representative for more information.

■ Warranty Scope

Failure diagnosis

The primary failure diagnosis shall be performed by your company as a rule.
By your company's request, however, we or our service sector can execute the work for your company for pay.
In such a case, if the cause of the failure is in our side, the work is free.

Repairs

If a Yaskawa product is found to be defective due to Yaskawa workmanship or materials and the defect occurs during the warranty period, Yaskawa will provide a replacement, repair the defective product, and provide shipping to and from the site free of charge.
If repairs are performed by Yaskawa or a Yaskawa-specified company, the repairs will be warranted for a period of 6 months after the repaired product is accepted by the customer.
This warranty is applicable only if the standard warranty period is expired or if there are less than 6 months remaining in the standard warranty period.
However, if the Yaskawa Authorized Service Center determines that the problem with the motor is not due to defective workmanship or materials, the customer will be responsible for the cost of any necessary repairs. Some problems that are outside the scope of this warranty are:

- Problems due to improper maintenance or handling, carelessness, or other reasons where the customer is determined to be responsible.
- Problems due to additions or modifications made to a Yaskawa product without Yaskawa's understanding.
- Problems due to the use of a Yaskawa product under conditions that do not meet the recommended specifications.
- Problems caused by natural disaster or fire.
- After the free warranty period elapses.
- Replenishment or replacement of consumables or expendables such as grease, batteries, bearings, cooling fans, electrolytic capacitors.
- Defective products due to packaging, fumigation, or transportation by the customer.
- Malfunction or problems caused by program that has been made by customers.
- Requests for additional or replacement manuals, warning labels, or other printed materials because they are dirty or damaged.
- Other problems not due to defects in Yaskawa workmanship or materials.

The services described above are available in Japan only. Please understand that failure diagnosis is not available outside of Japan. If overseas after-sales service is desired, consider registering for the optional overseas after-sales service contract.

Exception of Guaranteed Duty

Lost business opportunities and damage to your property, including your customers and other compensation for work, is not covered by the warranty regardless of warranty eligibility, except when caused by product failure of Yaskawa products.

■ Definition of Delivery

For standard products that are not set or adjusted for a specified application, Yaskawa considers the product delivered when it arrives at your company and Yaskawa is not responsible for on-site adjustments or test runs.

SS7-Series Eco PM Motor

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YASKAWA ELECTRIC CORPORATION

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

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

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