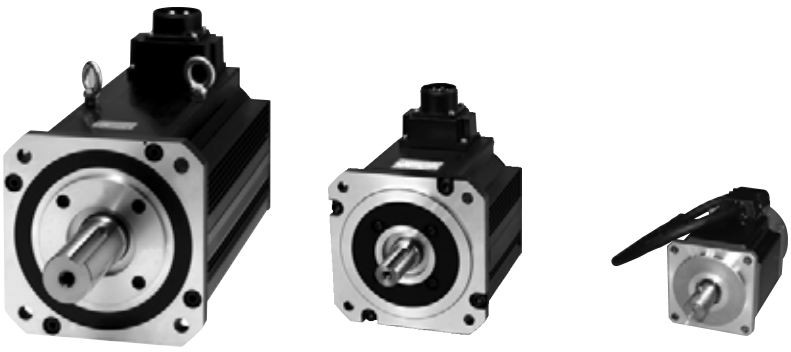
VELCONIC®

Engineering Handbook

Standard Motor Edition 1

BS Servo VLBS Series

BS Motor



TOSHIBA MACHINE

BS Servo Motor

Engineering Handbook

STANDARD MOTOR

PREFACE

This manual describes the method of handling and functions of the BS servo motor, and cautions on safety use.
Improper handling may lead to unexpected troubles or serious results. Before the use, be sure to read through this Engineering Handbook (Standard Motor Edition).
The contents in this manual may subject to change without prior notice to effect improvements.

REQUEST

Keep this manual at a place where this manual can be referred to any time.

TOSHIBA MACHINE CO., LTD.

CAUTIONS ON SAFETY

Before using this equipment, make sure that you well understand the structure and functions of this positioner, safety information and cautions to be observed. After reading this manual, be sure to keep it at a place where it can be referred to any time.

Meaning of "DANGER" and "CAUTION" Signs

In this manual, safety cautions are classified into "DANGER" and "CAUITION" to indicate the extent of warning.

⚠ DANGER — This means that "incorrect handling will lead to fatalities or serious injuries.".

⚠ CAUTION — This means that "incorrect handling may lead to personal injuries (i.e., injuries, burns and electric shocks, etc., which do not require hospitalization or long-term medial treatment or physical damage (i.e., damages due to destruction of assets or resources)."

Meaning of "PROHIBITED" and "MANDATORY" Symbols

This means that the action is prohibited (must not be done).

For "Fire Prohibited", for instance, it is indicated by 

This means that the action is mandatory (must be done).

For "Grounding", for instance, it is indicated by 

If trouble has occurred

If a trouble such as abnormal noise, nasty smell or smoke is caused during operation, immediately turn off the power and call us for repairs at Toei Electric Service Center or Toshiba Machine agent in your territory.

Toei Electric After-Sale Service Center
Matsumoto 131, Mishima City, Shizuoka Pref.
411–8510, JAPAN
Phone: +81–55–977–0129 Fax: +81–55–977–3744

General

⚠ DANGER

1.Transport, installation, wiring, operation, inspection and maintenance should be performed by qualified personnel well versed in the equipment. Otherwise, an electric shock, injury or fire may be caused.
2.NEVER touch the amplifier interior by hand. Otherwise, you may get an electric shock.
3.Be sure to ground each grounding terminal of the amplifier and motor. Otherwise, you may get an electric shock.
4.Perform wiring and inspection more than ten (10) minutes after the power is turned off and after you have confirmed the charge lamp OFF condition and voltage. Otherwise, you may get an electric shock.

5.DO NOT cut the cable, stretch it excessively, exert a heavy load on it or overtwist it. Otherwise, you may get an electric shock.
6.NEVER use the equipment at a place where it is exposed to water splash, in a corrosive atmosphere, in an atmosphere containing inflammable gas or metal chip, or near combustibles. Otherwise, a fire or equipment failure may be caused.
7.NEVER change this equipment. Otherwise, an electric shock, fire, injury or malfunction may be caused.

1. NEVER approach or contact the motor revolving part (such as shaft) during operation. Otherwise, you may be caught in the motor and injured seriously.

⚠ CAUTION

1.Use a specified combination of motor and amplifier.
Otherwise, a fire or malfunction may be caused.

2.Take careful precautions on the temperature of the amplifier, motor and peripheral equipment, because the temperature of them will rise to cause a fire.

1.NEVER touch the amplifier radiator, reverse-current absorption resistor or motor for some time after the power is turned off, or during their excitation. Otherwise, you may get burnt

Transport

⚠ CAUTION

1. DO NOT hold the cable and motor shaft during transport.
Otherwise, the equipment may malfunction, or you may get injured**.**

1.Overloading of products may cause a collapse of them during transport. To avoid this, observe the instructions given on them. Otherwise, the equipment may malfunction, or you may get injured.

2.Confirm the mass of the product by referring to the external view drawing, catalog, etc., and carry the product properly according to its mass. Otherwise, the equipment may malfunction, or you may get injured.
3.The motor eyebolt should be used only when it is transported. NEVER use it for transporting the machine. Otherwise, the equipment may malfunction, or you may get injured.

Installation

⚠ CAUTION

1.Make sure that the product you have received is exactly the one you ordered. If a different product is installed, you may get injured, or the equipment may be damaged.
2.DO NOT block the suction or exhaust port of the servo motor with a cooling fan. Otherwise, a fire or motor failure may be caused.
3.Make sure that the output power and mass of the motor you are going to install are appropriate. Otherwise, you may get injured, or the equipment may malfunction.
4.NEVER touch the keyway on the motor shaft end by bare hand. Otherwise, you may get injured.
5.DO NOT drop the product or impose a heavy impact on it. Otherwise, you may get injured, or the equipment may malfunction.
6.When combining the motor with a load, take careful precautions on center alignment, parallelism of the belt stretching pulleys, etc. The motor cannot be connected directly with the load. Otherwise, you may get injured.
7.DO NOT exert on the motor shaft a load larger than the allowable load. Otherwise, the shaft may be broken, or you may get injured.
8.DO NOT ride on the equipment or exert a heavy load on it. Otherwise, you may get injured.
9.Strictly observe the set direction of the equipment. Otherwise, the equipment may malfunction.
10.Keep the specified clearance between the equipment, control panel interior and other equipment. Otherwise, a fire or equipment failure may be caused.

1. DO NOT block the suction or exhaust port or allow entry of contaminant. Otherwise, a fire may be caused.

Wiring

⚠ CAUTION

1.Electric work should be done only by qualified electric personnel. Otherwise, a fire or electric shock may be caused.
2.Perform wiring properly. Otherwise, the motor may run uncontrollable, or you may get injured.
3.DO NOT connect a commercial power supply directly with the servo motor. Otherwise, the motor may malfunction.
4.Provide an emergency stop switch on the outside so that you can immediately stop the operation and turn off the power. Otherwise, you may get injured.
5.Tighten the terminal block screws with specified clamping torque. Otherwise, a fire may be caused.
6.Make sure that the input master power voltage falls under the rated value. Otherwise, a fire or failure may be caused.
7.DO NOT pass the motor drive line and signal line in the same duct, or bundle them. To connect the motor sensor, use an exclusive cable.
8.When connecting a battery, take careful precautions on the polarity. If the polarity is wrong, equipment damage or rupture may be caused.

1. Be sure to ground the grounding terminal (E), using an electric wire. Otherwise, a fire or electric shock may be caused**.**

Operation

⚠ CAUTION

1.NEVER adjust or change the equipment excessively.
Otherwise, the operation will be unstable and you may get injured.
2.Perform a test run to confirm the operation with the motor secured and disconnected from the machine.Then mount the motor on the machine. Otherwise, you may get injured.
3.The holding brake will not serve as a stop device to assure the machine safety. Provide a stop device on the machine side to assure safety. Otherwise, you may get injured.
4.At alarm generation, remove the cause of the trouble, reset the alarm after assuring safety, and resume the operation. Otherwise, you may get injured.
5.After the power supply is restored following momentary power failure, DO NOT approach the machine because it may restart suddenly. Otherwise, you may get injured..

1.Provide an emergency stop circuit on the outside so that you can immediately stop the operation and turn off the power. Otherwise, you may get injured.
2.Before rotating the motor alone, remove the key which is set temporarily to the output shaft. Otherwise, it will fly out and you may get injured.
3.Use a specified combination of motor and amplifier. Set the legal motor code for the servo amplifier parameter. Otherwise, a fire or malfunction may be caused.
4.When using the servo motor for the vertical axis, provide a safety device (such as holding brake) to prevent drop of a workpiece due to alarm generation or axis overtravel.
5.Be sure to observe the allowable operation range of the motor (see the Motor Engineering Handbook, etc.). Otherwise, you may get injured, or the motor may malfunction.
6.During power ON or some time after power OFF, DO NOT touch the amplifier, regenerative resistor, motor, etc., by hand. The temperature of them may be high and you may get injured.

Inspection and Maintenance

⚠ CAUTION

1.DO NOT inspect the equipment by a person other than the qualified engineer. Otherwise, an electric shock may be caused.
2.DO NOT measure the insulation resistance of the controller, using a megger. Otherwise, the controller may malfunction.
3.DO NOT disassemble or repair the equipment. Otherwise, an electric shock, fire, injury or malfunction may be caused.
For repair, contact the shop where you bought the equipment, or Toei Electric After-Sale Service Center.

1. Perform regular inspection and maintenance. Otherwise, an abnormality or trouble may be overlooked, resulting in personal injury or equipment malfunction.
It is recommended to perform the following inspection on a regular basis.
(1)Make sure that each terminal block screw is tightened completely. If loosened, tighten the screw completely.
(2)Make sure that no abnormal noise is caused from the servo motor bearing or brake unit.

(3)Make sure that all cables are not cut or scratched or not cracked. Especially, when the cable moves at operation, perform regular inspection according to the using conditions.
(4)Make sure that the load connecting shaft is correctly aligned.

2.DO NOT measure the insulation resistance of the controller, using a megger. Otherwise, the controller may malfunction.
3.When replacing the equipment with a new one, transfer the user's set data of the replaced equipment to the new equipment beforehand. Then restart the operation. Otherwise, the equipment may malfunction.
4.DO NOT change wiring during power ON. Otherwise, you may get an electric shock or injured.

Disposal

⚠ CAUTION

1. Scrap this equipment as a general industrial waste.

General Precautions

Be sure to observe the following precautions when using the equipment.

1. In some circumstances, illustrations included in this manual are drawn with the cover or safety shield disconnected, to explain the details. Before operating the equipment, be sure to set all covers and shields as they are set originally, and perform an operation according to this manual.
2. Illustrations and drawings carried in this manual are the representative examples and may differ from the actual equipment delivered to the customer.
3. This manual may be subject to change due to change in the specifications, etc.
4. Any product changed by the customer is excluded from our warranty. We shall not assume any responsibility for damages and injuries resulting from the changed product.

Applications of this equipment:

1. This equipment is not designed and manufactured to serve as a device or equipment used under serious conditions in which malfunction or trouble of this equipment will affect the human lives (i.e., for nuclear power, aerospace, traffic devices, medical appliances, various safety devices, etc.). When you wish to use this equipment for a special purpose, be sure to consult with us beforehand.
2. This equipment is manufactured under the strict quality control. When you wish to use the equipment in a facility where a serious accident or loss is expected due to its malfunction, be sure to equip safety devices.

EEP-ROM life:

1.The maximum number of writing counts to the EEP-ROM memorizing parameter set values is 100,000.
When the total counts of the following operations exceed 100,000, the EEP-ROM life will end and the servo amplifier may malfunction.
•Writing to EEP-ROM to change parameter set value, etc.
•Home point setting when an absolute position sensor system is used.

General Precautions

Warranty

Toshiba Machine agrees to repair or replace as necessary all defective material or workmanship without any charge incurred on the customer according to the following conditions.

1.Only the basic unit shall be covered by this Warranty.

2.If nonconformity is found in the equipment, which is attributable to Toshiba Machine, we will repair the equipment or replace it with an alternative equipment free of charge.
This Warranty and services shall be effected only when the equipment is used in Japan. When the equipment is exported and used overseas, separate consultation shall be held to decide the details.
Only the specifications and functions of the equipment, which are defined in the specifications manual, catalog, instruction manual and the like, shall be guaranteed. In no event, does Toshiba Machine's Guarantee cover the secondary compensation and any other compensations not defined in this Warranty.

3.The warranty period shall be one (1) year after delivery of the equipment. The specific parts (such as consumable parts and accessories) shall not be guaranteed, however. Unless the equipment is used immediately after the delivery, the warranty period shall be eighteen (18) months from the date of acceptance, which shall be effective, however, only when the equipment was sold via our agents.

4.Even during the warranty period, the following nonconformities and malfunctions shall be repaired with all expenses incurred on the customer.
[1]Malfunction caused by negligent handling and operation.
[2]Malfunction which was caused intentionally or negligently.
[3]Malfunction caused by the use under special conditions.
[4]Malfunction caused by a reason other than Toshiba Machine's product.
[5]Malfunction caused by insufficient maintenance and management.
[6]Malfunction caused by the change made on the product by the customer for customer's convenience.
[7]Malfunction caused by the repair done by other than Toshiba Machine or a company or factory specified by Toshiba Machine.
[8]Malfunction caused by the use of any part other than Toshiba Machine's designated parts.
[9]Nonconformity caused by fire, earthquake, flood, thunderbolt, acts of God, or any other causes beyond Toshiba Machine's control.
[10]Nonconformity caused by aged deterioration (natural fading of painted surface, plated surface, etc., and rust development on them).
[11]Use done by neglecting the precautions stipulated in the instruction manual, specifications manual and catalog.

5.On-site investigation of this equipment is possible on condition that the customer pays for all actual expenses incurred. When another contract of warranty exists, priority shall be given to this contract.

Page

- **Name of Each Part**

DO NOT exert a heavy impact. Otherwise, the motor may be damaged.

DO NOT cut the cable, stretch it excessively, exert a heavy load on it or overtwist it. Otherwise, you may get an electric shock.

Perform wiring properly and exactly. Otherwise, the motor may be uncontrollable, or you may get injured.

Be sure to ground the grounding terminal (E), using an electric wire. Otherwise, you may get an electric shock.

NEVER touch the revolving part of the motor by hand during operation. Otherwise, you may get injured.

DO NOT impose a heavy impact on the motor. Otherwise, the motor may be damaged.

Perform a test run to confirm the operation with the motor secured and disconnected from the machine. Then mount the motor on the machine. Otherwise, you may get injured.

NEVER use the motor at a place where it is exposed to water splash, in a corrosive atmosphere, or near combustibles. Otherwise, a fire or motor failure may be caused.

DO NOT disassemble or repair the motor by a person other than the qualified engineer. Otherwise, you may get injured, or the motor may be damaged.

- **Check Items at Unpacking**

When the BS series servo motor has reached you, check and confirm the following items.

(1) Is there any damage suffered during transport?

Perform visual check on the motor and make sure that no damage or cut is found there.

(2) Is the motor exactly the one you ordered?

Check for the servo motor model number given on the label.

(3) Are all screws and nuts tightened completely?

Perform check, using a screwdriver.

(4) Will the motor rotate smoothly when you turn the motor shaft by hands?

If the armature wire comes in contact with terminal U, V or W, electric braking is effected on the motor, resulting in unsmooth rotation of the motor. (When the motor is equipped with a brake, it will not rotate.)

If any nonconformity is found in the above items, contact our after-sale service center, our sales section, or our sales agent in your territory from which you purchased the motor.

- Tokyo Sales Section
  Sukiyabashi Fuji Bldg., 2–11, Ginza 4–chome, Chuo-ku, Tokyo 104–8141
  Phone: 81–3–3567–8831
  Fax: 81–3–3535–2570
- Numazu Head Office
  2068–3, Ooka, Numazu-shi, Shizuoka Pref. 410–8510
  Phone: 81–55–926–5032
  Fax: 81–55–925–6527
- Osaka Sales Office
  Shin-Hankyu Bldg., 12–39, Umeda 1-chome, Kita-ku, Osaka 530–0001
  Phone: 81–6–6341–6181
  Fax: 81–6–6345–2738
- Nagoya Sales Office
  5–307, Kamiyashiro, Meito-ku, Nagoya 465–0025
  Phone: 81–52–702–7660
  Fax: 81–52–702–1141
- Toei Electric Service Center
  131, Matsumoto, Mishima-shi, Shizuoka Pref. 411–8510
  Phone: 81–55–977–0129
  Fax: 81–55–977–3744

CAUTION

At transport, DO NOT hold the cable or motor shaft. Otherwise, you may get injured, or the motor may malfunction.

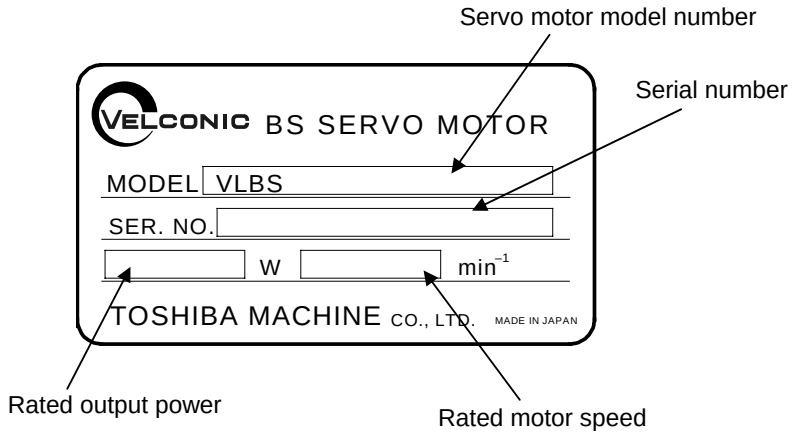
Motors designed for X series amplifiers

Series	Type	Square	Rated output power (W)	Voltage (V)	Rated/Max. motor speed (min^{-1})	Class
VLBSV	ZA	40	30	200	3000/5000	Low inertia
			50			
			100			
		60	200			
			400			
		80	600			
			750			
VLBSV	Standard	130	500	200	1500/2000	Mid inertia
			1.0 K			
			1.5 K			
			1.0 K	200	3000/4000	
			1.8 K			
			2.4 K			
		180	2.0 K	200	1500/2000	
			3.0 K			
			5.0 K			
			7.5 K			
			3.0 K	200	3000/4000	
			4.5 K			
			7.0 K			
			10 K			
	ZA	220	11 K	200	1500/2000	
			14 K	200	1500/1800	
VLBST	Standard	95	400	200	1500/2000	Low inertia
			500	200	3000/4000	
			800			
		130	800	200	1500/2000	
			1.0 K			
			1.5 K			
			1.4 K	200	3000/4000	
			1.8 K			
			2.4 K			
		180	2.6 K	200	1500/2000	
			3.7 K			
			5.0 K			
			3.7 K	200	3000/4000	
			5.5 K			
			6.5 K			
		220	7.5 K	200	2000/2500	
			10 K			
VLBSG	A	220	20 K	200	2000/2200	Large-sized
		290	33 K			
	B	290	55 K	400		

- **Motor Model**

(1) Label showing motor model number

The following label is attached to the servo motor frame, where the year of manufacture and serial number are stipulated, in addition to the model number. Use these data when you confirm the product ordered or when you make inquiries.



(2) Servo motor model number

VLBS ® – ®® ®®® ®® ®® – ® ®®®

Special spec. number

Options (Indication of two (2) or more options is possible. Ex.: BKO)
B : Brake O : Oil seal
G : Reduction gear T : Taper shaft
K : Straight shaft without key

Motor sensor Blank: Resolver
V: Resolver for T series X amplifier
S1: 17-bit absolute encoder

Motor speed: 15: 1500 min−1, 20: 2000 min−1, 30: 3000 min−1

Capacity: Indicated value × 10 = Rated output power (W)
(Ex. 010: 100 W, except for 10 K: 10 K)

Type: Blank: Standard type, ZA: ZA-type, G series: A or B

Series name: V series: V, G series: G, T series: T

Motor name: VELCONIC BS servo motor

(3) Combination of motor and amplifier

Use a desired combination of V-series servo amplifier and servo motor as shown in the table below.

When the power is turned on, the parameter setting error AL 26 occurs. Specify the control mode and selected motor code for user parameters UP-01 and UP-02, respectively. Turn the power off once and make sure that the display unit has turned off, then turn the power on again.

If illegal setting is done, they will not operate normally.

Resolver specifications (Applicable amplifier: VL®®X–®®®P®–H®®, –A®®)

Motor speed	Motor model VLBSV–	Output	Motor code UP–02	Applicable amp. VL®®X–
ZA- type 3,000 min^{-1}	ZA00330	30 W	01061	008P2
	ZA00530	50 W	01062	008P2
	ZA01030	100 W	01063	008P2
	ZA02030	200 W	01064	008P2
	ZA04030	400 W	01065	012P2
	ZA06030	600 W	01066	025P2
	ZA07530	750 W	01067	025P2
ZA- type 1,500 min^{-1}	ZA11K15	11 kW	01080	200P3
	ZA14K15	14 kW	01082	320P3
Standard type 1,500 min^{-1}	05015	500 W	01021	012P2
	10015	1 kW	01022	035P3
	15015	1.5 kW	01023	035P3
	20015	2 kW	01024	070P3
	30015	3 kW	01025	070P3
	50015	5 kW	01026	100P3
	75015	7.5 kW	01027	200P3
Standard type 3,000 min^{-1}	10030	1 kW	01041	035P3
	18030	1.8 kW	01042	070P3
	24030	2.4 kW	01043	070P3
	30030	3 kW	01044	070P3
	45030	4.5 kW	01045	100P3
	70030	7 kW	01046	200P3
	10K30	10 kW	01047	200P3

Motor speed	Motor model VLBSG–	Output	Motor code UP–02	Applicable amp. VL®®X–
Standard type 2,000 min^{-1}	A20K20	20 kW	01350	320P3
	A33K20	33 kW	01351	500P3
	B55K20	55 kW	01359	400P4

Motor speed	Motor model VLBST–	Output	Motor code UP–02	Applicable amp. VL®®X–
Standard type 1,500 min^{-1}	04015V	400 W	01101	012P2
	08015V	800 W	01102	025P2
	10015V	1 kW	01103	025P2
	15015V	1.5 kW	01104	035P3
	26015V	2.6 kW	01105	070P3
	37015V	3.7 kW	01106	100P3
	50015V	5 kW	01107	100P3
Standard type 2,000 min^{-1}	75020V	7.5 kW	01108	200P3
	10K20V	10 kW	01109	200P3
Standard type 3,000 min^{-1}	05030V	500 W	01113	012P2
	08030V	800 W	01114	025P2
	14030V	1.4 kW	01115	035P3
	18030V	1.8 kW	01116	070P3
	24030V	2.4 kW	01117	070P3
	37030V	3.7 kW	01118	100P3
	55030V	5.5 kW	01119	200P3
	65030V	6.5 kW	01120	200P3

Encoder specifications (Applicable amplifier: VL®®X–®®®P®–S®®)

Motor speed	Motor model VLBSV–	Output	Motor code UP–02	Applicable amp. VL®®X–
ZA- type 3,000 min^{-1}	ZA00330S1	30 W	02061	008P2
	ZA00530S1	50 W	02062	008P2
	ZA01030S1	100 W	02063	008P2
	ZA02030S1	200 W	02064	008P2
	ZA04030S1	400 W	02065	012P2
	ZA06030S1	600 W	02066	025P2
	ZA07530S1	750 W	02067	025P2
Standard type 1,500 min^{-1}	05015S1	500 W	02021	012P2
	10015S1	1 kW	02022	035P3
	15015S1	1.5 kW	02023	035P3
	20015S1	2 kW	02024	070P3
	30015S1	3 kW	02025	070P3
	50015S1	5 kW	02026	100P3
	75015S1	7.5 kW	02027	200P3
Standard type 3,000 min^{-1}	10030S1	1 kW	02041	035P3
	18030S1	1.8 kW	02042	070P3
	24030S1	2.4 kW	02043	070P3
	30030S1	3 kW	02044	070P3
	45030S1	4.5 kW	02045	100P3
	70030S1	7 kW	02046	200P3
	10K30S1	10 kW	02047	200P3

CAUTION

Use a specified combination of motor and amplifier. Otherwise, a fire or malfunction may be caused.

Installation	Section 1

1. Installation

1.1 Environmental Conditions

The X series servo motor is designed for general indoor use. Make sure that the site of installation is as specified below. When the motor is provided with a reduction gear, the environmental conditions may differ from the conditions below.

Environment	Conditions	
	VLBSV standard type	VLBSV–ZA type
Ambient temperature	–10 ~ +40°C (non-freezing)	0 ~ +40°C (non-freezing)
Ambient humidity	30 ~ 90 %RH (non-condensing)	30 ~ 85 %RH (non-condensing)
Storage temperature	–20 ~ +75°C (non-freezing)	–10 ~ +75°C (non-freezing)
Storage humidity	30 ~ 90 %RH (non-condensing)	30 ~ 90 %RH (non-condensing)
Atmosphere	Indoor (not exposed to direct sunlight). Corrosive gas or explosive gas should not be involved. Protection against direct splash of water, coolant oil, etc., should be taken.	Indoor (not exposed to direct sunlight). Corrosive gas or explosive gas should not be involved. Protection against direct splash of water, coolant oil, etc., should be taken.
Vibration	2G or less	ZA-type, 3,000 min^{-1}: 5G or less ZA-type, 1,500 min^{-1}: 2G or less

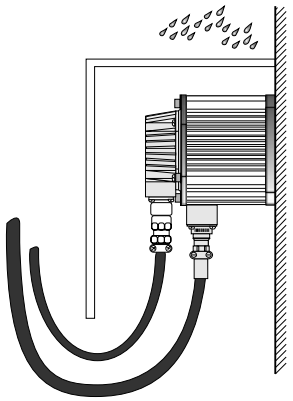
Environment	Conditions	
	VLBSG standard type	VLBST standard type
Ambient temperature	–10 ~ +40°C (non-freezing)	0 ~ +40°C (non-freezing)
Ambient humidity	30 ~ 90 %RH (non-condensing)	30 ~ 90 %RH (non-condensing)
Storage temperature	–20 ~ +75°C (non-freezing)	–20 ~ +75°C (non-freezing)
Storage humidity	30 ~ 90 %RH (non-condensing)	30 ~ 90 %RH (non-condensing)
Atmosphere	Indoor (not exposed to direct sunlight). Corrosive gas or explosive gas should not be involved. Protection against direct splash of water, coolant oil, etc., should be taken.	Indoor (not exposed to direct sunlight). Corrosive gas or explosive gas should not be involved. Protection against direct splash of water, coolant oil, etc., should be taken.
Vibration	1G or less	2G or less

 **CAUTION**	
	NEVER use the motor at a place where it is exposed to water splash, in a corrosive atmosphere, in an atmosphere containing inflammable gas or metal chip, or near combustibles. Otherwise, a fire or motor failure may be caused.
	NEVER store the motor at a place where it is exposed to rain or water drip, or at a place where hazardous gas or liquid is involved.
	Store the motor at a place where it is not exposed to direct sunlight and the predetermined temperature and humidity (–20 ~ +75°C, 30 ~ 90 %RH) are maintained.

1.2 Cautions on Installation

1.2.1 Measures against Oil and Water

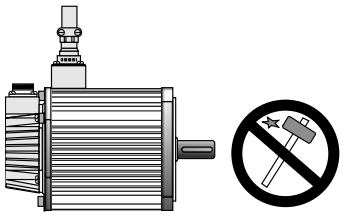
(1) If oil or water drip splashes from the machine side, take necessary measures by mounting a cover or facing the connectors downward.



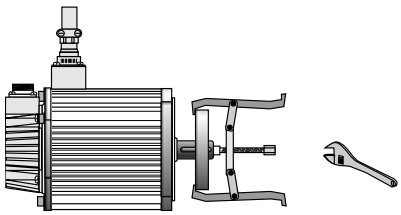
(2) The oil seal is an option. If oil will splash on the shaft, it is recommended that you ask for the oil seal to be factory-set at order entry.

1.2.2 Load and Impact Imposed on Shaft

(1) When mounting a pulley, etc., on the shaft of the servo motor, use a plastic hammer and take careful precautions not to inflict any impact on the shaft.



(2) When removing the pulley, etc., from the shaft, use a pulley remover and take careful precautions not to exert any impact on the shaft.



(3) DO NOT allow a load exceeding the specified load on the shaft.

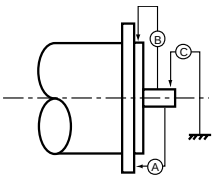
(4) When linking with the timing belt, take careful precautions not to overstretch the belt.

(5) For the permissible radial load and thrust load, see the specifications table.

CAUTION	NEVER touch the keyway on the motor shaft end by bare hand. Otherwise, you may get injured.

1.2.3 Assembly Accuracy

(1) The accuracy of the servo motor output shaft and shaft mounting accuracy are tabled below.

Accuracy (T.I.R.)	Ref. figure
Squareness between flange surface and output shaft [A]	
Eccentricity of flange fit outer diameter [B]	
Runout of output shaft [C]	

Series	Type	Motor speed	Accuracy (T.I.R.)
VLBSV	ZA	3000	A: 0.07 mm B: 0.06 mm C: 0.02 mm
VLBSV	Standard	1500	A: 0.08mm B: 0.06 mm C: 0.03 mm
		3000	
VLBSV	ZA	1500	
VLBST	Standard	1500	
		3000	
VLBSG	Standard	2000	A: 0.08 mm B: 0.08 mm C: 0.05 mm

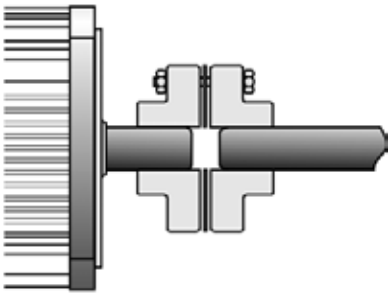
Note: T.I.R. (Total Indicator Reading)

(2) The servo motor is provided with a straight key (JIS B1301–1976). It is incorporated in or attached to the shaft.

(3) It is recommended that the servo motor is secured with hexagon socket head cap screws and Belleville spring washers (class 2).

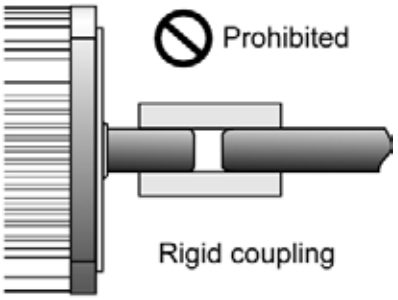
1.2.4 Coupling

(1) When linking the motor with a mechanical system, select a coupling which can absorb eccentricity, then use the motor within the permissible eccentricity of the coupling. Also make sure of the load exerted on the motor shaft caused by eccentricity.



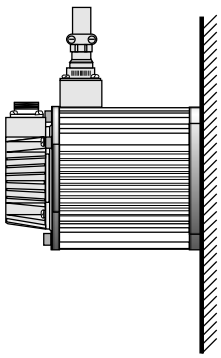
(2) DO NOT connect the motor with a rigid coupling. If the shaft center has shifted, the shaft may be damaged.

(3) Fit-tolerance of the flange spigot joint is machined to h7. Machine the matching machine side according to this size. (General matching dimensional tolerance: H7)

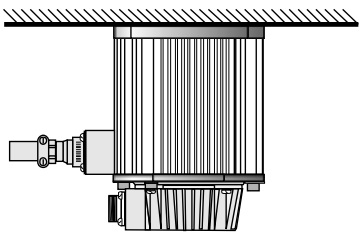


1.2.5 Motor Mounting Direction

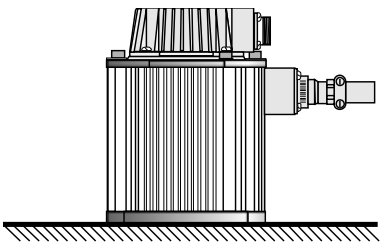
(1) The servo motor can be mounted horizontally, facing upward or downward, as illustrated below.



Horizontal



Shaft facing up



Shaft facing down

(2) The mounting direction of the servo motor with reduction gear is predetermined. Mount it according to the profile of the reduction gear.

Wiring and Operation	Section 2

This section describes the motor connection only. For connection with the amplifier, see the Standard Servo Amplifier Engineering Handbook provided separately.

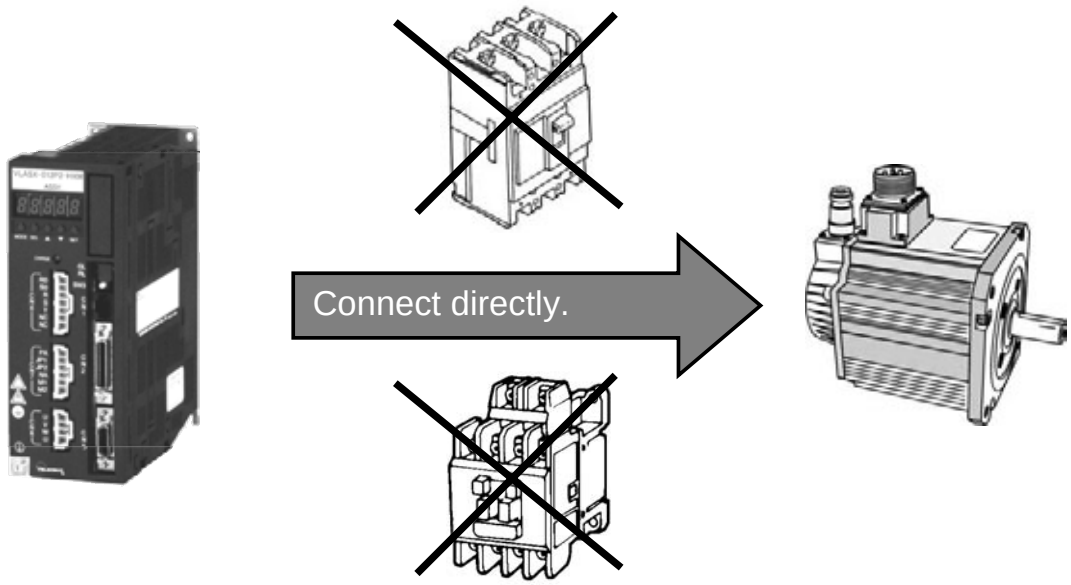
2.1 Wiring

(1) The armature and ground wires are factory-connected to the receptacles. Connect the pins and cable on the plug side completely and cover them with tape, etc., for insulation.

(2) NEVER directly apply the commercial power to armature wires U, V and W of the servo motor.

(3) To change the motor revolving direction, change the command input or change the value set in the servo amplifier parameter. For details, see the Amplifier Engineering Handbook provided separately.

(4) NEVER connect an electromagnetic contactor or breaker for wiring to the wire running between the servo motor and servo amplifier.



CAUTION	Perform wiring properly and exactly. Otherwise, the motor may be uncontrollable, or you may get injured.

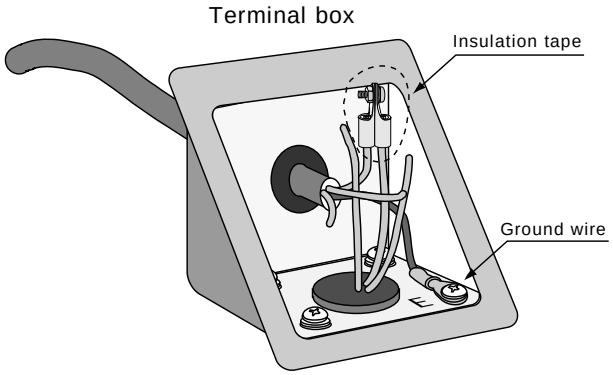
2.2 Armature

(1) Connector specification: VLBSV standard type, VLBSV–ZA type

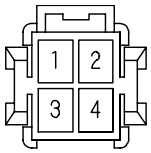
(2) Terminal box specification: VLBSG standard type, VLBST standard type

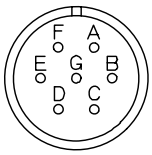
1) Remove the terminal box cover, connect the cabtyre cable, etc. with the armature lead wire with screw and nut in the terminal box, then tape them completely to isolate from the surroundings.

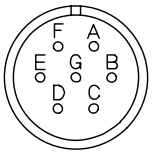
2) Be sure to match terminals U, V, W of the motor armature wire with terminals U, V, W of the servo amplifier terminal block.
Terminals U, V, W of the armature lead wire are identified by the wire color or mark tube. The lead wire size is tabled below.
To protect the cable and prevent entry of contaminant, equip a bushing, etc. on the wire hole on the terminal box. After the wiring, be sure to mount the terminal box cover.



Armature wiring table

<table>
<tr><th colspan="2">VLBSV–®®®®®®®®®</th><th rowspan="2">Type of connector</th><th rowspan="2">Receptacle wiring table</th></tr>
<tr><th>1500 min^{-1}</th><th>3000 min^{-1}</th></tr>
<tr><td></td><td>ZA00330(S1)
ZA00530(S1)
ZA01030(S1)
ZA02030(S1)
ZA04030(S1)
ZA06030(S1)
ZA07530(S1)</td><td>Receptacle (motor side)
YLR–04V
Pin: BYM–41T–P0.5A
Plug (cable side)
YLP–04V
Socket: BYF–41T–P0.5A</td><td> 

<table>
<tr><th>Pin No.</th><th>Symbol</th></tr>
<tr><td>1</td><td>U</td></tr>
<tr><td>2</td><td>V</td></tr>
<tr><td>3</td><td>W</td></tr>
<tr><td>4</td><td>E</td></tr>
</table></td></tr>
<tr><td>05015(S1)
10015(S1)
15015(S1)</td><td>10030(S1)
* 18030(S1)
* 24030(S1)</td><td>Receptacle (motor side)
JL04V–2E20–15PE–B–R
Straight plug (cable side)
JL04V–6A20–15SE–EB–R
Cable clamp
JL04–2022CK(09)–R
* JL04–2022CK(12)–R</td><td> 

<table>
<tr><th>Pin No.</th><th>Symbol</th></tr>
<tr><td>A</td><td>U</td></tr>
<tr><td>B</td><td>V</td></tr>
<tr><td>C</td><td>W</td></tr>
<tr><td>D</td><td>E</td></tr>
<tr><td>E</td><td>Not used</td></tr>
<tr><td>F</td><td>Not used</td></tr>
<tr><td>G</td><td>Not used</td></tr>
</table></td></tr>
<tr><td>20015(S1)
30015(S1)</td><td>30030(S1)
45030(S1)</td><td>Receptacle (motor side)
JL04V–2E24–10PE–B–R
Straight plug (cable side)
JL04V–6A24–10SE–EB–R
Cable clamp
JL04–2428CK(14)–R</td><td> 

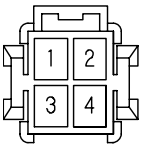
<table>
<tr><th>Pin No.</th><th>Symbol</th></tr>
<tr><td>A</td><td>U</td></tr>
<tr><td>B</td><td>V</td></tr>
<tr><td>C</td><td>W</td></tr>
<tr><td>D</td><td>E</td></tr>
<tr><td>E</td><td>Not used</td></tr>
<tr><td>F</td><td>Not used</td></tr>
<tr><td>G</td><td>Not used</td></tr>
</table></td></tr>
<tr><td>50015(S1)
75015(S1)</td><td>70030(S1)
10K30(S1)</td><td>Receptacle (motor side)
JL04V–2E32–17PE–B–R
Mono-block (cable side)
JL04V–6A32–17SE–R
Cable clamp
ACS–20RL–MS32F</td><td> 

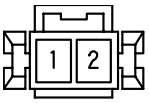
<table>
<tr><th>Pin No.</th><th>Symbol</th></tr>
<tr><td>A</td><td>U</td></tr>
<tr><td>B</td><td>V</td></tr>
<tr><td>C</td><td>W</td></tr>
<tr><td>D</td><td>E</td></tr>
</table></td></tr>
<tr><td>ZA11K15(S1)
ZA14K15(S1)</td><td></td><td>Receptacle (motor side)
N/MS3102A32–17P
Straight plug (cable side)
N/MS3106B32–17P
Cable clamp
N/MS3057–20A</td><td> 

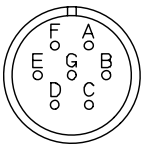
<table>
<tr><th>Pin No.</th><th>Symbol</th></tr>
<tr><td>A</td><td>U</td></tr>
<tr><td>B</td><td>V</td></tr>
<tr><td>C</td><td>W</td></tr>
<tr><td>D</td><td>E</td></tr>
</table></td></tr>
</table>

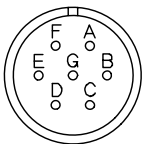
- For the *-marked motor, use the *-marked cable clamp.
- The applicable cabtyre cable diameter is as follows:
  JL04–2022CK(09)–R : 6.5 mm ~ 9.5 mm
  JL04–2022CK(12)–R : 9.5 mm ~ 13 mm
  JL04–2428CK(14)–R : 12 mm ~ 15 mm
  ACS–20RL–MS32F : 16 mm ~ 20 mm
- The JL04V-series plug is compatible with the MS-series connector.
- If the plug height is limited, low-height type angle end bell is also available. (Please contact us for details.)

"Armature + brake" wiring table (Connector specification)

<table>
<tr><th colspan="2">VLBSV–®®®®®®®®–B</th><th rowspan="2">Type of connector</th><th rowspan="2">Receptacle wiring table</th></tr>
<tr><th>1500 min^{-1}</th><th>3000 min^{-1}</th></tr>
<tr><td rowspan="2"></td><td rowspan="2">ZA00330(S1)
ZA00530(S1)
ZA01030(S1)
ZA02030(S1)
ZA04030(S1)
ZA06030(S1)
ZA07530(S1)</td><td>Receptacle (motor side)
YLR–04V
Pin: BYM–41T–P0.5A
Plug (cable side)
YLP–04V
Socket: BYF–41T–P0.5A</td><td>Armature
 

<table><tr><th>Pin No.</th><th>Symbol</th></tr><tr><td>1</td><td>U</td></tr><tr><td>2</td><td>V</td></tr><tr><td>3</td><td>W</td></tr><tr><td>4</td><td>E</td></tr></table></td></tr>
<tr><td>Receptacle (motor side)
YLR–02V
Pin: BYM–01T–P0.5A
Plug (cable side)
YLP–02V
Socket: BYF–01T–P0.5A</td><td>Brake
 

<table><tr><th>Pin No.</th><th>Symbol</th></tr><tr><td>1</td><td>B1</td></tr><tr><td>2</td><td>B2</td></tr></table></td></tr>
<tr><td>05015(S1)
10015(S1)
15015(S1)</td><td>10030(S1)
* 18030(S1)
* 24030(S1)</td><td>Receptacle (motor side)
JL04V–2E20–15PE–B–R
Straight plug (cable side)
JL04V–6A20–15SE–EB–R
Cable clamp
JL04–2022CK(09)–R
* JL04–2022CK(14)–R</td><td> 

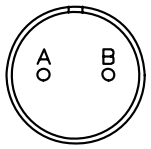
<table><tr><th>Pin No.</th><th>Symbol</th></tr><tr><td>A</td><td>U</td></tr><tr><td>B</td><td>V</td></tr><tr><td>C</td><td>W</td></tr><tr><td>D</td><td>E</td></tr><tr><td>E</td><td>B1</td></tr><tr><td>F</td><td>B2</td></tr><tr><td>G</td><td>Not used</td></tr></table></td></tr>
<tr><td>20015(S1)
30015(S1)</td><td>30030(S1)
* 45030(S1)</td><td>Receptacle (motor side)
JL04V–2E24–10PE–B–R
Straight plug (cable side)
JL04V–6A24–10SE–EB–R
Cable clamp
JL04–2428CK(14)–R
* JL04–2428CK(17)–R</td><td> 

<table><tr><th>Pin No.</th><th>Symbol</th></tr><tr><td>A</td><td>U</td></tr><tr><td>B</td><td>V</td></tr><tr><td>C</td><td>W</td></tr><tr><td>D</td><td>E</td></tr><tr><td>E</td><td>B1</td></tr><tr><td>F</td><td>B2</td></tr><tr><td>G</td><td>Not used</td></tr></table></td></tr>
<tr><td rowspan="2">50015(S1)
75015(S1)</td><td rowspan="2">70030(S1)
10K30(S1)</td><td>Receptacle (motor side)
JL04V–2E32–17PE–B–R
Mono-block (cable side)
JL04V–6A32–17SE–R
Cable clamp
ACS–20RL–MS32F</td><td>Armature
 

<table><tr><th>Pin No.</th><th>Symbol</th></tr><tr><td>A</td><td>U</td></tr><tr><td>B</td><td>V</td></tr><tr><td>C</td><td>W</td></tr><tr><td>D</td><td>E</td></tr></table></td></tr>
<tr><td>Receptacle (motor side)
JL04V–2E10SL–3PE–B–R
Straight plug (cable side)
JL04V–6A10SL–3SE–EB–R
Cable clamp
JL04–1012CK(05)–R
JL04–1012CK(06)–R</td><td>Brake
 

<table><tr><th>Pin No.</th><th>Symbol</th></tr><tr><td>A</td><td>B1</td></tr><tr><td>B</td><td>B2</td></tr><tr><td>C</td><td>Not used</td></tr></table></td></tr>
</table>

<table>
<tr><td colspan="2">VLBSV–®®®®®®®®–B</td><td rowspan="2">Type of connector</td><td rowspan="2">Receptacle wiring table</td></tr>
<tr><td>1500 min^{-1}</td><td>3000 min^{-1}</td></tr>
<tr><td rowspan="2">ZA11K15(S1)
ZA14K15(S1)</td><td rowspan="2"></td><td>Receptacle (motor side)
N/MS3102A32–17P
Straight plug (cable side)
N/MS3106B32–17S
Cable clamp
N/MS3057–20A</td><td>Armature
 

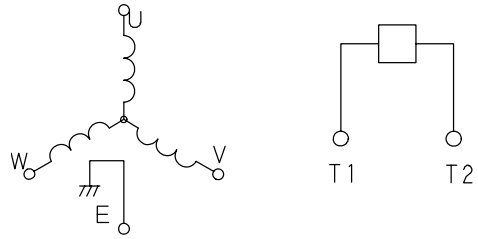
<table>
<tr><th>Pin No.</th><th>Symbol</th></tr>
<tr><td>A</td><td>U</td></tr>
<tr><td>B</td><td>V</td></tr>
<tr><td>C</td><td>W</td></tr>
<tr><td>D</td><td>E</td></tr>
</table></td></tr>
<tr><td>Receptacle (motor side)
N/MS3102A10SL–4P
Straight plug (cable side)
N/MS3106B10SL–4S
Cable clamp
N/MS3057–4A</td><td>Brake
 

<table>
<tr><th>Pin No.</th><th>Symbol</th></tr>
<tr><td>A</td><td>B1</td></tr>
<tr><td>B</td><td>B2</td></tr>
</table></td></tr>
</table>

- For the *-marked motor, use the *-marked cable clamp.
- The applicable cabtyre cable diameter is as follows:
  - JL04–2022CK(09)–R : 6.5 mm ~ 9.5 mm
  - JL04–2022CK(14)–R : 12.9 mm ~ 16 mm
  - JL04–2428CK(14)–R : 12 mm ~ 15 mm
  - JL04–2428CK(17)–R : 15 mm ~ 18 mm
  - ACS–20RL–MS32F : 16 mm ~ 20 mm
  - ACS–08RL–MS10F : 4 mm ~ 8 mm
  - JL04–1012CK(05)–R : 4 mm ~ 6 mm
  - JL04–1012CK(06)–R : 4.6 mm ~ 6.6 mm
- The JL04V-series plug is compatible with the MS-series connector.
- If the plug height is limited, low-height type angle end bell is also available. (Please contact us for details.)

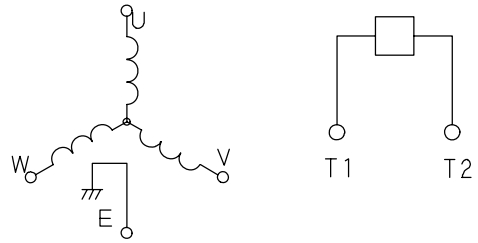
Armature wiring table (Terminal box specification)

VLBSG–A20K20



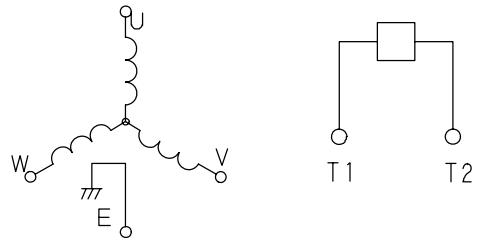
Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Blue	14	M6
V	Blue	14	M6
W	Blue	14	M6
E	(Green)	(14)	(M6)
T1	Blue	1.25	M6
T2	Blue	1.25	M6

VLBSG–A3K20



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Blue	38	M8
V	Blue	38	M8
W	Blue	38	M8
E	(Green)	(38)	(M8)
T1	Blue	2.0	M6
T2	Blue	2.0	M6

VLBSG–B55K20



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Blue	22	M8
V	Blue	22	M8
W	Blue	22	M8
E	(Green)	(22)	(M8)
T1	Blue	2.0	M6
T2	Blue	2.0	M6

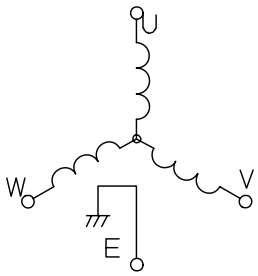
Armature (U, V, W)

Ground (E)

Thermo-switch (T1, T2)

Armature wiring table (Terminal box specification)

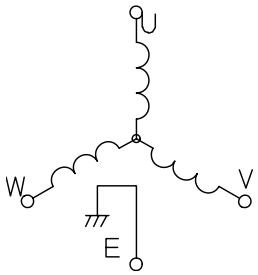
VLBST–04015V
VLBST–05030V



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Red	0.75	None
V	White	0.75	None
W	Blue	0.75	None
E	Green/Yellow	0.75	None

Without terminal box

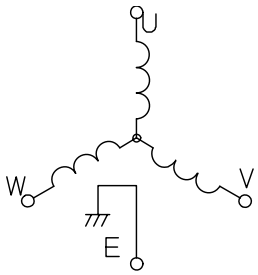
VLBST–08030V



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Red	1.25	None
V	White	1.25	None
W	Blue	1.25	None
E	Green/Yellow	1.25	None

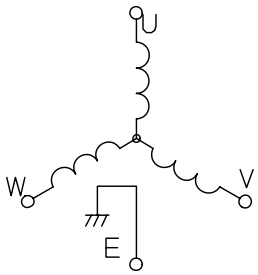
Without terminal box

VLBST–08015V
VLBST–10015V



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Red	1.25	M4
V	White	1.25	M4
W	Blue	1.25	M4
E	(Green/Yellow)	(1.25)	M4

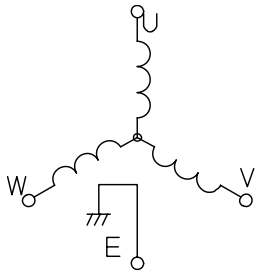
VLBST–15015V
VLBST–14030V
VLBST–18030V



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Red	2	M4
V	White	2	M4
W	Blue	2	M4
E	(Green/Yellow)	(2)	M4

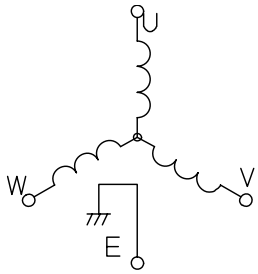
Armature wiring table (Terminal box specification)

VLBST–26015V
VLBST–24030V



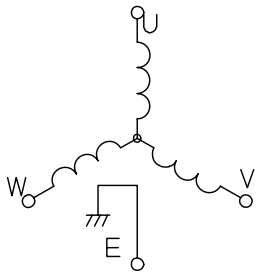
Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Black (mark tube)	3.5	M5
V	Black (mark tube)	3.5	M5
W	Black (mark tube)	3.5	M5
E	(Green/Yellow)	(3.5)	M4

VLBST–37015V
VLBST–37030V



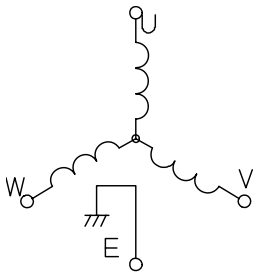
Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Black (mark tube)	5.5	M5
V	Black (mark tube)	5.5	M5
W	Black (mark tube)	5.5	M5
E	(Green/Yellow)	(5.5)	M4

VLBST–50015V
VLBST–55030V



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Black (mark tube)	8	M6
V	Black (mark tube)	8	M6
W	Black (mark tube)	8	M6
E	(Green/Yellow)	(8)	M5

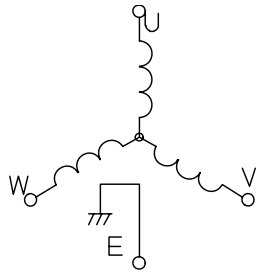
VLBST–65030V



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Black (mark tube)	14	M6
V	Black (mark tube)	14	M6
W	Black (mark tube)	14	M6
E	(Green/Yellow)	(14)	M5

Armature wiring table (Terminal box specification)

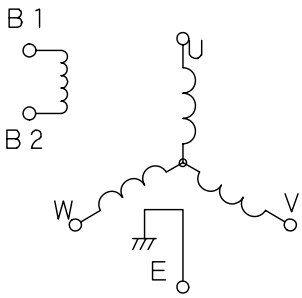
VLBST–75020V
VLBST–10K20V



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Black (mark tube)	14	M6
V	Black (mark tube)	14	M6
W	Black (mark tube)	14	M6
E	(Green/Yellow)	(14)	M6

"Armature + brake" wiring table (Terminal box specification)

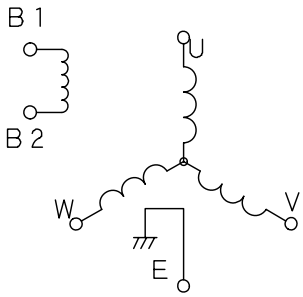
VLBST–04015V–B
VLBST–05030V–B



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Red	0.75	None
V	White	0.75	None
W	Blue	0.75	None
E	Green/Yellow	0.75	None
B1	Black (without polarity)	0.5	None
B2	Black (without polarity)	0.5	None

Without terminal box

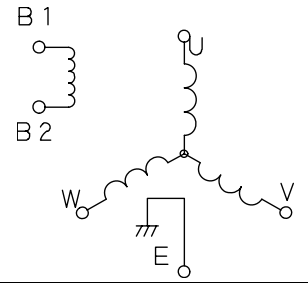
VLBST–08030V–B



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Red	1.25	None
V	White	1.25	None
W	Blue	1.25	None
E	Green/Yellow	1.25	None
B1	Black (without polarity)	0.5	None
B2	Black (without polarity)	0.5	None

Without terminal box

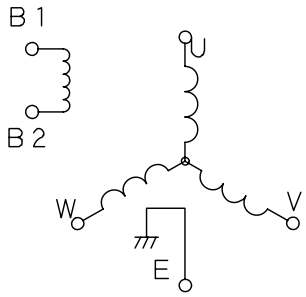
VLBST–08015V–B
VLBST–10015V–B



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Red	1.25	M4
V	White	1.25	M4
W	Blue	1.25	M4
E	(Green/Yellow)	(1.25)	M4
B1	Black (without polarity)	0.5	M4
B2	Black (without polarity)	0.5	M4

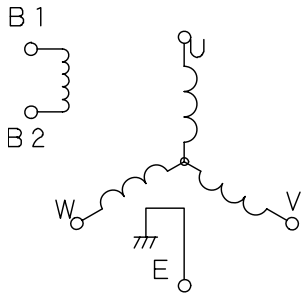
"Armature + brake" wiring table (Terminal box specification)

VLBST–15015V–B
VLBST–14030V–B
VLBST–18030V–B



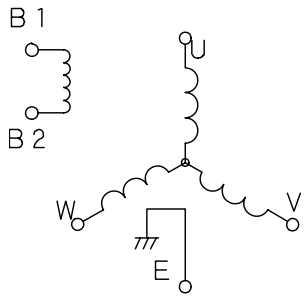
Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Red	2	M4
V	White	2	M4
W	Blue	2	M4
E	(Green/Yellow)	(2)	M4
B1	Black (without polarity)	0.5	M4
B2	Black (without polarity)	0.5	M4

VLBST–24030V–B



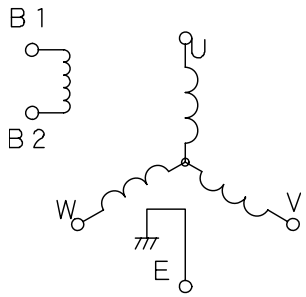
Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Black (mark tube)	3.5	M5
V	Black (mark tube)	3.5	M5
W	Black (mark tube)	3.5	M5
E	(Green/Yellow)	(3.5)	M4
B1	Black (without polarity)	0.5	M4
B2	Black (without polarity)	0.5	M4

VLBST–26015V–B



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Black (mark tube)	3.5	M5
V	Black (mark tube)	3.5	M5
W	Black (mark tube)	3.5	M5
E	(Green/Yellow)	(3.5)	M4
B1	Black (without polarity)	0.75	M4
B2	Black (without polarity)	0.75	M4

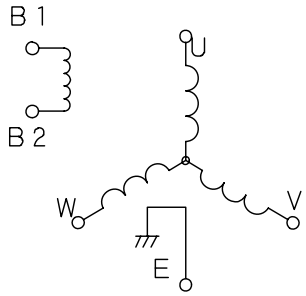
VLBST–37015V–B
VLBST–37030V–B



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Black (mark tube)	5.5	M5
V	Black (mark tube)	5.5	M5
W	Black (mark tube)	5.5	M5
E	(Green/Yellow)	(5.5)	M4
B1	Black (without polarity)	0.75	M4
B2	Black (without polarity)	0.75	M4

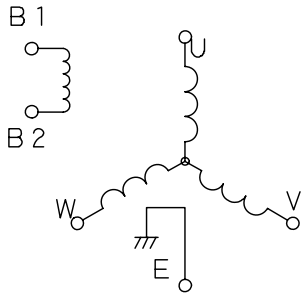
"Armature + brake" wiring table (Terminal box specification)

VLBST–50015V–B
VLBST–55030V–B



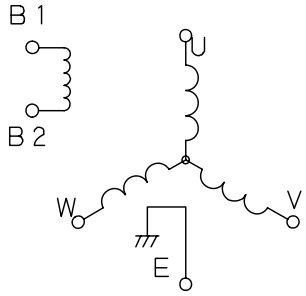
Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Black (mark tube)	8	M6
V	Black (mark tube)	8	M6
W	Black (mark tube)	8	M6
E	(Green/Yellow)	(8)	M5
B1	Black (without polarity)	0.75	M4
B2	Black (without polarity)	0.75	M4

VLBST–65030V–B



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Black (mark tube)	14	M6
V	Black (mark tube)	14	M6
W	Black (mark tube)	14	M6
E	(Green/Yellow)	(14)	M5
B1	Black (without polarity)	0.75	M4
B2	Black (without polarity)	0.75	M4

VLBST–75020V–B
VLBST–10K20V–B



Symbol	Wire color	Wire dia. [mm^2]	Clamp terminal
U	Black (mark tube)	14	M6
V	Black (mark tube)	14	M6
W	Black (mark tube)	14	M6
E	(Green/Yellow)	(14)	M6
B1	Black (without polarity)	0.75	M4
B2	Black (without polarity)	0.75	M4

Armature (U, V, W)

Ground (E)

Brake (B1, B2)

2.3 Grounding

For the wire diameter, refer to the Amplifier Engineering Handbook provided separately.

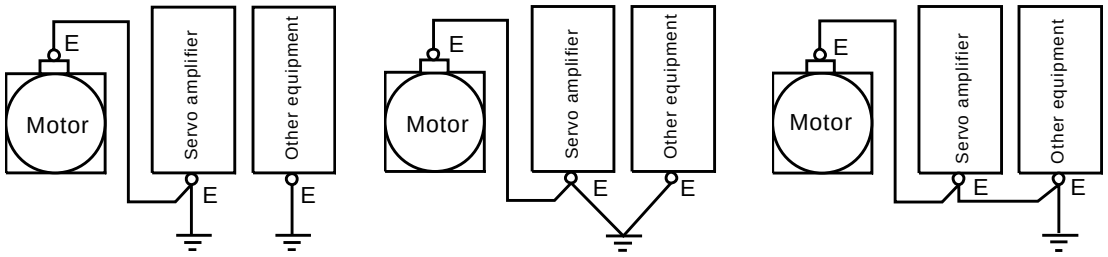
(1) Be sure to perform grounding to assure safety and prevent noise.

(2) Be sure to connect the grounding wire of the servo motor to "⏚" of the servo amplifier.

(3) Perform exclusive grounding with grounding resistance of 100 Ω or less.

(4) Avoid common grounding with a large power equipment, motor, etc.

(5) DO NOT perform grounding to a steel-frame of building, where various equipment are connected.



Exclusive grounding: Good　　Common grounding: Good　　Common grounding: NG

2.4 Sensor

2.4.1 Resolver

(1) The resolver detects the speed and position of motor. It is a very important sensor for controlling the servo motor. As the resolver is factory-adjusted, DO NOT disassemble, adjust or repair it by the user.

(2) Be sure to use an exclusive resolver cable for connecting the resolver between the motor and amplifier. For details on the resolver cable, see the Amplifier Engineering Handbook provided separately.

(3) The connector comes in the two (2) types according to the motor model.

2.4.2 ABS Encoder

(1) The ABS encoder detects the speed and position of motor. It is a very important sensor for controlling the servo motor. As the resolver is factory-adjusted, DO NOT disassemble, adjust or repair it by the user.

(2) Be sure to use an exclusive ABS encoder cable for connecting the ABS encoder between the motor and amplifier. For details on the ABS encoder cable, see the Amplifier Engineering Handbook provided separately.

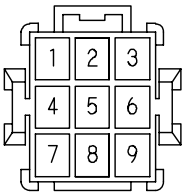
(3) The connector comes in the two (2) types according to the motor model.

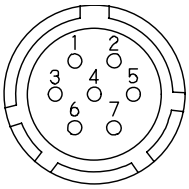
(4) When the ABS encoder cable has been disconnected from the ZA-type motor, alarm AL42 (encoder backup error) and alarm AL32 (home point non-memory error) will generate. When this happens, set the home point again according to the absolute home point setting procedures.
In the standard type motor, no alarm will occur within ten (10) minutes.

Note: The G series motor does not support the ABS encoder.

 **CAUTION**	 Be sure to ground the grounding terminal (E), using an electric wire. Otherwise, you may get an electric shock.

Sensor wiring table (Resolver)

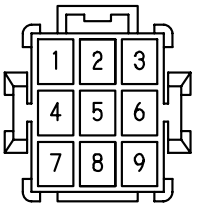
<table>
<tr><th colspan="3">VLBS®–</th><th rowspan="2">Type of connector</th><th rowspan="2">Receptacle wiring table</th></tr>
<tr><th>1500 min^{-1}</th><th>2000 min^{-1}</th><th>3000 min^{-1}</th></tr>
<tr><td></td><td></td><td>V–ZA00330
V–ZA00530
V–ZA01030
V–ZA02030
V–ZA04030
V–ZA06030
V–ZA07530</td><td>Receptacle (motor side) YLR–09V
Pin:
BYM–01T–P0.5A
Plug (cable side)
YLP–09V
Socket:
BYF–01T–P0.5A</td><td>Resolver
 

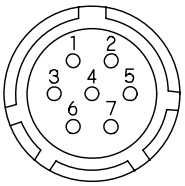
<table>
<tr><th>Pin No.</th><th>Symbol</th></tr>
<tr><td>1</td><td>R1</td></tr>
<tr><td>2</td><td>R2</td></tr>
<tr><td>3</td><td>Without pin</td></tr>
<tr><td>4</td><td>S1</td></tr>
<tr><td>5</td><td>S3</td></tr>
<tr><td>6</td><td>Without pin</td></tr>
<tr><td>7</td><td>S2</td></tr>
<tr><td>8</td><td>S4</td></tr>
<tr><td>9</td><td>Shield</td></tr>
</table></td></tr>
<tr><td>V–05015
V–10015
V–15015
V–20015
V–30015
V–37015
V–50015
V–50015
V–75015
V–ZA11K15
V–ZA14K15
T–04015V
T–08015V
T–10015V
T–15015V
T–26015V
T–37015V
T–50015V</td><td>G–A20K20
G–A33K20
G–B55K20
T–75020V
T–10K20V</td><td>V–10030
V–18030
V–24030
V–30030
V–45030
V–70030
V–10K30
T–05030V
T–08030V
T–14030V
T–18030V
T–24030V
T–37030V
T–55030V
T–65030V</td><td>Receptacle (motor side)
JRC16WRQ–7P
Plug (cable side)
JRC16WPQ–7S
Cable clamp
JRC16WPQ–CP10</td><td>Resolver
 

<table>
<tr><th>Pin No.</th><th>Symbol</th></tr>
<tr><td>1</td><td>R1</td></tr>
<tr><td>2</td><td>R2</td></tr>
<tr><td>3</td><td>S4</td></tr>
<tr><td>4</td><td>Not used</td></tr>
<tr><td>5</td><td>S1</td></tr>
<tr><td>6</td><td>S2</td></tr>
<tr><td>7</td><td>S3</td></tr>
</table></td></tr>
</table>

Use a sensor cable designated by Toshiba Machine.

Sensor wiring table (ABS encoder)

<table>
<tr><th colspan="3">VLBS®–</th><th rowspan="2">Type of connector</th><th rowspan="2">Receptacle wiring table</th></tr>
<tr><th>1500 min^{-1}</th><th>2000 min^{-1}</th><th>3000 min^{-1}</th></tr>
<tr><td></td><td></td><td>V–ZA00330S1
V–ZA00530S1
V–ZA01030S1
V–ZA02030S1
V–ZA04030S1
V–ZA06030S1
V–ZA07530S1</td><td>Receptacle (motor side)
YLR–09V
Pin:
BYM–01T–P0.5A
Plug (cable side)
YLP–09V
Socket:
BYF–01T–P0.5A</td><td>ABS encoder
 

<table>
<tr><th>Pin No.</th><th>Symbol</th></tr>
<tr><td>1</td><td>Without pin</td></tr>
<tr><td>2</td><td>+5 V</td></tr>
<tr><td>3</td><td>GND</td></tr>
<tr><td>4</td><td>Without pin</td></tr>
<tr><td>5</td><td>V8</td></tr>
<tr><td>6</td><td>GND</td></tr>
<tr><td>7</td><td>SD/RQ</td></tr>
<tr><td>8</td><td>$\overline{\text{SD/RQ}}$</td></tr>
<tr><td>9</td><td>Shield</td></tr>
</table></td></tr>
<tr><td>V–05015S1
V–10015S1
V–15015S1
V–20015S1
V–30015S1
V–37015S1
V–50015S1
V–50015S1
V–75015S1
V–ZA11K15S1
V–ZA14K15S1</td><td></td><td>V–10030S1
V–18030S1
V–24030S1
V–30030S1
V–45030S1
V–70030S1
V–10K30S1</td><td>Receptacle (motor side)
JRC16WRQ–7P
Plug (cable side)
JRC16WPQ–7S
Cable clamp
JRC16WPQ–CP10</td><td>ABS encoder
 

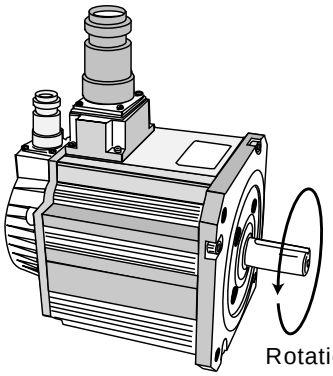
<table>
<tr><th>Pin No.</th><th>Symbol</th></tr>
<tr><td>1</td><td>GND</td></tr>
<tr><td>2</td><td>DC +5 V</td></tr>
<tr><td>3</td><td>GND</td></tr>
<tr><td>4</td><td>VB</td></tr>
<tr><td>5</td><td>CASE GND/Shield</td></tr>
<tr><td>6</td><td>SD</td></tr>
<tr><td>7</td><td>$\overline{\text{SD}}$</td></tr>
</table></td></tr>
</table>

Use a sensor cable designated by Toshiba Machine.

CAUTION	Perform wiring properly and exactly. Otherwise, the motor may be uncontrollable, or you may get injured.

2.5 Operation

When performing a test operation, operate the motor independently without linking it to the machine. When the motor has to be connected with the machine, however, make sure beforehand that emergency stop can be effected at any time.



Rotation in forward direction

(1) Before starting the test operation, perform check on the following points.

- Make sure that all bolts and screws are tightened completely.
- Make sure that the wiring is performed correctly.

(2) Operate the motor at a low speed independently and make sure that the revolving direction is correct.
When the positive voltage or forward pulse is input by the speed command, the counterclockwise (CCW) direction as viewed from the motor shaft side is taken as the forward direction.

(3) While the motor is connected to the machine, operate the motor for a short time (one (1) or two (2) hours) and check for the vibration, noise, heat generation and temperature rise of the bearing. (When the motor is equipped with a brake, sliding noise of the brake disc may be heard. This poses no problem, however.)
If an error occurred, operate the motor independently, and you can identify where the trouble results from the motor side or machine side.

* In the BS series servo system, test operation can be executed with only the setting in the servo amplifier even if there is no external signal, after the power supply, motor armature and resolver cable are connected.

! CAUTION

1. Use a specified combination of motor and amplifier. Set the legal motor code for the servo amplifier parameter. Otherwise, a fire or malfunction may be caused.
2. NEVER adjust or change the motor excessively. Otherwise, the operation will be unstable and you may get injured.
3. Before rotating the motor alone, remove the key which is set temporarily to the output shaft. Otherwise, it will fly out and you may get injured.

4. Perform a test run to confirm the operation with the motor secured and disconnected from the machine. Then mount the motor on the machine. Otherwise, you may get injured.
5. The holding brake will not serve as a stop device to assure the machine safety. Provide a stop device on the machine side to assure safety. Otherwise, you may get injured.
6. At alarm generation, remove the cause of the trouble, reset the alarm after assuring safety, and resume the operation. Otherwise, you may get injured.
7. After the power supply is restored following momentary power failure, DO NOT approach the machine because it may restart suddenly. Otherwise, you may get injured.
8. Make sure that the power specifications are as designated. Otherwise, the motor failure may be caused.

1. The brake built in the motor is used for holding purpose. DO NOT use it for normal braking purpose.

1. Provide an emergency stop circuit on the outside so that you can immediately stop the operation and turn off the power. Otherwise, you may get injured.

Options	Section 3

3.1 Brake (Holding Brake) VLBS©–©©©©©–B

The brake of BS series servo motor is a slim type dry non-excited electromagnetic brake. Use it for preventing the vertical shaft from falling and for holding the horizontal shaft at power OFF.

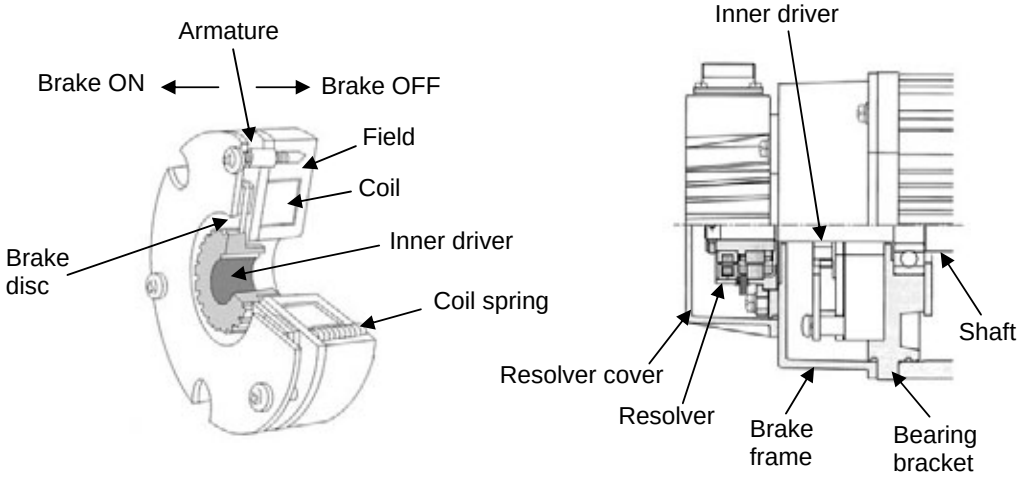
(1) Construction

The electromagnetic brake compresses the brake disc with a coil spring, and its frictional force causes the holding torque.

[1] Once the coil is charged, the armature which is compressed against the brake disc is pulled by the field core, resulting in release of the brake.

[2] When the exciting current of the coil is cut off, pressure of the coil spring causes the armature to be compressed against the brake disc, turning on the brake.

Reference drawing (RNB)



CAUTION	The holding brake will not serve as a stop device to assure the machine safety. Provide a stop device on the machine side to assure safety. Otherwise, you may get injured.

(2) Table of performance

Motor VLBSV–©–B		Type of brake	Static friction torque	Rotor inertia $GD^2/4$	Coil (20°C)				Pulling time	Release time	Max. backlash	Mass of brake
					Voltage	Current	Resistance	Capacity				
			N·m	$\times 10^{-4}$ kg·m^2	V	A	Ω	W	ms	ms	°	kg
ZA00330		KS-30B	0.32	0.03	24	0.19	115	4	40	20	1	0.2
ZA00530												
ZA01030												
ZA02030		KS-50B	1.27	0.1	24	0.35	64	8	50	20	1	0.5
ZA04030												
ZA06030		KS–70B	2.39	0.24	24	0.33	73.5	8	60	30	1	0.9
ZA07530												
ZA11K15		HBD-190-1500	150	33	24	1.59	15	39	300	100	0.5	13
ZA14K15												
5015	10030	RNB 0.8G-27	7.84	0.675	24	0.63	38	15	55	15	0.54	2.0
10015	18030											
15015	24030											
20015	30030	RNB 1.6G-18	15.7	2.85	24	0.76	32	18	70	25	0.47	2.7
30015	45030											
50015	70030	RNB3G-12	29.4	3.0	24	0.96	25	23	100	35	0.41	4.4
75015	10K30	RNB5G-10	49	5.75	24	1.13	21	27	120	50	0.41	7.0

Motor VLBST–©–B		Type of brake	Static friction torque	Rotor inertia $GD^2/4$	Coil (20°C)				Pulling time	Release time	Max. backlash	Mass of brake
					Voltage	Current	Resistance	Capacity				
			N·m	$\times 10^{-4}$ kg·m^2	V	A	Ω	W	ms	ms	°	kg
04015V	05030V 08030V	RNB 0.2G–11	1.96	0.185	24	0.41	59	10	35	12	0.71	0.8
08015V	14030V	RNB 0.8G–27	7.84	0.675	24	0.63	38	15	55	15	0.54	2
10015V	18030V											
15015V	24030V											
26015V	37030V	RNB 3G–12	29.4	3.0	24	0.96	25	23	100	35	0.41	4
37015V	55030V											
50015V	65030V											
75020V		RNB 10G–05	98	13	24	1.37	17.5	33	180	65	0.6	11
10K20V												

Note 1: The rotor inertia in the above tables is expressed in $GD^2/4$.

Note 2: To obtain the inertia converted into the motor shaft, convert the brake rotor inertia to the standard motor rotor inertia.

Note 3: To obtain the motor mass with brake, convert the brake mass to the standard motor mass.

Note 4: When the brake is used for the speed control, brake gap will widen due to wear, which cannot be adjusted, however, because the motor is of a closed construction type.

Note 5: For the outer dimensions, see Section 4.

⚠ **CAUTION**	⚠ The holding brake will not serve as a stop device to assure the machine safety. Provide a stop device on the machine side to assure safety. Otherwise, you may get injured.

3.2 Reduction Gear VLBS©–©©©©©–G

The HPG-series reduction gear, Able reduction gear or Coronet reduction gear is standardly equipped. For the Cyclo reduction gear and VIS reduction gear, consult with us as necessary. Loss torque of the reduction gear maximizes at the start and reduces with lapse of the time. The output torque data shown in the table below are obtained half an hour after the operation.

3.2.1 Reduction Gear for Standard Motor

- Able reduction gear made by NIDEC-SHIMPO

(1) Able reduction gear (standard backlash)

Motor model VLBSV–	Reduction ratio	Type of reduction gear	Rated output torque [N·m]	Max. speed of output shaft [min^{-1}]	Reduction gear $GD^2/4$ (converted into input shaft) $\times 10^{-4}$ [$kg \cdot m^2$]
05015	1/3	VRSF-3D-SEC	7.55	500	2.43
	1/5	VRSF-5D-SEC	13.4	300	1.85
	1/9	VRSF–S9E-SEC	20.0	167	2.81
	1/15	VRSF–15E-SEC	33.3	100	2.80
	1/25	VRSF–25E-SEC	55.7	60	1.88
10015	1/3	VRSF-3D-SEC	17.2	500	2.43
	1/5	VRSF-5E-SEC	23.8	300	3.50
	1/9	VRSF–S9E-SEC	48.6	167	2.81
	1/15	VRSF–15E-SEC	81.0	100	2.80
	1/25	VRKF–25F-TEC	134	60	2.80
15015	1/3	VRSF-3E-SED	23.7	500	5.50
	1/5	VRSF-5E-SED	39.6	300	3.48
	1/9	VRSF–S9E-SED	73.0	167	2.77
	1/15	VRKF–15F-TED	122	100	3.53
	1/25	VRKF–25G-TED	178	60	3.98
20015	1/3	VRSF-3E-SFE	33.1	500	5.78
	1/5	VRSF-5E-SFE	55.3	300	3.75
	1/9	VRKF-9F-TFE	92.7	167	3.75
	1/15	VRKF-15G-TFE	154	100	3.53
	1/25	VRXF-25G-TFE	257	60	3.98
10030	1/3	VRSF-3D-SEC	7.55	1000	2.43
	1/5	VRSF-5D-SEC	13.4	600	1.85
	1/9	VRSF-S9E-SEC	20.0	333	2.81
	1/15	VRSF-15E-SEC	33.3	200	2.80
	1/25	VRSF-25E-SEC	55.7	120	1.88

Motor model VLBSV–	Reduction ratio	Type of reduction gear	Rated output torque [N·m]	Max. speed of output shaft [min^{-1}]	Reduction gear $GD^2/4$ (converted into input shaft) $\times 10^{-4}$ [$kg \cdot m^2$]
18030	1/3	VRSF-3D-SEC	15.2	1000	2.43
	1/5	VRSF-5E-SEC	20.3	600	3.50
	1/9	VRSF-S9E-SEC	42.9	333	2.81
	1/15	VRSF-15E-SEC	71.5	200	2.80
	1/25	VRKF-25F-TEC	119	120	2.80
24030	1/3	VRSF-3E-SED	18.1	1000	5.50
	1/5	VRSF-5E-SED	29.9	600	3.48
	1/9	VRSF-S9E-SED	58.4	333	2.77
	1/15	VRKF-15F-TED	93.0	200	3.53
	1/25	VRKF-25G-TED	131	120	3.98
30030	1/3	VRSF-3E-SFE	23.7	1000	5.78
	1/5	VRSF-5E-SFE	39.6	600	3.75
	1/9	VRSF-S9E-SFE	73.0	333	2.77
	1/15	VRKF-15F-TFE	122	200	3.53
	1/25	VRKF-25G-TFE	178	120	3.98
45030	1/3	VRSF-3E-SFE	37.7	1000	5.78
	1/5	VRKF-5F-TFE	62.9	600	5.70
	1/9	VRKF-9F-TFE	107	333	6.95
	1/15	VRKF-15G-TFE	117	200	5.00
	1/25	VRKF-25G-TFE	297	120	3.98

- VR®F–®®® (reduction ratio·frame number)–®®® (type number)
- Backlash: 0.25° or less for frames D and E.
  0.5° or less for frames F and G.
- Lubrication: Grease-lubrication for all types.
- The revolving direction of the output shaft is the same as that of the input shaft.
- Combinations in the shaded areas have low efficiency.

(2) Able reduction gear (low backlash)

Motor model VLBSV–	Reduction ratio	Type of reduction gear VRSF–LB–	Rated output torque [N·m]	Max. speed of output shaft [min^{-1}]	Reduction gear $GD^2/4$ (converted into input shaft) $\times 10^{-4}$ [$kg \cdot m^2$]
05015	1/3	3D-SEC	7.55	500	2.43
	1/5	5D-SEC	13.4	300	1.85
	1/9	S9E-SEC	20.0	167	2.81
	1/15	15E-SEC	33.3	100	2.80
	1/25	25E-SEC	55.7	60	1.88
10015	1/3	3D-SEC	17.2	500	2.43
	1/5	5E-SEC	23.8	300	3.50
	1/9	S9E-SEC	48.6	167	2.81
	1/15	15E-SEC	81.0	100	2.80
15015	1/3	3E-SED	23.7	500	5.50
	1/5	5E-SED	39.6	300	3.48
	1/9	S9E-SED	73.0	167	2.77
20015	1/3	3E-SFE	33.1	500	5.78
	1/5	5E-SFE	55.3	300	3.75
10030	1/3	3D-SEC	7.55	1000	2.43
	1/5	5D-SEC	13.4	600	1.85
	1/9	S9E-SEC	20.0	333	2.81
	1/15	15E-SEC	33.3	200	2.80
	1/25	25E-SEC	55.7	120	1.88
18030	1/3	3D-SEC	15.2	1000	2.43
	1/5	5E-SEC	20.3	600	3.50
	1/9	S9E-SEC	42.9	333	2.81
	1/15	15E-SEC	71.5	200	2.80
24030	1/3	3E-SED	18.1	1000	5.50
	1/5	5E-SED	29.9	600	3.48
	1/9	S9E-SED	58.4	333	2.77
30030	1/3	3E-SFE	23.7	1000	5.78
	1/5	5E-SFE	39.6	600	3.75
	1/9	S9E-SFE	73.0	333	2.77
45030	1/3	3E-SFE	37.7	1000	5.78

- VRSF–LB–®®® (reduction ratio·frame number)–®®® (type number)
- Backlash: 0.08° or less.
- Lubrication: Grease-lubrication for all types.
- The revolving direction of the output shaft is the same as that of the input shaft.
- Combinations in the shaded areas have low efficiency.

- Coronet reduction gear made by NIDEC-SHIMPO
  Motors larger than VLBSV–05015 can employ the Coronet reduction gear made by NIDEC SHIMPO.

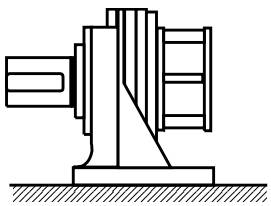
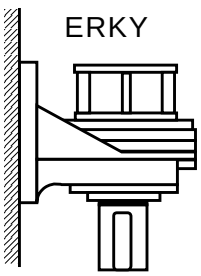
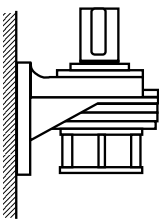
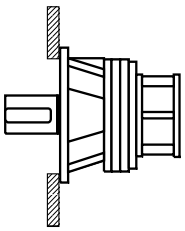
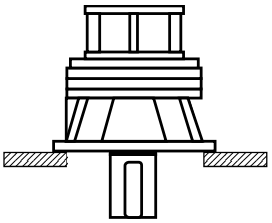
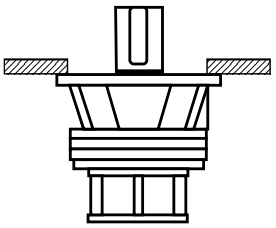
  The type of reduction gear which can be used in combination with the BS servo motor is:

  ERK ®–®®–®®®®–®®®®®
  [1] [2] [3] [4] [5]

  [1] Profile
  [2] Backlash Blank: Standard NB: No backlash
  [3] Reduction ratio 3 ~ 71
  [4] Frame No. B, C, D, NE, NF
  [5] Type No. TEC, TED, TFE, TFF

  This reduction gear comes in the two (2) types (standard type and no backlash type) according to the backlash specifications.

(1) Profile of reduction gear

	Horizontal type (Output shaft facing sideways)	Vertical type (Output shaft facing downward)	Inverted type (Output shaft facing upward)
With base	ERK 	ERKY 	ERKZ 
With flange	ERKX 	ERKV 	ERKI 

For the external view, see Section 4.

(2) Coronet reduction gear (standard backlash)

Motor model VLBSV–	Reduction ratio	Type of reduction gear ERK®–	Rated output torque [N·m]	Max. speed of output shaft [min^{-1}]	Reduction gear $GD^2/4$ (converted into input shaft) $\times 10^{-4}$ [$kg \cdot m^2$]	
05015	1/3	3C-TEC	7.84	496	12.2	*
	1/6	6C-TEC	15.1	257	3.03	*
	1/11	11B-TEC	31.6	136	0.70	
	1/17	17B-TEC	48.7	88	0.98	
	1/29	29C-TEC	75.1	52	4.18	
	1/35	35C-TEC	90.6	43	4.15	
	1/47	47C-TEC	122	32	4.10	
	1/59	59C-TEC	153	25	4.10	
10015	1/3	3C-TEC	17.3	496	12.2	*
	1/6	6C-TEC	33.4	257	3.03	*
	1/11	11C-TEC	63.0	136	3.10	
	1/17	17C-TEC	97.3	88	3.43	
	1/29	29C-TEC	167	52	4.18	
	1/35	35D-TEC	180	43	11.8	
	1/47	47D-TEC	242	32	11.8	
	1/59	59D-TEC	304	25	11.5	
	1/71	71D-TEC	366	21	11.5	
15015	1/3	3D-TED	25.2	496	31.5	*
	1/6	6D-TED	50.0	250	9.18	*
	1/11	11C-TED	94.5	136	3.10	
	1/17	17C-TED	146	88	3.43	
	1/29	29D-TED	242	52	12.0	
	1/35	65D-TED	292	43	11.8	
	1/47	47D-TED	392	32	11.8	
20015	1/3	3D-TFE	34.6	496	31.5	*
	1/6	6D-TFE	68.7	250	9.18	*
	1/11	11D-TFE	126	136	7.75	
	1/17	17D-TFE	195	88	11.0	
	1/29	29D-TFE	332	52	12.0	
	1/35	35NE-TFE	353	43	49.0	
	1/47	47NE-TFE	473	32	48.5	
	1/59	59NE-TFE	595	25	48.3	
	1/71	71NE-TFE	715	21	48.0	
30015	1/3	3D-TFE	51.8	496	31.5	*
	1/6	6NE-TFE	100	257	39.0	*
	1/11	11D-TFE	189	136	7.75	
	1/17	17D-TFE	292	88	11.0	

Motor model VLBSV–	Reduction ratio	Type of reduction gear ERK®–	Rated output torque [N·m]	Max. speed of output shaft [min^{-1}]	Reduction gear $GD^2/4$ (converted into input shaft) $\times 10^{-4}$ [$kg \cdot m^2$]	
30015	1/29	29NE-TFE	477	52	49.5	
	1/35	35NE-TFE	575	43	49.0	
	1/47	47NE-TFE	773	32	48.5	
	1/59	59NE-TFE	970	25	48.3	
50015	1/3	3NE-TFF	86.4	496	121	*
	1/6	6NE-TFF	167	257	39.0	*
	1/11	11NE-TFF	315	136	31.5	
	1/17	17NE-TFF	487	88	52.5	
	1/29	29NE-TFF	830	52	49.5	
	1/35	35NE-TFF	1000	43	49.0	
	1/47	47NF-TFF	1210	32	128	
	1/59	59NF-TFF	1520	25	125	
	1/71	71NF-TFF	1820	21	125	
75015	1/6	6NF-TFF	265	243	111	*
	1/11	11NE-TFF	472	136	31.5	
	1/17	17NE-TFF	730	88	52.5	
	1/29	29NF-TFF	1210	52	130	
	1/35	35NF-TFF	1460	43	128	
	1/47	47NF-TFF	1960	32	128	

- The reduction ratio of 1/3 and 1/6 as marked * is the nominal reduction ratio. The real reduction ratio is as follows:
  3C = 130/43, 3D = 124/41, 3NE = 130/43
  6C = 105/18, 6D = 102/17, 6NE = 105/18, 6NF = 111/18
- Backlash: 0.5° or less for reduction ratio of 1/3 and 1/6.
  1.3° or less for reduction ratio of 1/11 to 1/71 inclusive.
- Lubrication: Grease-lubrication for all types. (Designation of the mounting profile is required.)
- When the reduction ratio is 1/3 or 1/6, the revolving direction of the output shaft is the same as that of the input shaft. When it is 1/11 through 1/71, the revolving direction of the output shaft is reverse to that of the input shaft.
- Continuous operation is not permitted for the combinations in the shaded areas (NE and NF frames). (For details, see Para. (4) below.)

(3) Coronet reduction gear (no backlash)

Motor model VLBSV–	Reduction ratio	Type of reduction gear ERK®–NB–	Rated output torque [N·m]	Max. speed of output shaft [min^{-1}]	Reduction gear $GD^2/4$ (converted into input shaft) $\times 10^{-4}$ [$kg \cdot m^2$]
05015	1/11	11C-TEC	27.3	136	3.10
	1/17	17C-TEC	42.3	88	3.43
	1/29	29C-TEC	72.5	52	4.18
	1/35	35C-TEC	87.5	43	4.15
10015	1/11	11C-TEC	62.4	136	3.10
	1/17	17D-TEC	83.8	88	11.0
	1/29	29D-TEC	143	52	12.0
	1/35	35D-TEC	172	43	11.8
15015	1/11	11D-TED	89.3	136	7.75
	1/17	17D-TED	138	88	11.0
20015	1/11	11D-TFE	124	136	7.75
	1/17	17D-TFE	192	88	11.0
	1/29	29NE-TFE	284	52	49.5
	1/35	35NE-TFE	343	43	49.0
	1/47	47NE-TFE	460	32	48.5
30015	1/11	11NE-TFE	177	136	31.5
	1/17	17NE-TFE	274	88	52.5
	1/29	29NE-TFE	468	52	49.5
	1/35	35NE-TFE	565	43	49.0
50015	1/11	11NE-TFF	315	136	31.5
	1/17	17NE-TFF	487	88	52.5
75015	1/11	11NF-TFF	416	136	87.5
	1/17	17NF-TFF	642	88	75.0

- Backlash: 0.1° or less
- Lubrication: Grease-lubrication for all types. (Designation of the mounting profile is required.)
- The revolving direction of the output shaft is reverse to that of the input shaft.
- Continuous operation is not permitted for the combinations in the shaded areas (NE and NF frames). (For details, see Para. (4) below.)

(4) Continuous operation

a. Conditions for continuous operation
The range in which continuous operation is possible is tabled below for each frame number of the Coronet reduction gear.

Frame No.	Range in which continuous operation is possible	Ref. (Permissible input revolution speed)
B	2,000 min^{-1} or less	3,600 min^{-1}
C	2,000 min^{-1} or less	3,600 min^{-1}
D	1,500 min^{-1} or less	3,000 min^{-1}
NE	Continuous operation is not permitted.	2,000 min^{-1}
NF	Continuous operation is not permitted.	2,000 min^{-1}

b. %ED (Load time ratio)

- In other than the above range in which continuous operation is possible, the load time ratio is 50 %ED or less of ten (10)-minute cycle.
  The load time ratio is the ratio of the operation time to the one (1)-cycle operation time including the motor stop time.

- The load time ratio can be figured out from the following equation.

  Load time ratio (%ED)
  = Operation time / (Operation time + Stop time) × 100 (%)

  * One (1) cycle (operation time + stop time) should be ten (10) minutes or less.

c. Operating conditions other than the above

- The above specification is valid when the servo motor is not provided with a fan and any cooling effect from the outside cannot be expected.
- When operating the reduction gear continuously in other than the above operation range, forced-air cooling of the same gear is necessary. Cool the reduction gear, using an air blower, etc., so that the surface temperature of the reduction gear can be the "ambient temperature + 50°C" or less.
- When operating the reduction gear for only one (1) hour per day, continuous operation may be possible. It differs with each case, however, consult with us.

(5) Others

- The input revolution speed of reduction gear should be slower than the rated revolution speed of motor.
- In principle, the motor of 3,000 min^{-1} rating cannot use the Coronet reduction gear.
- The permissible load exerted on the shaft differs with the frame number and reduction ratio. Consult with us.
- The loss torque of reduction gear is maximized at the start, which reduces with lapse of the time. The output torque given in the table is calculated based on the value obtained after half-an-hour operation.
- The ambient temperature of the motor with reduction gear is 0 ~ +40°C.
- The lubrication oil should be replaced every 3,000 hours.

Recommended lubrication oil

	Frame number	A ~ C	D ~ NF
	Consistency, viscosity	JIS K2219 gear oil, for industrial use, grade 2 ISO VG100	JIS K2219 gear oil, for industrial use, grade 2 ISO VG220
*	Idemitsu Kosan	Daphne Super Gear Oil 100	Daphne Super Gear Oil 220
	General	SP Gear Roll 100	SP Gear Roll 220
	Mobil Oil	Mobil Gear 629	Mobil Gear 630
	Esso	Spartan EP150	Spartan EP220
	Shell	Omala Oil 100	Omala Oil 220

The lubrication oil marked * is the factory-filled standard oil.

3.2.2 Reduction Gear for ZA-Type Motor

- HPG-series reduction gear made by Harmonic Drive Systems

Motor model VLBSV–	Reduction ratio	Type of reduction gear HPG–	Rated output torque [N·m]	Max. speed of output shaft [min^{-1}]	Reduction gear $GD^2/4$ (converted into input shaft) $\times 10^{-4}$ [$kg \cdot m^2$]
ZA00530	1/5	14A-05-J6ABJ	0.27	600	0.073
	1/11	14A-11-J6ABK	1.10	273	0.060
	1/21	14A-21-J6ABK	2.50	143	0.050
	1/33	14A-33-J6ABL	4.24	91	0.044
	1/45	14A-45-J6ABL	5.80	67	0.044
ZA01030	1/5	14A-05-J6ABJ	1.04	600	0.073
	1/11	14A-11-J6ABK	2.73	273	0.060
	1/21	14A-21-J6ABK	5.69	143	0.050
	1/33	20A-33-J6JBLA	8.09	91	0.065
	1/45	20A-45-J6JBLA	11.0	67	0.063
ZA02030	1/5	14A-05-J6AZW	2.48	600	0.089
	1/11	14A-11-J6AZX	6.03	273	0.077
	1/21	20A-21-J6GCK	11.1	143	0.49
	1/33	20A-33-J6GCL	18.3	91	0.45
	1/45	20A-45-J6GCL	25.1	67	0.45
ZA04030	1/5	20A-05-J6GCJ	4.71	600	0.70
	1/11	20A-11-J6GCK	12.1	273	0.57
	1/21	20A-21-J6GCK	24.1	143	0.49
	1/33	32A-33-J6NDLA	36.2	91	0.62
	1/45	32A-45-J6NDLA	49.1	67	0.61
ZA06030	1/5	20A-05-J6HBO	7.84	600	0.68
	1/11	20A-11-J6HBP	18.7	273	0.56
	1/21	32A-21-J6NCI	34.1	143	3.0
	1/33	32A-33-J6NCJ	56.1	91	2.7
	1/45	32A-45-J6NCJ	76.5	67	2.7
ZA07530	1/5	20A-05-J6HBO	9.80	600	0.68
	1/11	20A-11-J6HBP	23.1	273	0.56
	1/21	32A-21-J6NCI	40.2	143	3.0
	1/33	32A-33-J6NCJ	67.0	91	2.7
	1/45	32A-45-J6NCJ	91.4	67	2.7

- Backlash: Three (3) minutes or less
- Lubrication: Grease-lubrication for all types.
- The revolving direction of the output shaft is the same as that of the input shaft.
- Also designed for flange output (without output shaft). Consult with us.
- Combinations in the shaded areas have low efficiency.

- Able reduction gear made by NIDEC-SHIMPO

(1) Able reduction gear (standard backlash)

Motor model VLBSV–	Reduction ratio	Type of reduction gear	Rated output torque [N·m]	Max. speed of output shaft [min^{-1}]	Reduction gear $GD^2/4$ (converted into input shaft) $\times 10^{-4}$ [$kg \cdot m^2$]
ZA00530	1/3	VRKF-3B-SAA	0.25	1000	0.058
	1/5	VRKF-58-SAA	0.51	600	0.040
	1/9	VRKF-S9B-SAA	0.92	333	0.035
	1/15	VRKF-15B-SAA	1.67	200	0.035
	1/25	VRKF-25B-SAA	2.74	120	0.033
ZA01030	1/3	VRKF-3B-SAA	0.72	1000	0.058
	1/5	VRKF-5B-SAA	1.18	600	0.040
	1/9	VRKF-S9B-SAA	2.25	333	0.035
	1/15	VRKF-15B-SAA	3.72	200	0.035
	1/25	VRKF-25C-SAA	6.27	120	0.038
ZA02030	1/3	VRSF-3B-SBB	1.47	1000	0.135
	1/5	VRSF-5B-SBB	2.65	600	0.118
	1/9	VRSF-S9C-SBB	3.72	333	0.275
	1/15	VRSF-15C-SBB	6.27	200	0.300
	1/25	VRSF-25C-SBB	11.1	120	0.288
ZA04030	1/3	VRSF-3B-SBB	3.43	1000	0.145
	1/5	VRSF-5C-SBB	5.39	600	0.363
	1/9	VRSF-S9C-SBB	9.51	333	0.275
	1/15	VRSF-15C-SBB	15.8	200	0.300
	1/25	VRSF-25D-SBB	26.4	120	0.300
ZA06030	1/3	VRSF-3C-SCC	5.00	1000	0.913
	1/5	VRSF-5C-SCC	8.33	600	0.713
	1/9	VRSF-S9D-SCC	13.9	333	0.650
	1/15	VRSF-15D-SCC	23.1	200	0.700
	1/25	VRSF-25E-SCC	38.6	120	0.700
ZA07530	1/3	VRSF-3C-SCC	6.37	1000	0.913
	1/5	VRSF-5C-SCC	10.7	600	0.713
	1/9	VRSF-S9D-SCC	18.2	333	0.650
	1/15	VRSF-15D-SCC	30.4	200	0.700
	1/25	VRSF-25E-SCC	50.7	120	0.700

- VR®F–®®® (reduction ratio·frame number)–®®® (type number)
- Backlash: 0.25° or less
- Lubrication: Grease-lubrication for all types.
- The revolving direction of the output shaft is the same as that of the input shaft.
- Combinations in the shaded areas have low efficiency.

(2) Able reduction gear (low backlash)

Motor model VLBSV–	Reduction ratio	Type of reduction gear	Rated output torque [N·m]	Max. speed of output shaft [min^{-1}]	Reduction gear $GD^2/4$ (converted into input shaft) $\times 10^{-4}$ [$kg \cdot m^2$]
ZA00530	1/3	VRKF-LB-3B-SAA	0.25	1000	0.058
	1/5	VRKF-LB-5B-SAA	0.51	600	0.040
	1/9	VRKF-LB-S9B-SAA	0.92	333	0.035
	1/15	VRKF-LB-15B-SAA	1.67	200	0.035
	1/25	VRKF-LB-25B-SAA	2.74	120	0.033
ZA01030	1/3	VRKF-LB-3B-SAA	0.72	1000	0.058
	1/5	VRKF-LB-5B-SAA	1.18	600	0.040
	1/9	VRKF-LB-S9B-SAA	2.25	333	0.035
	1/15	VRKF-LB-15B-SAA	3.72	200	0.035
	1/25	VRKF-LB-25C-SAA	6.27	120	0.038
ZA02030	1/3	VRSF-LB-3B-SBB	1.47	1000	0.135
	1/5	VRSF-LB--5B-SBB	2.65	600	0.118
	1/9	VRSF-LB-S9C-SBB	3.72	333	0.275
	1/15	VRSF-LB-15C-SBB	6.27	200	0.300
	1/25	VRSF-LB-25C-SBB	11.1	120	0.288
ZA04030	1/3	VRSF-LB-3B-SBB	3.43	1000	0.145
	1/5	VRSF-LB-5C-SBB	5.39	600	0.363
	1/9	VRSF-LB-S9C-SBB	9.51	333	0.275
	1/15	VRSF-LB-15C-SBB	15.8	200	0.300
	1/25	VRSF-LB-25D-SBB	26.4	120	0.300
ZA06030	1/3	VRSF-LB-3C-SCC	5.00	1000	0.913
	1/5	VRSF-LB--5C-SCC	8.33	600	0.713
	1/9	VRSF-LB-S9D-SCC	13.9	333	0.650
	1/15	VRSF-LB-15D-SCC	23.1	200	0.700
	1/25	VRSF-LB-25E-SCC	38.6	120	0.700
ZA07530	1/3	VRSF-LB-3C-SCC	6.37	1000	0.913
	1/5	VRSF-LB-5C-SCC	10.7	600	0.713
	1/9	VRSF-LB-S9D-SCC	18.2	333	0.650
	1/15	VRSF-LB-15D-SCC	30.4	200	0.700
	1/25	VRSF-LB-25E-SCC	50.7	120	0.700

- VR®F–LB–®®® (reduction ratio·frame number)–®®® (type number)
- Backlash: 0.166° or less for frame B.
  0.08° or less for frames C, D and E.
- Lubrication: Grease-lubrication for all types.
- The revolving direction of the output shaft is the same as that of the input shaft.
- Combinations in the shaded areas have low efficiency.

- Able reduction gear made by NIDEC-SHIMPO

(1) Able reduction gear (standard backlash)

Motor model VLBST–	Reduction ratio	Type of reduction gear	Rated output torque [N·m]	Max. speed of output shaft [min^{-1}]	Reduction gear $GD^2/4$ (converted into input shaft) $\times 10^{-4}$ [$kg \cdot m^2$]
04015V	1/3	VRSF-3C-SDC	6.86	500	0.91
	1/5	VRSF-5C-SDC	11.5	300	0.71
	1/9	VRSF-S9D-SDC	18.2	167	0.65
	1/15	VRSF-15D-SDC	30.4	100	0.70
	1/25	VRSF-25E-SDC	50.7	60	0.70
08015V	1/3	VRSF-3D-SEC	12.9	500	2.43
	1/5	VRSF-5D-SEC	22.6	300	1.85
	1/9	VRSF-S9E-SEC	32.0	167	2.81
	1/15	VRSF-15E-SEC	58.7	100	2.80
	1/25	VRKF-25F-TEH	104	60	2.80
10015V	1/3	VRSF-3D-SEC	17.2	500	2.43
	1/5	VRSF-5E-SEC	23.8	300	3.50
	1/9	VRSF-S9E-SEC	48.6	167	2.81
	1/15	VRSF-15E-SEC	81.0	100	2.80
	1/25	VRKF-25F-TEH	134	60	2.80
15015V	1/3	VRSF-3E-SED	23.7	500	5.50
	1/5	VRSF-5E-SED	39.6	300	3.48
	1/9	VRSF-S9E-SED	73.0	167	2.77
	1/15	VRKF-15F-TED	122	100	3.53
	1/25	VRKF-25G-TED	178	60	3.98
05030V	1/3	VRSF-3C-SDB	3.96	1000	0.91
	1/5	VRSF-5C-SDB	6.76	600	0.71
	1/9	VRSF-S9D-SDB	11.0	333	0.65
	1/15	VRSF-15D-SDB	18.4	200	0.70
	1/25	VRSF-25E-SDB	30.6	120	0.70
08030V	1/3	VRSF-3C-SDC	6.86	1000	0.91
	1/5	VRSF-5C-SDC	11.5	600	0.71
	1/9	VRSF-S9D-SDC	18.2	333	0.65
	1/15	VRSF-15D-SDC	30.4	200	0.70
	1/25	VRSF-25E-SDC	50.7	120	0.70
14030V	1/3	VRSF-3D-SEC	11.3	1000	2.43
	1/5	VRSF-5D-SEC	19.8	600	1.85
	1/9	VRSF-S9E-SEC	31.3	333	2.81
	1/15	VRSF-15E-SEC	52.0	200	2.80
	1/25	VRKF-25F-TEH	86.8	120	2.80

Motor model VLBST–	Reduction ratio	Type of reduction gear	Rated output torque [N·m]	Max. speed of output shaft [min^{-1}]	Reduction gear $GD^2/4$ (converted into input shaft) $\times 10^{-4}$ [$kg \cdot m^2$]
18030V	1/3	VRSF-3D-SEC	15.2	1000	2.43
	1/5	VRSF-5E-SEC	20.3	600	3.50
	1/9	VRSF-S9E-SEC	42.9	333	2.81
	1/15	VRSF-15E-SEC	71.5	200	2.80
	1/25	VRSF-25F-TEH	119	120	2.80
24030V	1/3	VRSF-3E-SED	18.1	1000	5.50
	1/5	VRSF-5E-SED	29.9	600	3.48
	1/9	VRSF-S9E-SED	58.4	333	2.77
	1/15	VRKF-15F-TED	93.0	200	3.53
	1/25	VRKF-25G-TED	131	120	3.98
37030V	1/3	VRSF-3E-SFE	30.0	1000	5.78
	1/5	VRSF-5E-SFE	50.0	600	3.75
	1/9	VRKF-9F-TFJ	83.7	333	6.95
	1/15	VRKF-15G-TFJ	139	200	5.00
	1/25	VRKF-25G-TFJ	232	120	3.98

- VR®F–®®® (reduction ratio·frame number)–®®® (type number)
- Backlash: 0.25° or less for frames C, D and E.
  0.5° or less for frames F and G.
- Lubrication: Grease-lubrication for all types.
- The revolving direction of the output shaft is the same as that of the input shaft.
- Combinations in the shaded areas have low efficiency.

(2) Able reduction gear (low backlash)

Motor model VLBST–	Reduction ratio	Type of reduction gear	Rated output torque [N·m]	Max. speed of output shaft [min^{-1}]	Reduction gear $GD^2/4$ (converted into input shaft) $\times 10^{-4}$ [$kg \cdot m^2$]
04015V	1/3	3C-SDC	6.86	500	0.91
	1/5	5C-SDC	11.5	300	0.71
	1/9	S9D-SDC	18.2	167	0.65
	1/15	15D-SDC	30.4	100	0.70
	1/25	25E-SDC	50.7	60	0.70
08015V	1/3	3D-SEC	12.9	500	2.43
	1/5	5D-SEC	22.6	300	1.85
	1/9	S9E-SEC	32.0	167	2.81
	1/15	15E-SEC	58.7	100	2.80
10015V	1/3	3D-SEC	17.2	500	2.43
	1/5	5E-SEC	23.8	300	3.50
	1/9	S9E-SEC	48.6	167	2.81
	1/15	15E-SEC	81.0	100	2.80
15015V	1/3	3E-SED	23.7	500	5.50
	1/5	5E-SED	39.6	300	3.48
	1/9	S9E-SED	73.0	167	2.77
05030V	1/3	3C-SDB	3.96	1000	0.91
	1/5	5C-SDB	6.76	600	0.71
	1/9	S9D-SDB	11.0	333	0.65
	1/15	15D-SDB	18.4	200	0.70
	1/25	25E-SDB	30.6	120	0.70
08030V	1/3	3C-SDC	6.86	1000	0.91
	1/5	5C-SDC	11.5	600	0.71
	1/9	S9D-SDC	18.2	333	0.65
	1/15	15D-SDC	30.4	200	0.70
	1/25	25E-SDC	50.7	120	0.70
14030V	1/3	3D-SEC	11.3	1000	2.43
	1/5	5D-SEC	19.8	600	1.85
	1/9	S9E-SEC	31.3	333	2.81
	1/15	15E-SEC	52.0	200	2.80
18030V	1/3	3D-SEC	15.2	1000	2.43
	1/5	5E-SEC	20.3	600	3.50
	1/9	S9E-SEC	42.9	333	2.81
	1/15	15E-SEC	71.5	200	2.80
24030V	1/3	3E-SED	18.1	1000	5.50
	1/5	5E-SED	29.9	600	3.48
	1/9	S9E-SED	58.4	333	2.77

Motor model VLBST–	Reduction ratio	Type of reduction gear	Rated output torque [N·m]	Max. speed of output shaft [min^{-1}]	Reduction gear $GD^2/4$ (converted into input shaft) $\times 10^{-4}$ [$kg \cdot m^2$]
37030V	1/3	3E-SFE	30.0	1000	5.78
	1/5	5E-SFE	50.0	600	3.75

- VRSF–LB–®®® (reduction ratio·frame number)–®®® (type number)
- Backlash: 0.08° or less
- Lubrication: Grease-lubrication for all types.
- The revolving direction of the output shaft is the same as that of the input shaft.
- Combinations in the shaded areas have low efficiency.

3.3 Straight Shaft without Key VLBS©–©©©©©–K

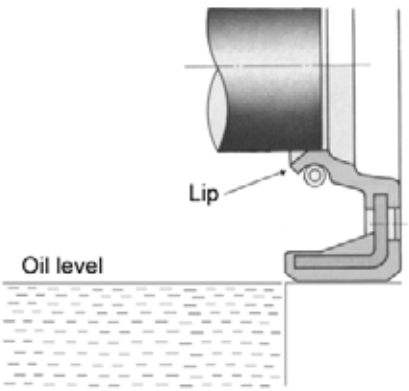
This shaft is identical with the keyed shaft in diameter and length. It is not provided, however, with key and shaft end tap.

3.4 Oil Seal VLBS®–®®®®®–O

If oil will splash from the machine side, it is recommended to attach an oil seal.
Keep the oil level below the lip of the oil seal to such an extent that the oil splash can barely reach.
For the VLBSV–ZA motor with oil seal (excluding the motor of 1,500 min^{-1}), the profile of the motor set flange differs. (See the external view in Para. 4.3. The other motors are the same as the standard motor in outer dimensions.)
When attaching an oil seal to the VLBSV–ZA motor, fully consider the shaft friction torque of the oil seal.

Shaft friction torque

30, 50, 100 W	:	Approx. 0.02 [N·m]
200, 400 W	:	Approx. 0.03 [N·m]
600, 750 W	:	Approx. 0.06 [N·m]



3.5 Taper Shaft VLBS®–®®®®®–T

No taper shaft is available for the VLBSV–Z/ZA motor.

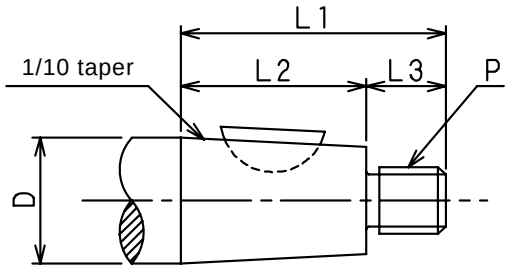


Fig. 1

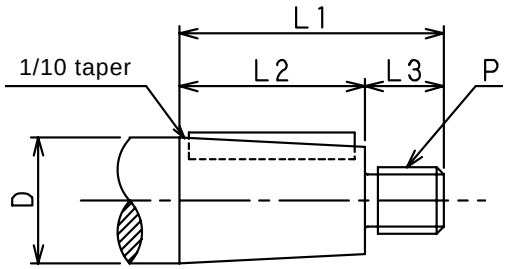


Fig. 2

Motor VLBSV–©©©©©–T		Basic dia. D	Screw thread P	L1	L2	L3	Key	Nut (class 1)	Profile
05015	10030	19	M10 P1.25	40	28	12	5×16 woodruff key	M10 P1.25	Fig. 1
10015	18030								
15015	24030	24	M12 P1.25	50	36	14	5×22 woodruff key	M12 P1.25	Fig. 1
20015	30030	32	M20 P1.5	80	58	22	7×25 woodruff key	M20 P1.5	Fig. 1
30015	45030								
50015	70030	42	M24 P2	110	82	28	10×8×70 Straight key	M24 P2	Fig. 2
75015	10K30								

No taper shaft is available for the VLBSV–ZA motor (3,000 min^{-1}).

Motor VLBST–©©©©©–T		Basic dia. D	Screw thread P	L1	L2	L3	Key	Nut (class 1)	Profile
04015V	08030V	19	M10 P1.25	40	28	12	5 × 16 woodruff key	M10 P1.25	Fig. 1
08015V	14030V								
10015V	18030V								
15015V	24030V	24	M12 P1.25	50	36	14	5 × 22 woodruff key	M12 P1.25	Fig. 1
26015V	37030V	32	M20 P1.5	80	58	22	7 × 25 woodruff key	M20 P1.5	Fig. 1
37015V	55030V								
50015V	65030V								
75020V		42	M24 P2	110	82	28	10 × 8 × 70 Straight key	M24 P2	Fig. 2
10K20V									

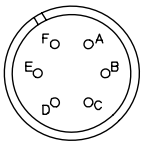
For the other types, please contact us.

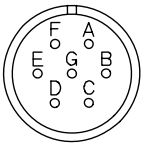
CE-marking compatible

Type	CE-marking compatible
VLBSV–ZA type	–
VLBSV standard type	Standard
VLBSG standard type	–
VLBST standard type	Option

* The VLBST standard type is CE-marking compatible by selecting a TUV approved connector for the armature wire and adding an oil seal. The connector specification and presence or absence of the oil seal differ with the type and capacity of the motor to be used.
The outer dimensions are the same as those of the standard motor, except for the terminal box. Some dimensions differ from those of the connector specification.

Motor type VLBST–©©©©©–U
The IP54 specification is selected and all types are attached with an oil seal. (Alphabet "O" is not shown.) A water-proof connector is used. The motor type when the specified straight plug and cable clamp are used is given in the table below. When a conduit is incorporated, the connector type varies. When this happens, please contact Toshiba Machine.

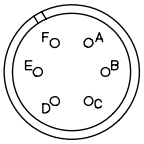
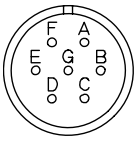
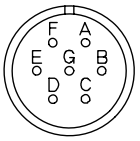
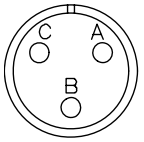
<table>
<tr><th colspan="3">VLBST–©–U</th><th rowspan="2">Connector type</th><th rowspan="2">Receptacle wiring drawing</th></tr>
<tr><th>1500 min^{-1}</th><th>2000 min^{-1}</th><th>3000 min^{-1}</th></tr>
<tr><td>04015V</td><td>–</td><td>05030V
08030V</td><td>Receptacle (motor side)
JL04V-2E18-12PE-B-R
Straight plug (cable side)
JL04V-6A18-12SE-EB-R
Cable clamp
JL04-18CK(13)-R</td><td> 

<table><tr><th>Pin No.</th><th>Symbol</th></tr><tr><td>A</td><td>U</td></tr><tr><td>B</td><td>V</td></tr><tr><td>C</td><td>W</td></tr><tr><td>D</td><td>E</td></tr><tr><td>E</td><td>Not used</td></tr><tr><td>F</td><td>Not used</td></tr></table></td></tr>
<tr><td>08015V
10015V
15015V</td><td>–</td><td>14030V
18030V
24030V</td><td>Receptacle (motor side)
JL04V-2E20-15PE-B-R
Straight plug (cable side)
JL04V-6A20-15SE-EB-R
Cable clamp
JL04-2022CK(14)-R</td><td rowspan="2"> 

<table><tr><th>Pin No.</th><th>Symbol</th></tr><tr><td>A</td><td>U</td></tr><tr><td>B</td><td>V</td></tr><tr><td>C</td><td>W</td></tr><tr><td>D</td><td>E</td></tr><tr><td>E</td><td>Not used</td></tr><tr><td>F</td><td>Not used</td></tr><tr><td>G</td><td>Not used</td></tr></table></td></tr>
<tr><td>26015V
37015V</td><td>–</td><td>37030V</td><td>Receptacle (motor side)
JL04V-2E24-10PE-B-R
Straight plug (cable side)
JL04V-6A24-10SE-EB-R
Cable clamp
JL04-2428CK(17)-R</td></tr>
<tr><td>50015V</td><td>75020V
10K20V</td><td>55030V
65030V</td><td>Receptacle (motor side)
JL04V-2E32-17PE-B-R
Block (cable side)
JL04V-6A32-17SE-R
(Incorporate a conduit for use.)</td><td> 

<table><tr><th>Pin No.</th><th>Symbol</th></tr><tr><td>A</td><td>U</td></tr><tr><td>B</td><td>V</td></tr><tr><td>C</td><td>W</td></tr><tr><td>D</td><td>E</td></tr></table></td></tr>
</table>

* Neither a cable side plug nor a cable clamp is attached, which is available from us for an extra price.

VLBST–©–BU			Connector type	Receptacle wiring drawing
1500 min^{-1}	2000 min^{-1}	3000 min^{-1}		
04015V	–	05030V 08030V	Receptacle (motor side) JL04V-2E18-12PE-B-R Straight plug (cable side) JL04V-6A18-12SE-EB-R Cable clamp JL04-18CK(13)-R	 Pin No. / Symbol A – U B – V C – W D – E E – B 1 F – B 2
08015V 10015V 15015V	–	14030V 18030V 24030V	Receptacle (motor side) JL04V-2E20-15PE-B-R Straight plug (cable side) JL04V-6A20-15SE-EB-R Cable clamp JL04-2022CK(14)-R	 Pin No. / Symbol A – U B – V C – W D – E E – B 1 F – B 2 G – Not used
26015V 37015V	–	37030V	Receptacle (motor side) JL04V-2E24-10PE-B-R Straight plug (cable side) JL04V-6A24-10SE-EB-R Cable clamp JL04-2428CK(17)-R	 Pin No. / Symbol A – U B – V C – W D – E E – B 1 F – B 2 G – Not used
50015V	75020V 10K20V	55030V 65030V	[Armature] Receptacle (motor side) JL04V-2E32-17PE-B-R Block (cable side) JL04V-6A32-17SE-R (Incorporate a conduit for use.)	Armature  Pin No. / Symbol A – U B – V C – W D – E
			[Brake] Receptacle (motor side) JL04V-2E10SL-3PE-B-R Straight plug JL04V-6A10SL-3SE-EB-R Cable clamp JL04-1012CK(05)-R	Brake  Pin No. / Symbol A – B 1 B – B 2 C – Not used

! CAUTION

Be sure to ground the grounding terminal (E), using an electric wire. Otherwise, you may get an electric shock.

! CAUTION

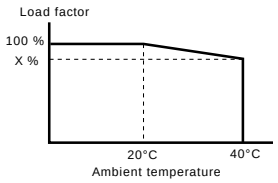
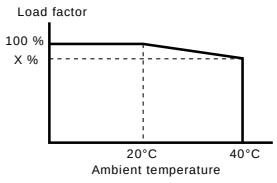
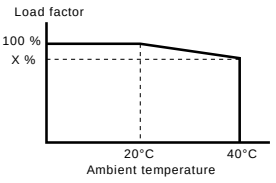
Perform wiring properly and exactly. Otherwise, the motor may be uncontrollable, or you may get injured.

Specifications	Section 4

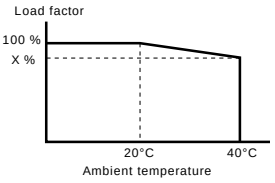
4.1 General Specifications

The specifications common to the X series servo motor are shown below. When the motor is equipped with reduction gear, the environmental conditions may differ.

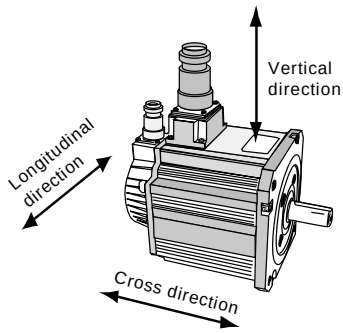
Item	Specifications		
	VLBSV standard type	VLBSV–ZA type	VLBSV–T type
Ambient temperature	–10 ~ +40°C (non-freezing)	0 ~ +40°C (non-freezing)	–10 ~ +40°C (non-freezing)
Ambient humidity	30 ~ 90 %RH (non-condensing)	30 ~ 85 %RH (non-condensing)	30 ~ 90 %RH (non-condensing)
Storage temperature	–20 ~ +75°C (non-freezing)	–10 ~ +75°C (non-freezing)	–10 ~ +75°C (non-freezing)
Storage humidity	30 ~ 90 %RH (non-condensing)	30 ~ 90 %RH (non-condensing)	30 ~ 90 %RH (non-condensing)
Atmosphere	Indoor (not exposed to direct sunlight). Corrosive gas or explosive gas should not be involved. Protection against direct splash of water, coolant oil, etc., should be taken.	Indoor (not exposed to direct sunlight). Corrosive gas or explosive gas should not be involved. Protection against direct splash of water, coolant oil, etc., should be taken.	Indoor (not exposed to direct sunlight). Corrosive gas or explosive gas should not be involved. Protection against direct splash of water, coolant oil, etc., should be taken.
Type of insulation	Type F	Type F	Type F
Insulation resistance	10 MΩ or over (at DC500 V)	10 MΩ or over (at DC500 V)	10 MΩ or over (at DC500 V)
Insulation voltage resistance	1,500 V, 1 min.	1,500 V, 1 min.	1,500 V, 1 min.
Vibration class	V15	V15	V15
Method of excitation	Permanent magnet	Permanent magnet	Permanent magnet
Mounting method	Flange mounted type	Flange mounted type	Flange mounted type

Item	Specifications		
	VLBSV standard type	VLBSV–ZA type	VLBSV–T type
Mounting direction	Horizontal, shaft facing up or shaft facing down	Horizontal, shaft facing up or shaft facing down	Horizontal, shaft facing up or shaft facing down
Cooling method	Natural air-cooling	Natural air-cooling	Natural air-cooling
Vibration resistance	2G or less	5G or less (2G or less for the motor of 1,500 min^{-1})	2G or less
Noise characteristic	75 dB (A)	75 dB (A)	75 dB (A)
Protection method	IP65 (excluding shaft through area)	IP65 (excluding connector and shaft through area)	IP44 (excluding shaft through area)
Temperature derating Load factor is limited by ambient temperature.			

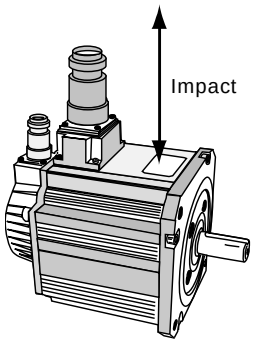
Item	Specifications
	VLBSG standard type
Ambient temperature	–10 ~ +40°C (non-freezing)
Ambient humidity	30 ~ 90 %RH (non-condensing)
Storage temperature	–20 ~ +75°C (non-freezing)
Storage humidity	30 ~ 90 %RH (non-condensing)

Item	Specifications
	VLBSG standard type
Atmosphere	Indoor (not exposed to direct sunlight). Corrosive gas or explosive gas should not be involved. Protection against direct splash of water, coolant oil, etc., should be taken.
Type of insulation	Type F
Insulation resistance	10 MΩ or over (at DC500 V)
Insulation voltage resistance	1,500 V, 1 min.
Method of excitation	Permanent magnet
Mounting method	Flange mounted type
Mounting direction	Horizontal, shaft facing up or shaft facing down
Cooling method	Forced air-cooling
Vibration resistance	1G or less
Protection method	IP44 (excluding shaft through area)
Temperature derating Load factor is limited by ambient temperature.	

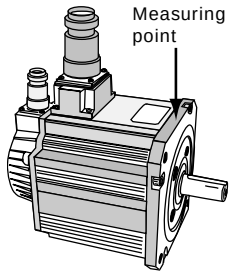
- Vibration resistance
  When vibration is exerted on the BS servo motor shaft mounted horizontally, the motor can withstand the vibration acceleration of 20 m/s^2 (2G) in the vertical, longitudinal and cross directions.



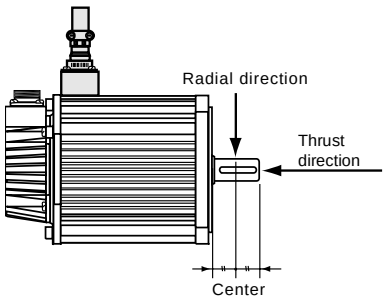
- Impact resistance
  When impact is exerted in the vertical direction while the BS servo motor shaft is mounted horizontally, the motor can withstand the impact acceleration of 200 m/s^2 (20G) three (3) times. NEVER impose an impact directly to the shaft end.
  Impact resistance of the motor with an encoder is 100 m/s^2 (10G).



- Vibration class
  The vibration class of BS servo motor is V15 at rated speed. When testing the motor independently, the motor may vibrate due to unbalance of the key.



- Permissible load
  For the output shaft load of BS servo motor, see the permissible radial load and permissible thrust load given in the table of performance specifications.
  The permissible radial load is the value taken at the center between the flange surface and shaft end.
  Permissible load on the shaft end is about 80 % of the value given in the table.



4.2 Performance Specifications

4.2.1 VLBSV Standard Type 1,500 min^{-1}

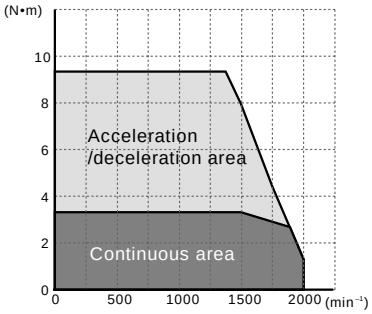
Item	Model	VLBSV–						
		05015	10015	15015	20015	30015	50015	75015
Rated output	W	500	1000	1500	2000	3000	5000	7500
Rated torque	N·m	3.18	6.37	9.55	12.7	19.1	31.8	47.8
Rated speed	min^{-1}	1500						
Max. speed	min^{-1}	2000						
Power rate	kW/s	15.0	31.4	48.0	48.5	59.5	112	156
Moment of inertia $GD^2/4$ ($\times 10^{-4}$)	$kg \cdot m^2$	6.76	12.9	19.0	33.4	61.3	90.8	146
Momentary max. torque	N·m	9.55	19.1	28.6	38.0	48.0	80.0	140
Momentary max. current	A (rms)	7.9	15.8	24.7	41.0	49.5	71.0	141
Rated voltage	V (rms)	130	126	120	127	112	122	116
Rated current	A (rms)	2.6	5.2	8.1	11.7	17.9	27.8	42.5
Torque constant	N·m/A (rms)	1.23	1.23	1.18	1.09	1.07	1.15	1.12
Heat time constant	min	15	17	20	34	40	45	55
Coil resistance	Ω	4.75	1.72	0.96	0.55	0.21	0.13	0.071
Coil inductance	mH	23.4	10.2	6.4	10.9	4.66	3.54	2.01
Derating (40°C)	%	100	100	100	100	100	100	100
Induced voltage constant	V(rms)/ min^{-1}	0.0767	0.0767	0.0733	0.0673	0.0660	0.0707	0.0693
Permissible thrust load	N	127	127	127	323	323	323	323
Permissible radial load	N	510	578	637	1333	1480	1470	1617
Mass	kg	5.5	7.5	9.8	15.5	22.0	29.5	42.5
Applicable servo amplifier VL©©X–	012P2	○						
	035P3		○	○				
	070P3				○	○		
	100P3						○	
	200P3							○

Note 1: The above values are obtained when the motor is used in combination with the BS servo amplifier and the armature coil temperature is 20°C.

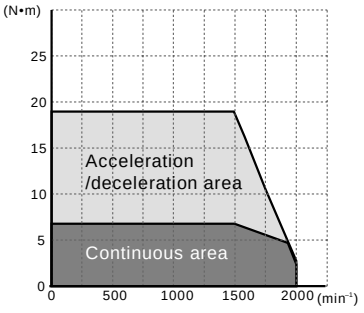
Note 2: V (rms) and A (rms) are the effective values.

Torque–speed characteristics

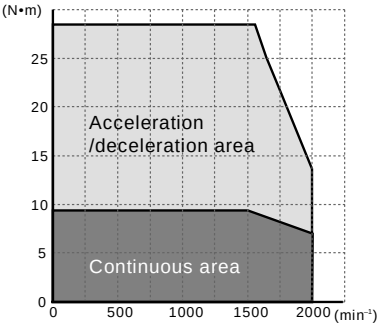
05015



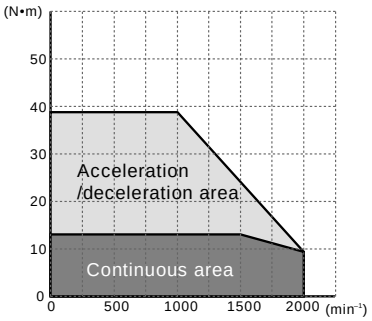
10015



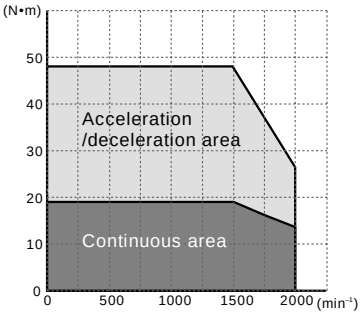
15015



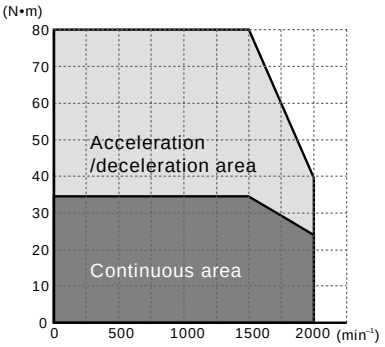
20015



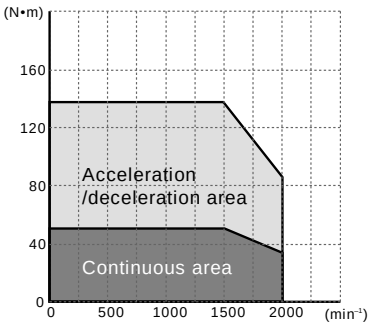
30015



50015



75015



4.2.2 VLBSV Standard Type 3,000 min^{-1}

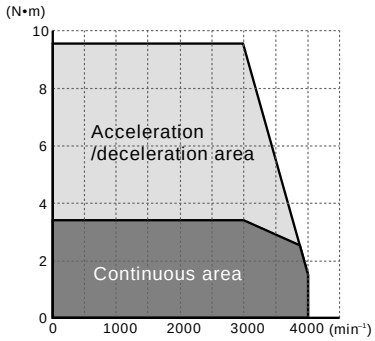
Item	Model	VLBSV–						
		10030	18030	24030	30030	45030	70030	10K30
Rated output	W	1000	1800	2400	3000	4500	7000	10000
Rated torque	N·m	3.18	5.73	7.64	9.55	14.3	22.3	31.8
Rated speed	min^{-1}	3000						
Max. speed	min^{-1}	4000						
Power rate	kW/s	15.0	25.4	30.7	27.3	33.5	54.7	69.4
Moment of inertia $GD^2/4$ ($\times 10^{-4}$)	$kg \cdot m^2$	6.76	12.9	19.0	33.4	61.3	90.8	146
Momentary max. torque	N·m	9.55	17.2	22.9	29.0	40.0	66.0	77.0
Momentary max. current	A (rms)	16.2	29.6	40.6	49.5	71.0	122	141
Rated voltage	V (rms)	125	119	115	131	118	110	109
Rated current	A (rms)	5.3	9.7	13.3	15.2	24.1	40.0	56.6
Torque constant	N·m/A (rms)	0.600	0.593	0.576	0.627	0.594	0.557	0.562
Heat time constant	min	15	17	20	34	40	45	55
Coil resistance	Ω	1.22	0.41	0.24	0.19	0.075	0.04	0.018
Coil inductance	mH	5.80	2.50	1.50	3.36	1.46	0.83	0.505
Derating (40°C)	%	100	100	100	100	100	90	90
Induced voltage constant	V(rms)/ min^{-1}	0.0383	0.0377	0.0367	0.0387	0.0367	0.0343	0.0347
Permissible thrust load	N	108	108	108	274	274	274	274
Permissible radial load	N	402	461	500	1058	1176	1166	1284
Mass	kg	5.5	7.5	9.8	15.5	22.0	29.5	42.5
Applicable servo amplifier VL©©X–	035P3	○						
	070P3		○	○	○			
	100P3					○		
	200P3						○	○

Note 1: The above values are obtained when the motor is used in combination with the BS servo amplifier and the armature coil temperature is 20°C.

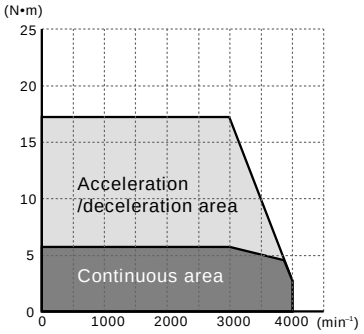
Note 2: V (rms) and A (rms) are the effective values.

Torque–speed characteristics

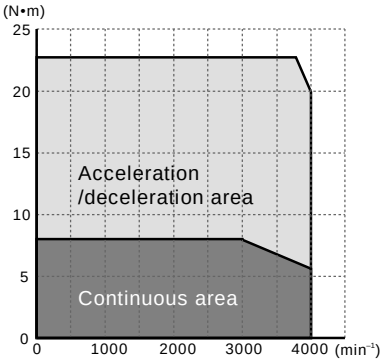
10030



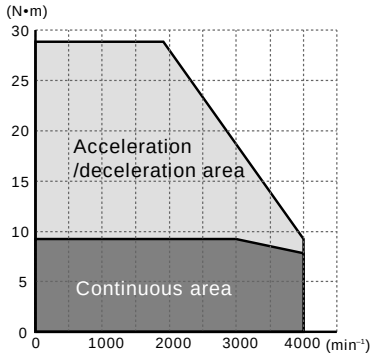
18030



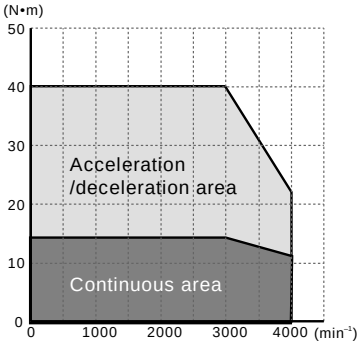
24030



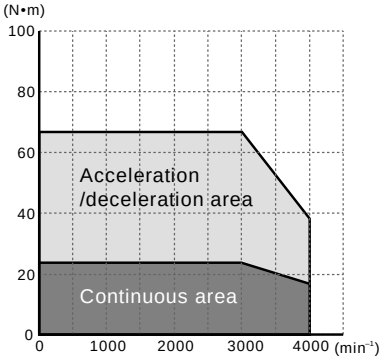
30030



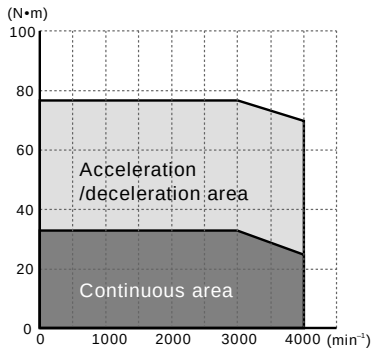
45030



70030



10K30



4.2.3 VLBSV-ZA Type 3,000 min^{-1}

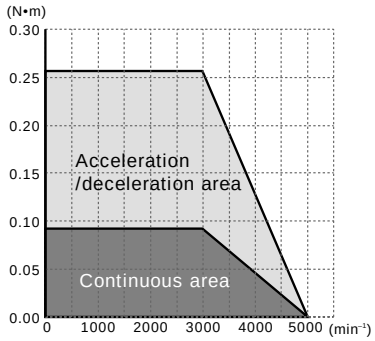
Item	Model	VLBSV–						
		ZA00330	ZA00530	ZA01030	ZA02030	ZA04030	ZA06030	ZA07530
Rated output	W	30	50	100	200	400	600	750
Rated torque	N·m	0.095	0.159	0.318	0.640	1.27	1.91	2.39
Rated speed	min^{-1}	3000						
Max. speed	min^{-1}	5000						
Power rate	kW/s	9.0	12.6	33.7	22.8	47.4	37.2	52.9
Moment of inertia $GD^2/4$ ($\times 10^{-4}$)	$kg \cdot m^2$	0.01	0.02	0.03	0.18	0.34	0.98	1.08
Momentary max. torque	N·m	0.25	0.40	0.86	1.52	2.99	5.07	6.27
Momentary max. current	A (rms)	0.9	1.5	3.0	4.5	8.5	12.6	14.1
Rated voltage	V (rms)	97	77	75	85	84	89	99
Rated current	A (rms)	0.31	0.65	1.10	1.84	3.40	4.70	5.50
Torque constant	N·m/A (rms)	0.318	0.290	0.314	0.366	0.373	0.436	0.489
Heat time constant	min	5	7	10	12	15	18	20
Coil resistance	Ω	91.4	31.3	12.7	4.80	1.94	0.92	0.84
Coil inductance	mH	98.5	40.7	21.7	17.9	8.23	6.52	6.29
Derating (40°C)	%	100	100	100	100	85	100	100
Induced voltage constant	V(rms)/ min^{-1}	0.0192	0.0175	0.0190	0.0222	0.0226	0.0264	0.0296
Permissible thrust load	N	39.2	39.2	39.2	68.6	68.6	98	98
Permissible radial load	N	78.4	78.4	78.4	196	196	343	343
Mass	kg	0.3	0.4	0.5	0.9	1.3	2.2	2.5
Applicable servo amplifier VL©©X–	008P2	○	○	○	○			
	012P2					○		
	025P2						○	○

Note 1: The above values are obtained when the motor is used in combination with the BS servo amplifier and the armature coil temperature is 20°C.

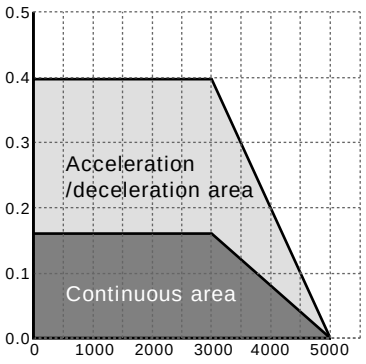
Note 2: V (rms) and A (rms) are the effective values.

Torque–speed characteristics

ZA00330



ZA00530



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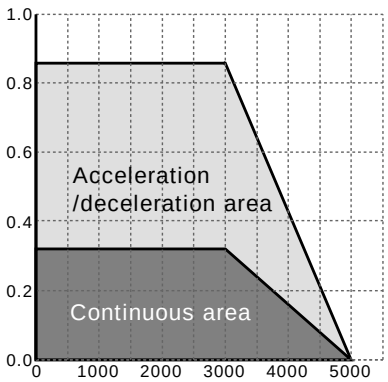

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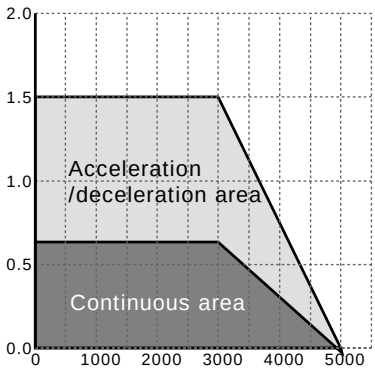

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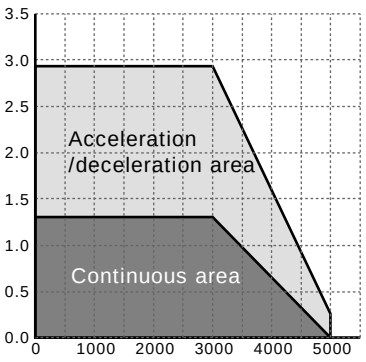

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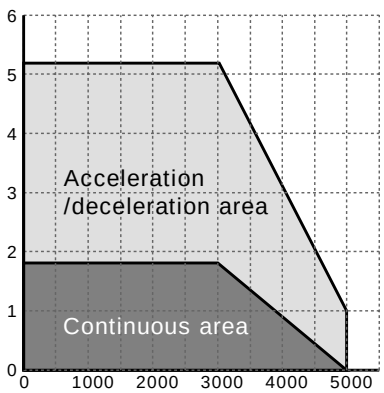

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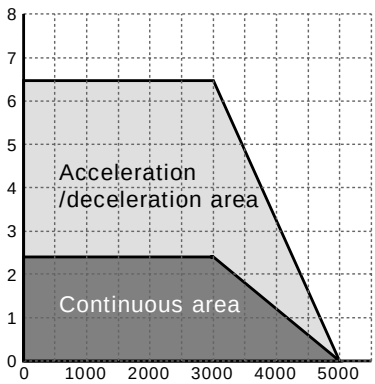


4.2.4 VLBSV-ZA Type 1,500 min^{-1}

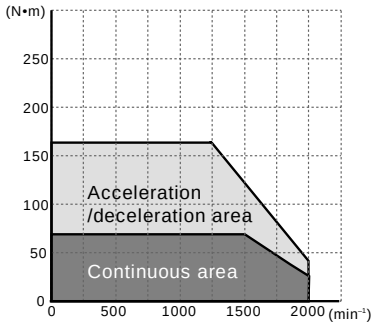
Item	Model	VLBSV–	
		ZA11K15	ZA14K15
Rated output	W	11000	14000
Rated torque	N·m	70.0	89.1
Rated speed	min^{-1}	1500	1500
Max. speed	min^{-1}	2000	1800
Power rate	kW/s	228	255
Moment of inertia $GD^2/4$ ($\times 10^{-4}$)	$kg \cdot m^2$	215	311
Momentary max. torque	N·m	165	235
Momentary max. current	A (rms)	134	157
Rated voltage	V (rms)	129	148
Rated current	A (rms)	54.2	60.0
Torque constant	N·m/A (rms)	1.30	1.51
Heat time constant	min	30	40
Coil resistance	Ω	0.05	0.04
Coil inductance	mH	1.42	1.30
Derating (40°C)	%	90	85
Induced voltage constant	V(rms)/ min^{-1}	0.080	0.0935
Permissible thrust load	N	392	392
Permissible radial load	N	784	784
Mass	kg	49	64
Applicable servo amplifier VL©©X–	200P3	%	
	320P3		%

Note 1: The above values are obtained when the motor is used in combination with the BS servo amplifier and the armature coil temperature is 20°C.

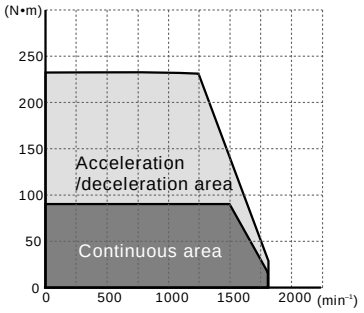
Note 2: V (rms) and A (rms) are the effective values.

Torque–speed characteristics

VLBSV–ZA11K15



VLBSV–ZA14K15



4.2.5 VLBSG Type 2,000 min^{-1}

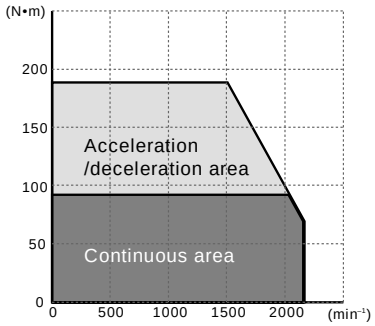
Item		Model VLBSG– A20K20	A33K20	B55K20
Rated output	W	20000	33000	55000
Rated torque	N·m	95.5	157.5	263
Rated speed	min^{-1}	2000	2000	2000
Max. speed	min^{-1}	2200	2200	2200
Power rate	kW/s	222	191	364
Moment of inertia $GD^2/4$ ($\times 10^{-4}$)	$kg \cdot m^2$	410	1300	1900
Momentary max. torque	N·m	186	320	526
Momentary max. current	A (rms)	212	353	276
Rated voltage	V (rms)	146	149	304
Rated current	A (rms)	96	157	120
Torque constant	N·m/A (rms)	1.0	1.0	2.3
Heat time constant	min	25	30	35
Coil resistance	Ω	0.032	0.0165	0.04
Coil inductance	mH	0.94	0.63	1.62
Derating (40°C)	%	100	100	90
Induced voltage constant	V(rms)/ min^{-1}	0.064	0.064	0.142
Permissible thrust load	N	670	1800	1800
Permissible radial load	N	2700	4500	4800
Mass	kg	74	129	160
Applicable servo amplifier VL©©X–	320P3	%		
	500P3		%	
	400P4			%

Note 1: The above values are obtained when the motor is used in combination with the BS servo amplifier and the armature coil temperature is 20°C.

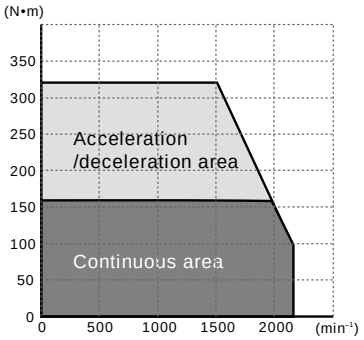
Note 2: V (rms) and A (rms) are the effective values.

Torque–speed characteristics

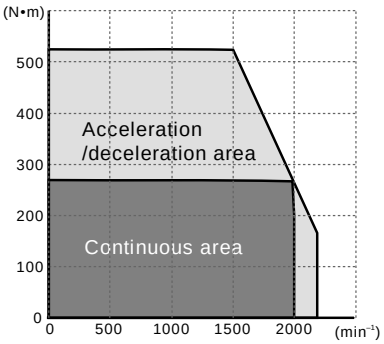
VLBSG–A20K20



VLBSG–A30K20



VLBSG–B55K20



4.2.6 VLBST–V Standard Type 1,500 min^{-1}

Item	Model	VLBST–©©©©©					
		04015V	08015V	10015V	15015V	26015V	37015V
Rated output	W	400	800	1000	1500	2600	3700
Rated torque	N·m	2.55	5.10	6.37	9.55	16.6	23.6
Rated speed	min^{-1}	1500					
Max. speed	min^{-1}	2000					
Power rate	kW/s	85	138	158	222	181	250
Moment of inertia $GD^2/4$ ($\times 10^{-4}$)	$kg \cdot m^2$	0.76	1.89	2.57	4.10	15.2	22.3
Momentary max. torque	N·m	7.35	11	15.4	23	38	60
Momentary max. current	A (rms)	8.5	17.7	17.7	25	42	64
Rated voltage	V (rms)	108	118	128	122	133	121
Rated current	A (rms)	2.7	5.3	5.7	8.3	14.1	21
Torque constant	N·m/A (rms)	0.96	0.96	1.12	1.15	1.17	1.15
Heat time constant	min	15	17	22	26	30	42
Coil resistance	Ω	6.43	2.7	2.2	1.11	0.48	0.24
Coil inductance	mH	57	20	19	12.9	8.3	4.9
Derating (40°C)	%	100	100	100	90	100	80
Induced voltage constant	V(rms)/ min^{-1}	0.058	0.059	0.069	0.070	0.074	0.071
Permissible thrust load	N	98	118	118	118	284	284
Permissible radial load	N	559	647	676	706	1350	1450
Mass	kg	4.5	6.2	7.8	11	20	27
Applicable servo amplifier VL©©X–	012P2	○					
	025P2		○	○			
	035P3				○		
	070P3					○	
	100P3						○
	200P3						

Note 1: The above values are obtained when the motor is used in combination with the BS servo amplifier and the armature coil temperature is 20°C.

Note 2: V (rms) and A (rms) are the effective values.

VLBST–V Standard Type 1,500 min^{-1}

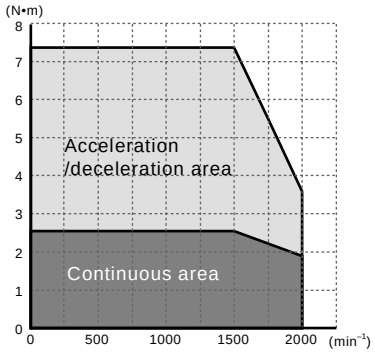
Item	Model	VLBST–©©©©©		
		50015V	75020V	10K20V
Rated output	W	5000	7500	10000
Rated torque	N·m	31.8	35.8	47.7
Rated speed	min^{-1}	1500	2000	2000
Max. speed	min^{-1}	2000	2500	2500
Power rate	kW/s	337	233	271
Moment of inertia $GD^2/4$ ($\times 10^{-4}$)	$kg \cdot m^2$	30.0	55	84
Momentary max. torque	N·m	73	100	100
Momentary max. current	A (rms)	71	113	113
Rated voltage	V (rms)	127	139	124
Rated current	A (rms)	28	36	51
Torque constant	N·m/A (rms)	1.17	1.00	0.95
Heat time constant	min	53	55	60
Coil resistance	Ω	0.175	0.090	0.038
Coil inductance	mH	3.9	2.4	1.2
Derating (40°C)	%	70	70	76
Induced voltage constant	V(rms)/ min^{-1}	0.071	0.061	0.057
Permissible thrust load	N	284	294	294
Permissible radial load	N	1520	1372	1470
Mass	kg	34	44	62
Applicable servo amplifier VL©©X–	012P2			
	025P2			
	035P3			
	070P3			
	100P3	%		
	200P3		%	%

Note 1: The above values are obtained when the motor is used in combination with the BS servo amplifier and the armature coil temperature is 20°C.

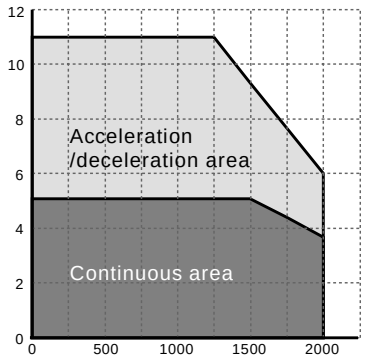
Note 2: V (rms) and A (rms) are the effective values.

Torque–speed characteristics

04015



08015



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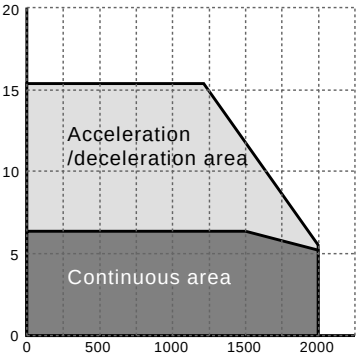

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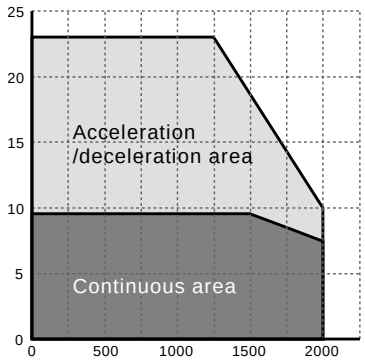

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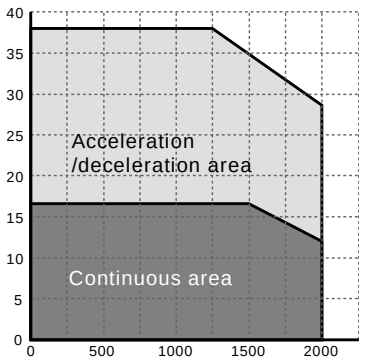
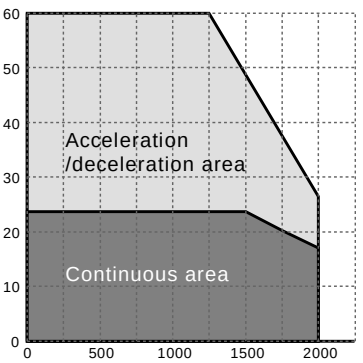
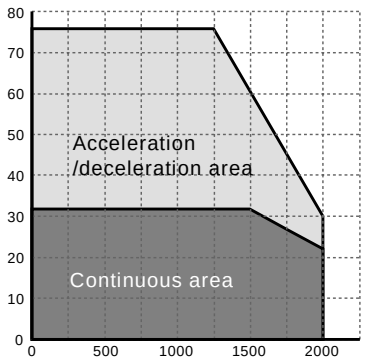


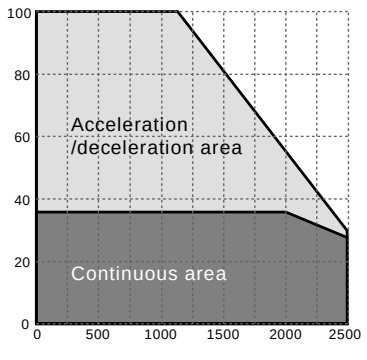
37015



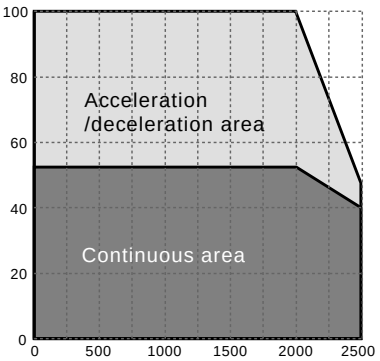
50015



75020



10K20



4.2.7 VLBST–V Standard Type 3,000 min^{-1}

Item	Model	VLBST–©©©©©					
		05030V	08030V	14030V	18030V	24030V	37030V
Rated output	W	500	800	1400	1800	2400	3700
Rated torque	N·m	1.59	2.55	4.46	5.73	7.64	11.8
Rated speed	min^{-1}	3000					
Max. speed	min^{-1}	4000					
Power rate	kW/s	53	85	105	128	142	92
Moment of inertia $GD^2/4$ ($\times 10^{-4}$)	$kg \cdot m^2$	0.47	0.76	1.89	2.57	4.1	15.2
Momentary max. torque	N·m	4.2	7.8	10	14	21	29.8
Momentary max. current	A (rms)	8.5	17.7	25	30	42	64
Rated voltage	V (rms)	117	100	124	116	109	113
Rated current	A (rms)	2.9	5.4	8.1	10.4	13.8	21
Torque constant	N·m/A (rms)	0.55	0.47	0.57	0.57	0.55	0.59
Heat time constant	min	10	15	17	23	30	30
Coil resistance	Ω	4.66	1.63	1.0	0.54	0.28	0.12
Coil inductance	mH	25	11.9	8.3	5.0	3.3	2.0
Derating (40°C)	%	100	90	100	100	80	80
Induced voltage constant	V(rms)/ min^{-1}	0.033	0.028	0.035	0.035	0.035	0.036
Permissible thrust load	N	49	88	98	98	98	235
Permissible radial load	N	284	441	510	539	559	1068
Mass	kg	3.2	4.5	6.2	7.8	11	20
Applicable servo amplifier VL©©X–	012P2	○					
	025P2		○				
	035P3			○			
	070P3				○	○	
	100P3						○
	200P3						

Note 1: The above values are obtained when the motor is used in combination with the BS servo amplifier and the armature coil temperature is 20°C.

Note 2: V (rms) and A (rms) are the effective values.

VLBST–V Standard Type 3,000 min^{-1}

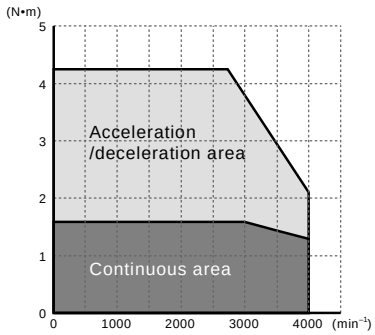
Item		Model VLBST–©©©©©	
		55030V	65030V
Rated output	W	5500	6500
Rated torque	N·m	17.5	20.7
Rated speed	min^{-1}	3000	
Max. speed	min^{-1}	4000	
Power rate	kW/s	137	143
Moment of inertia $GD^2/4$ ($\times 10^{-4}$)	$kg \cdot m^2$	22.3	30
Momentary max. torque	N·m	47	60
Momentary max. current	A (rms)	92	113
Rated voltage	V (rms)	115	115
Rated current	A (rms)	31	38
Torque constant	N·m/A (rms)	0.57	0.57
Heat time constant	min	36	48
Coil resistance	Ω	0.07	0.046
Coil inductance	mH	1.5	1.1
Derating (40°C)	%	80	70
Induced voltage constant	V(rms)/ min^{-1}	0.035	0.035
Permissible thrust load	N	235	235
Permissible radial load	N	1147	1205
Mass	kg	27	34
Applicable servo amplifier VL©©X–	012P2		
	025P2		
	035P3		
	070P3		
	100P3		
	200P3	%	%

Note 1: The above values are obtained when the motor is used in combination with the BS servo amplifier and the armature coil temperature is 20°C.

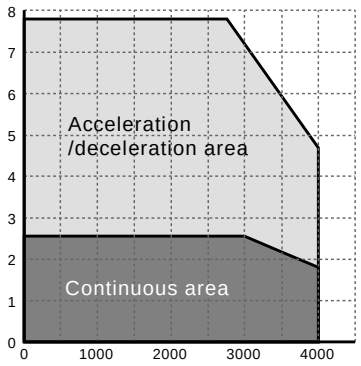
Note 2: V (rms) and A (rms) are the effective values.

Torque–speed characteristics

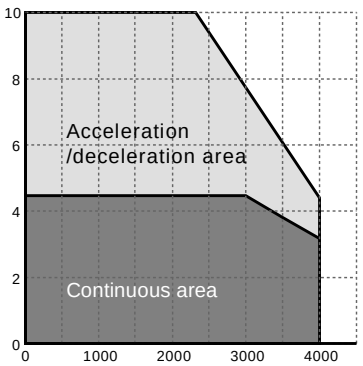
05030



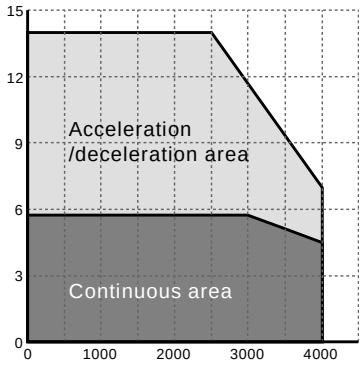
08030



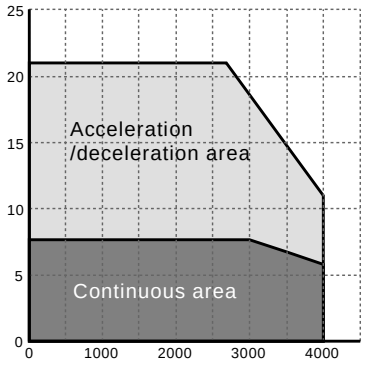
14030



18030



24030



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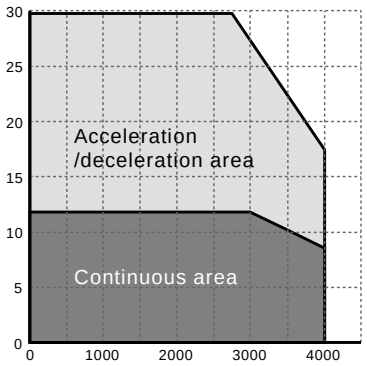

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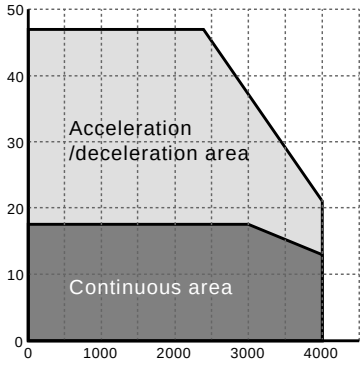
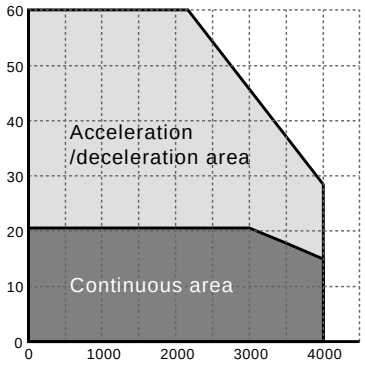


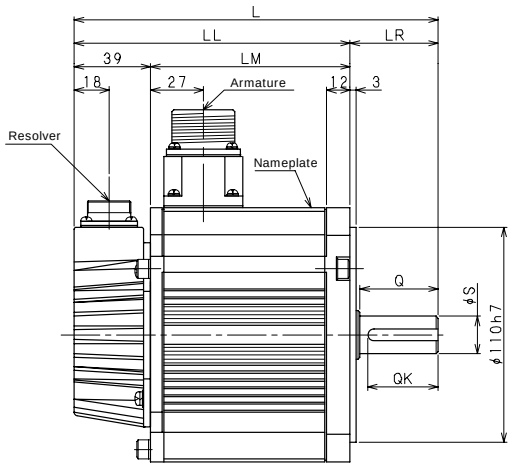
65030



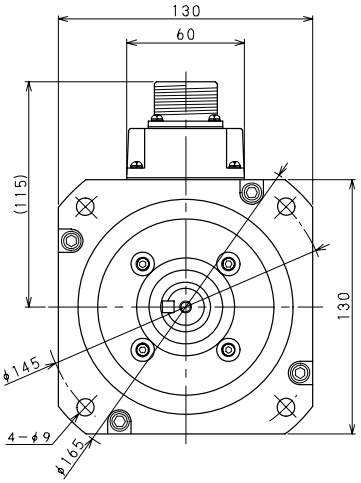
4.3 External View

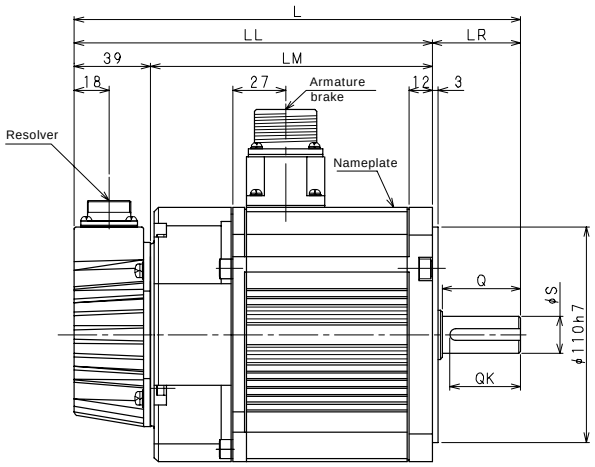
4.3.1 Standard Servo Motor

VLBSV–05015, 10015, 15015, 10030, 18030, 24030 (130-sq.)

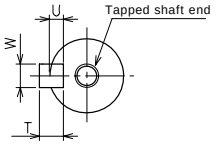


Standard type





With brake

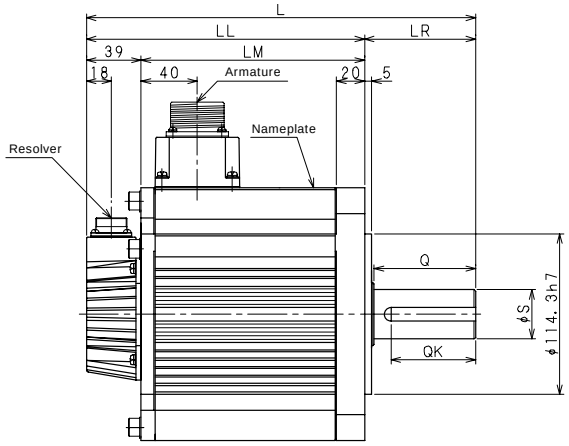


Details of shaft end

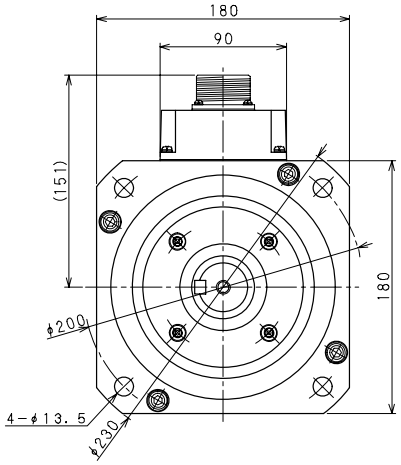
Model VLBSV–	L	LL	LM	LR	ØS	Q	QK	W	T	U	Shaft end tap	Eyebolt
05015, 10030	186	141	102	45	19h6	40	36	6h9	6	3.5	M6P1.0 depth 16	Not provided
10015, 18030	211	166	127	45	19h6	40	36	6h9	6	3.5	M6P1.0 depth 16	Not provided
15015, 24030	246	191	152	55	24h6	50	45	8h9	7	4	M8P1.25 depth 20	Not provided
05015–B, 10030–B	228	183	144	45	19h6	40	36	6h9	6	3.5	M6P1.0 depth 16	Not provided
10015–B, 18030–B	253	208	169	45	19h6	40	36	6h9	6	3.5	M6P1.0 depth 16	Not provided
15015–B, 24030–B	288	233	194	55	24h6	50	45	8h9	7	4	M8P1.25 depth 20	Not provided

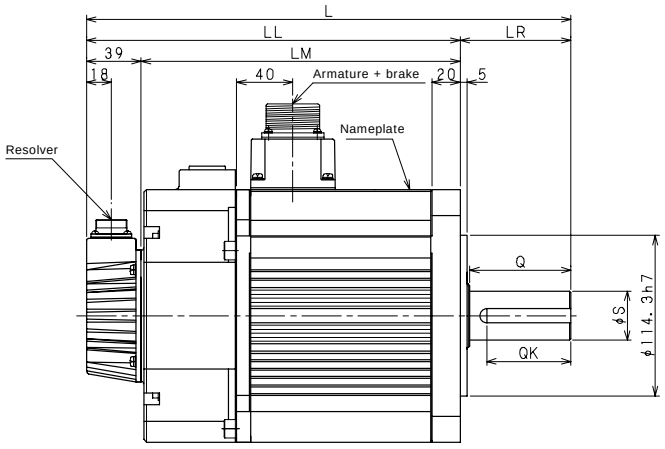
Note: "–B" signifies the motor with brake.

VLBSV–20015, 30015, 30030, 45030 (180-sq.)

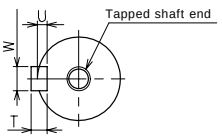


Standard type





With brake

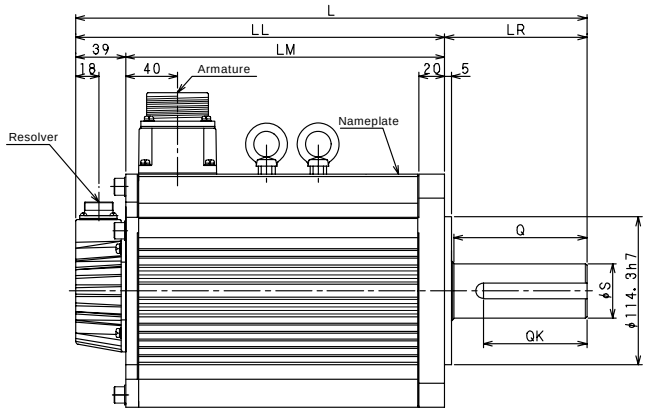


Details of shaft end

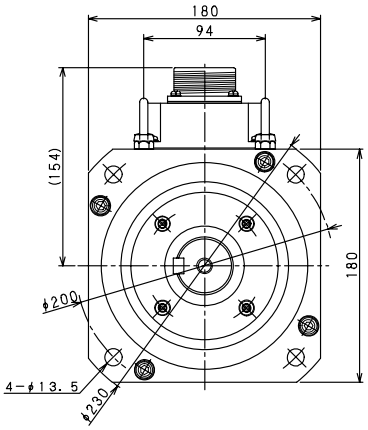
Model VLBSV–	L	LL	LM	LR	ØS	Q	QK	W	T	U	Shaft end tap	Eyebolt
20015, 30030	277	198	159	79	35 +0.01 0	72	60	10h9	8	5	M10P1.5 depth 20	Not provided
30015, 45030	321	242	203	79	35 +0.01 0	72	60	10h9	8	5	M10P1.5 depth 20	Not provided
20015–B, 30030–B	345	266	227	79	35 +0.01 0	72	60	10h9	8	5	M10P1.5 depth 20	Not provided
30015–B, 45030–B	389	310	271	79	35 +0.01 0	72	60	10h9	8	5	M10P1.5 depth 20	Not provided

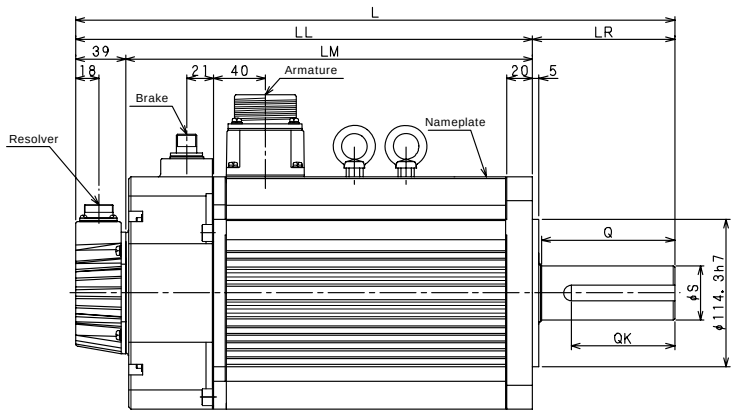
Note: "–B" signifies the motor with brake.

VLBSV–50015, 75015, 70030, 10K30 (180-sq.)

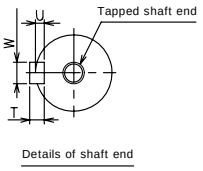


Standard type





With brake

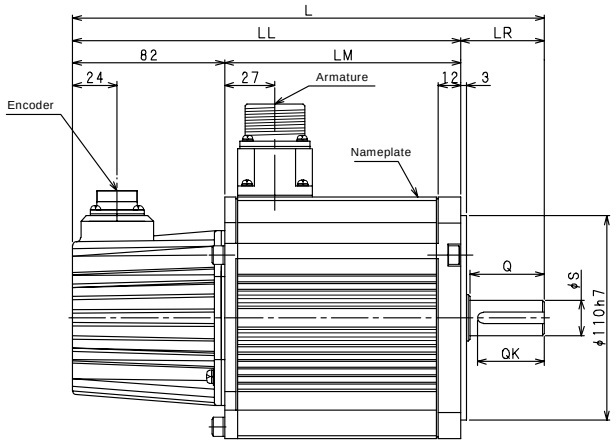


Details of shaft end

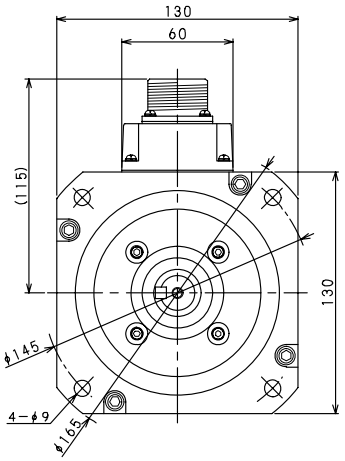
Model VLBSV–	L	LL	LM	LR	ØS	Q	QK	W	T	U	Shaft end tap	Eyebolt
50015, 70030	396	286	247	110	42h6	103	80	12h9	8	5	M12P1.75 depth 24	Provided
75015, 10K030	480	370	331	110	42h6	103	80	12h9	8	5	M12P1.75 depth 24	Provided
50015–B, 70030–B	464	354	315	110	42h6	103	80	12h9	8	5	M12P1.75 depth 24	Provided
75015–B, 10K30–B	548	438	399	110	42h6	103	80	12h9	8	5	M12P1.75 depth 24	Provided

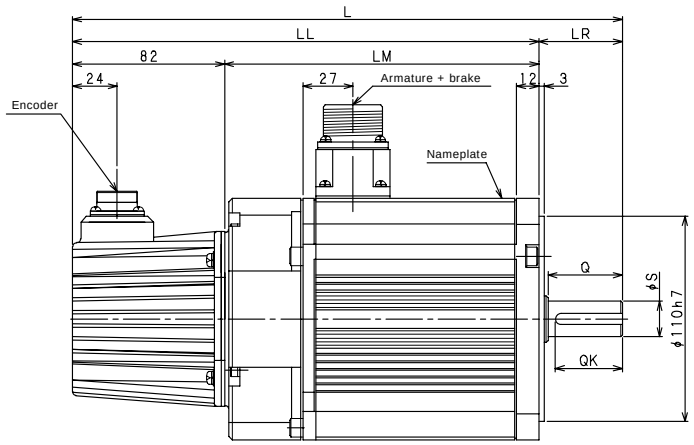
Note: "–B" signifies the motor with brake.

VLBSV–05015S1, 10015S1, 15015S1, 10030S1, 18030S1, 24030S1 (130-sq.)

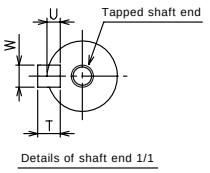


Standard type





With brake

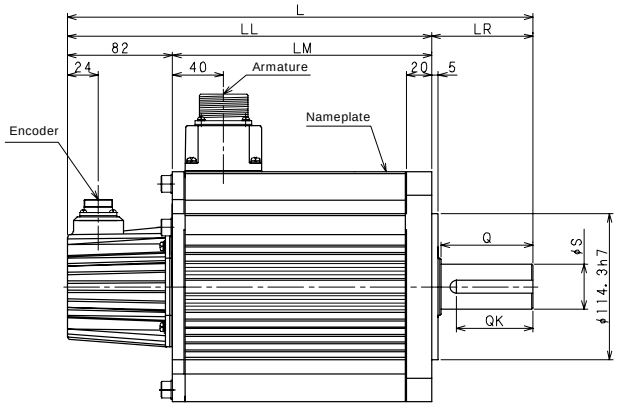


Details of shaft end 1/1

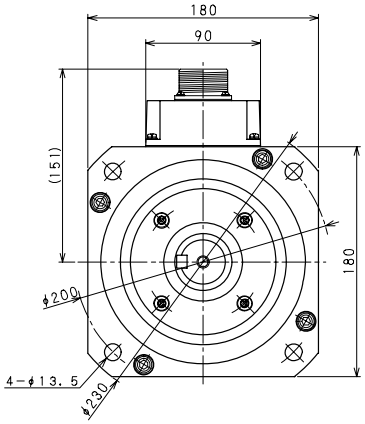
Model VLBSV–	L	LL	LM	LR	ØS	Q	QK	W	T	U	Shaft end tap	Eyebolt
05015S1, 10030S1	229	184	102	45	19h6	40	36	6h9	6	3.5	M6P1.0 depth 16	Not provided
10015S1, 18030S1	254	209	127	45	19h6	40	36	6h9	6	3.5	M6P1.0 depth 16	Not provided
15015S1, 24030S1	289	234	152	55	24h6	50	45	8h9	7	4	M8P1.25 depth 20	Not provided
05015S1–B, 10030S1–B	271	226	144	45	19h6	40	36	6h9	6	3.5	M6P1.0 depth 16	Not provided
10015S1–B, 18030S1–B	296	251	169	45	19h6	40	36	6h9	6	3.5	M6P1.0 depth 16	Not provided
15015S1–B, 24030S1–B	331	276	194	55	24h6	50	45	8h9	7	4	M8P1.25 depth 20	Not provided

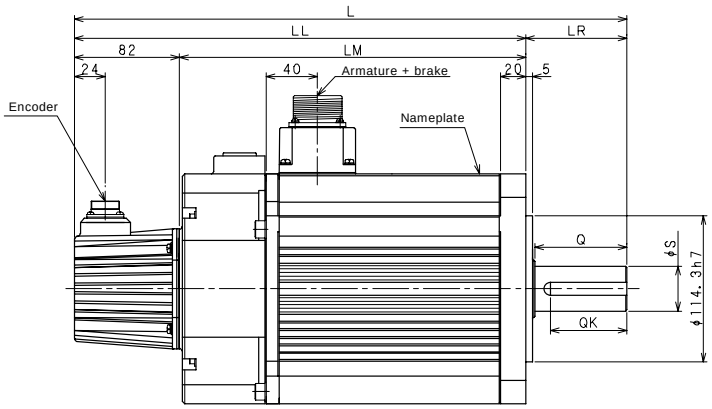
Note: "–B" signifies the motor with brake.

VLBSV–20015S1, 30015S1, 30030S1, 45030S1 (180-sq.)

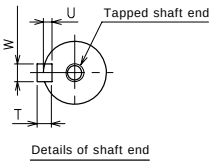


Standard type





With brake

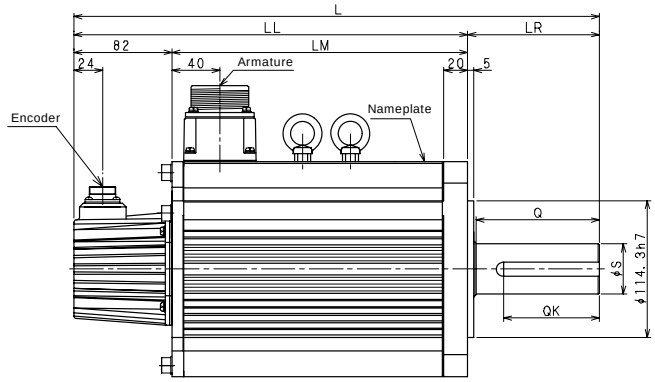


Details of shaft end

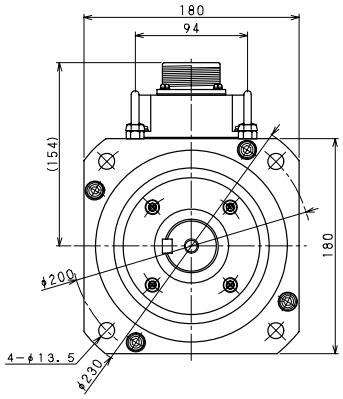
Model VLBSV–	L	LL	LM	LR	ØS	Q	QK	W	T	U	Shaft end tap	Eyebolt
20015S1, 30030S1	320	241	159	79	35 $^{+0.01}_{0}$	72	60	10h9	8	5	M10P1.5 depth 20	Not provided
30015S1, 45030S1	364	285	203	79	35 $^{+0.01}_{0}$	72	60	10h9	8	5	M10P1.5 depth 20	Not provided
20015S1–B, 30030S1–B	388	309	227	79	35 $^{+0.01}_{0}$	72	60	10j9	8	5	M10P1.5 depth 20	Not provided
30015S1–B, 45030S1–B	432	353	271	79	35 $^{+0.01}_{0}$	72	60	10h9	8	5	M10P1.5 depth 20	Not provided

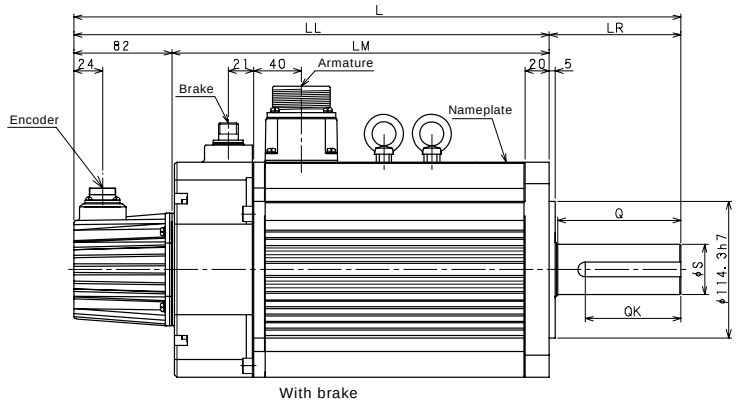
Note: "–B" signifies the motor with brake.

VLBSV–50015S1, 75015S1, 70030S1 10K30S1 (180-sq.)

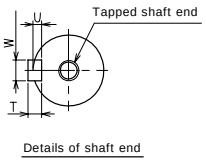


Standard type





With brake



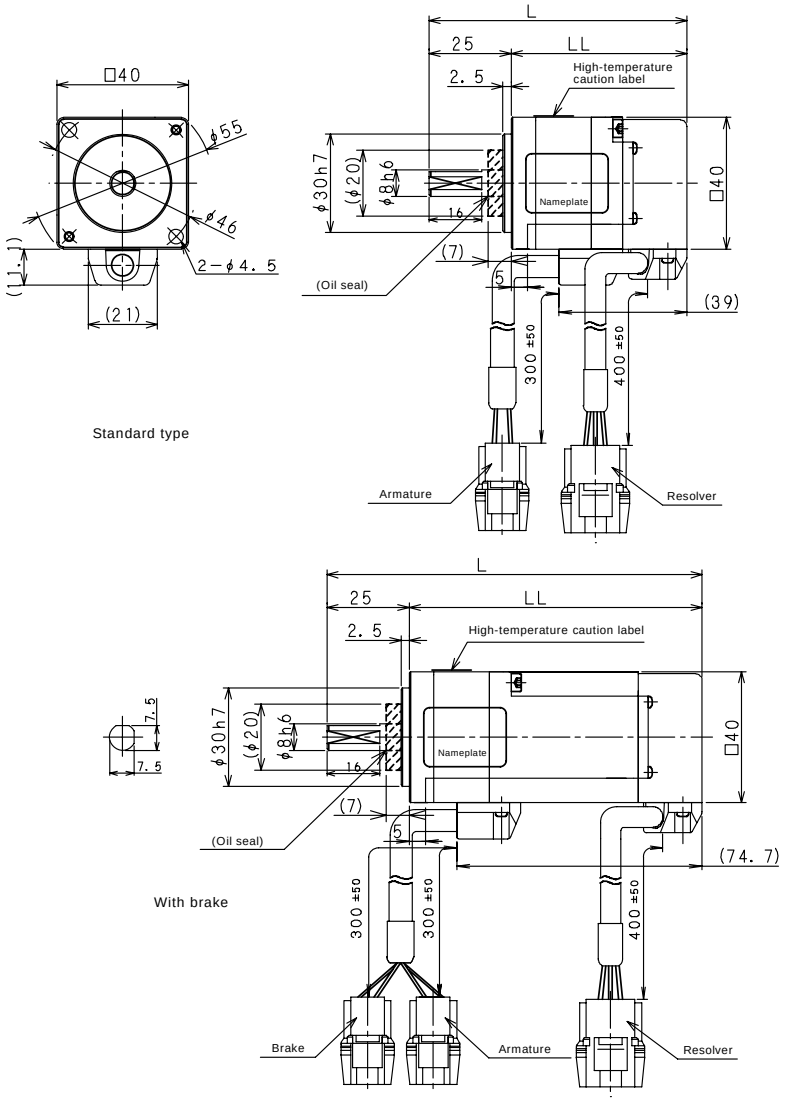
Details of shaft end

Model VLBSV–	L	LL	LM	LR	ØS	Q	QK	W	T	U	Shaft end tap	Eyebolt
50015S1, 70030S1	439	329	247	110	42h6	103	80	12h9	8	5	M12P1.75 depth 24	Provided
75015S1, 10K030S1	523	413	331	110	42h6	103	80	12h9	8	5	M12P1.75 depth 24	Provided
50015S1–B, 70030S1–B	507	397	315	110	42h6	103	80	12h9	8	5	M12P1.75 depth 24	Provided
75015S1–B, 10K30S1–B	591	481	399	110	42h6	103	80	12h9	8	5	M12P1.75 depth 24	Provided

Note: "–B" signifies the motor with brake.

4.3.2 VLBSV–ZA Type Servo Motor

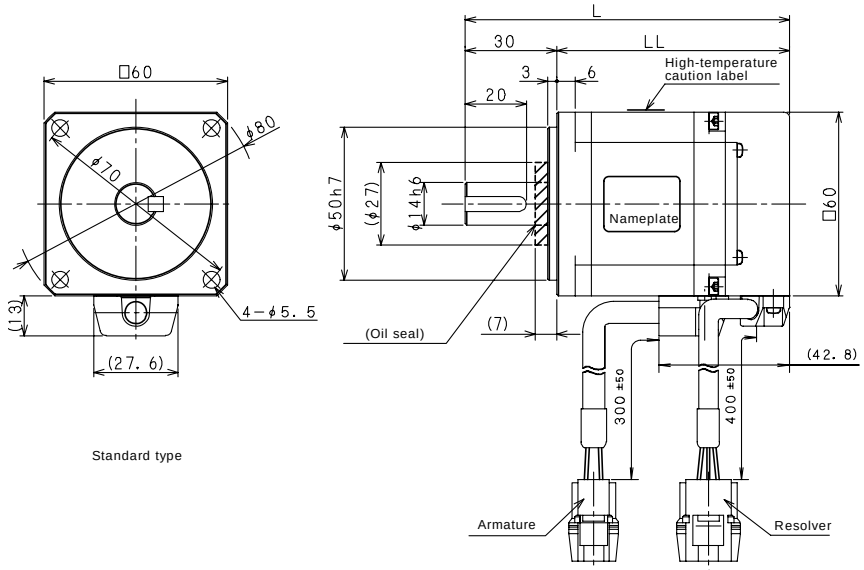
VLBSV–ZA00330, ZA00530, ZA01030 (40-sq.)



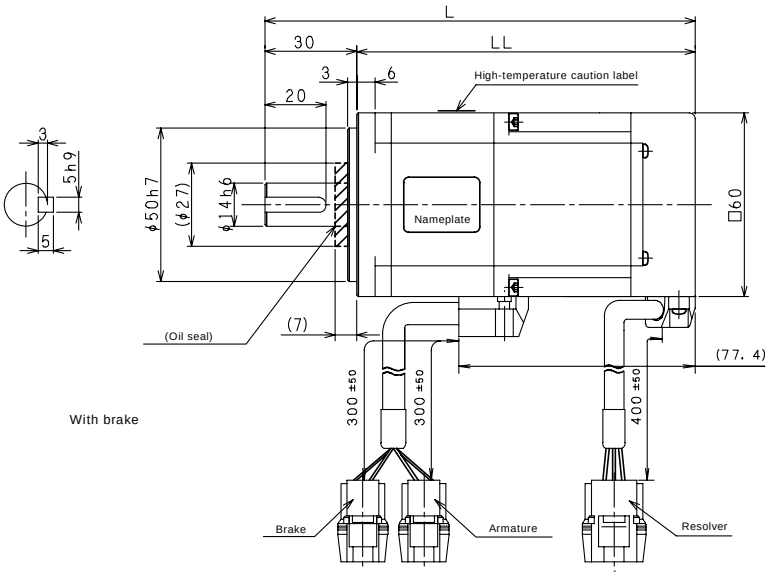
Model VLBSV–	L	LL
ZA00330	78.5	53.5
ZA00530	84.5	59.5
ZA01030	98.5	73.5
ZA00330–B	114.1	89.1
ZA00530–B	120.1	95.1
ZA01030–B	134.1	109.1

Note: "–B" signifies the motor with brake.
When the oil seal (shaded area) is attached, take careful precautions to prevent interference of the oil seal.

VLBSV–ZA02030, ZA04030 (60-sq.)



Standard type

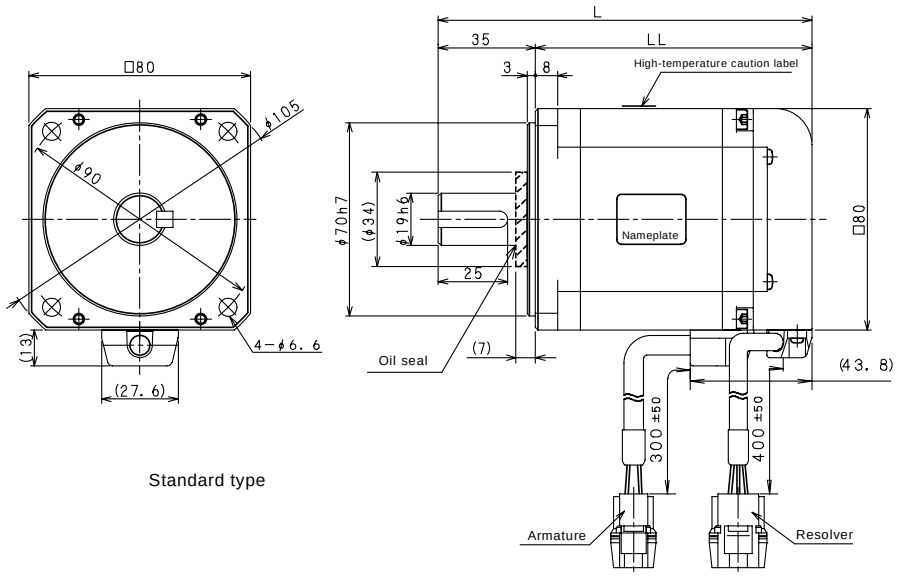


With brake

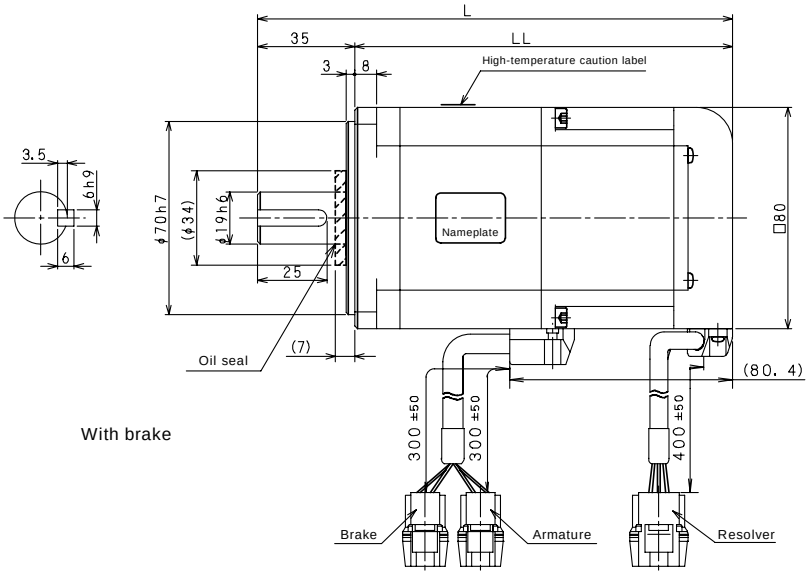
Model VLBSV–	L	LL
ZA02030	106.1	76.1
ZA04030	128.1	98.1
ZA02030–B	140.7	110.7
ZA04030–B	162.7	132.7

Note: "–B" signifies the motor with brake.
When the oil seal (shaded area) is attached, take careful precautions to prevent interference of the oil seal.

VLBSV–ZA06030, ZA07530 (80-sq.)



Standard type

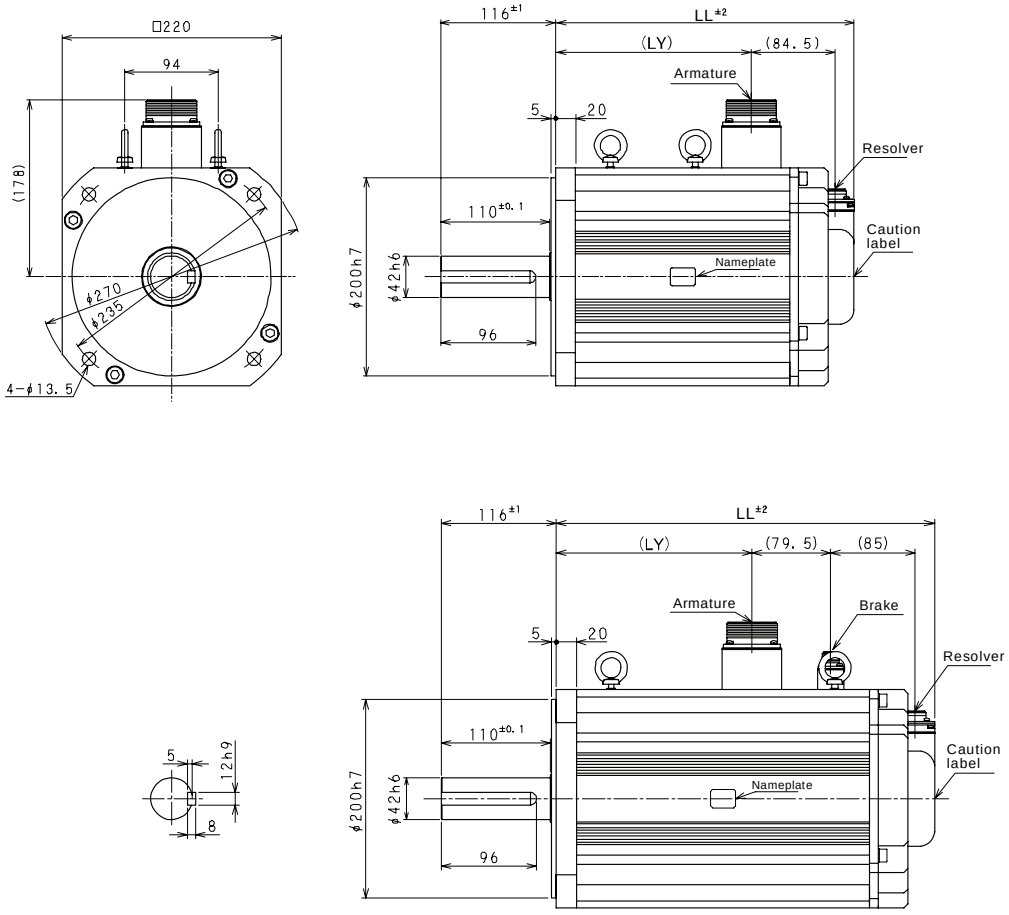


With brake

Model VLBSV–	L	LL
ZA06030	134.7	99.7
ZA07530	143.7	108.7
ZA06030–B	171.3	136.3
ZA07530–B	180.3	145.3

Note: "–B" signifies the motor with brake.
When the oil seal (shaded area) is attached, take careful precautions to prevent interference of the oil seal.

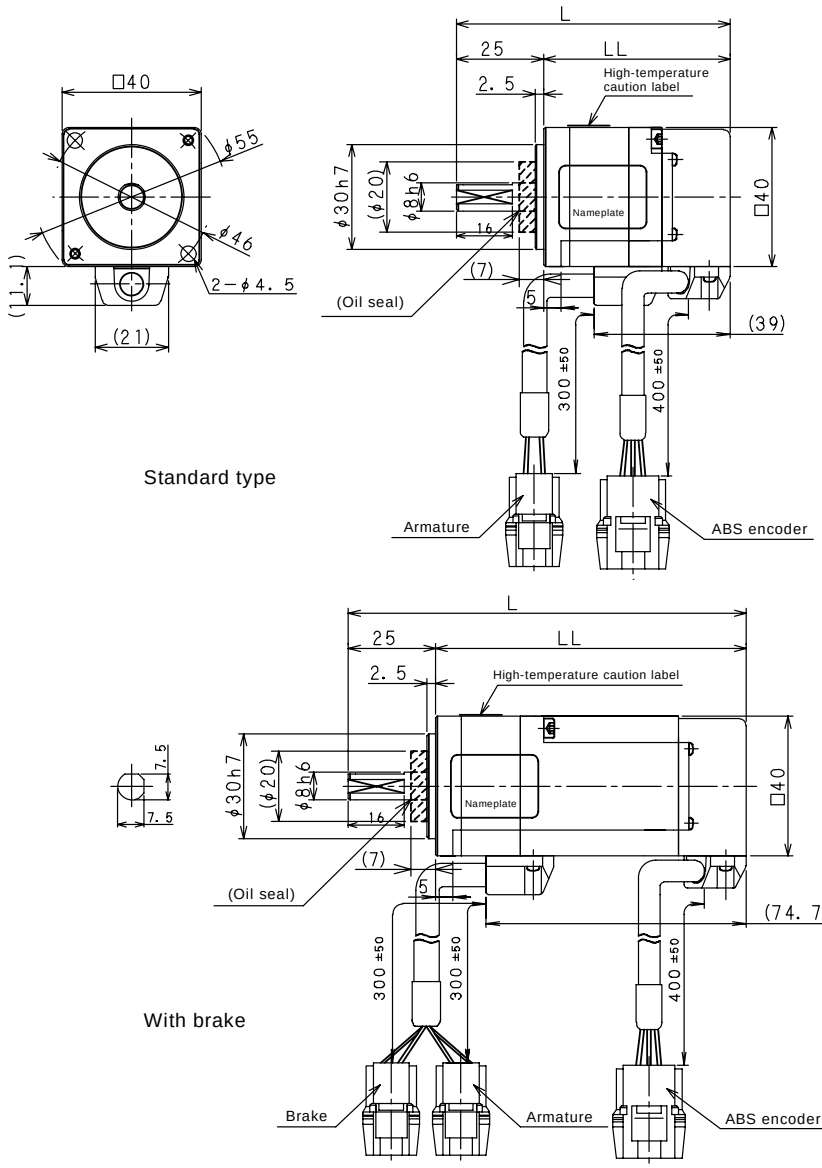
VLBSV–ZA11K15, ZA14K15 (220-sq.)



Model VLBSV–	LL	LY
ZA11K15	300	196
ZA14K15	360	256
ZA11K15–B	380	196
ZA14K15–B	440	256

Note: "–B" signifies the motor with brake.

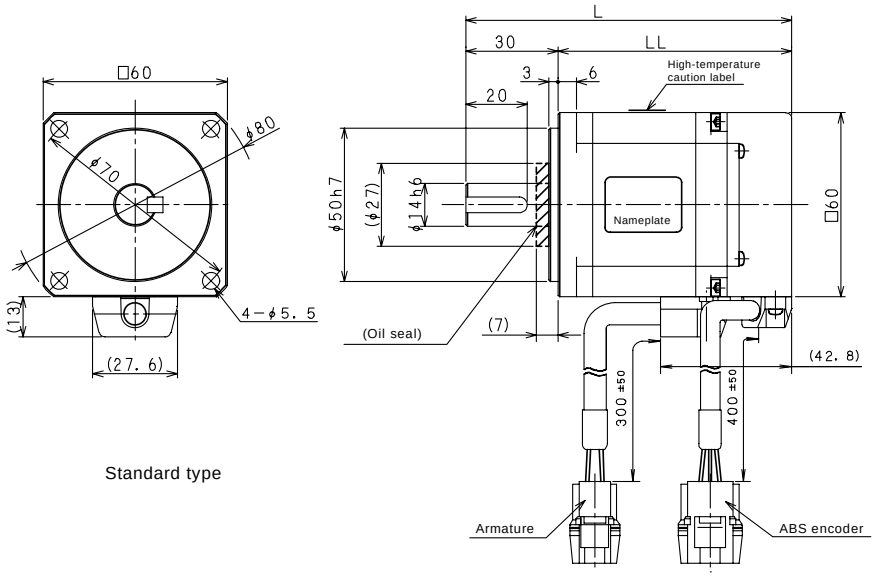
VLBSV–ZA00330S1, ZA00530S1, ZA01030S1 (40-sq.)



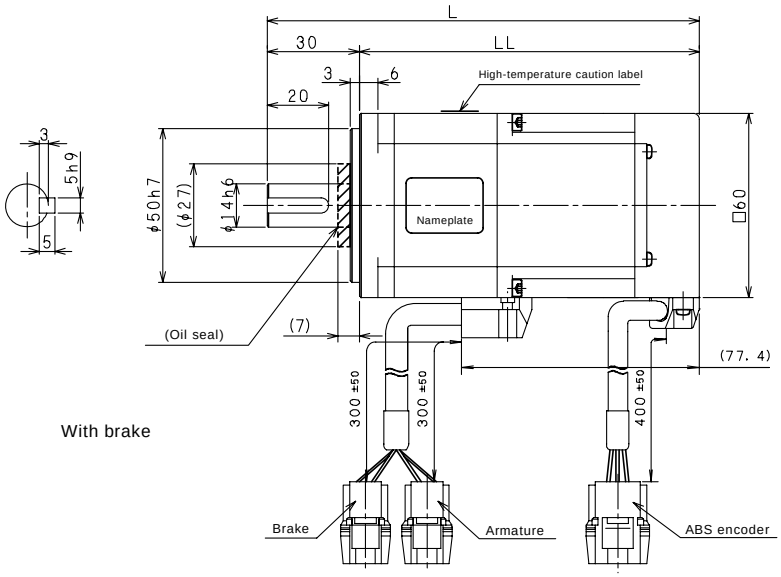
Model VLBSV–	L	LL
ZA00330S1	78.5	53.5
ZA00530S1	84.5	59.5
ZA01030S1	98.5	73.5
ZA00330S1–B	114.1	89.1
ZA00530S1–B	120.1	95.1
ZA01030S1–B	134.1	109.1

Note: "–B" signifies the motor with brake.
When the oil seal (shaded area) is attached, take careful precautions to prevent interference of the oil seal.

VLBSV–ZA02030S1, ZA04030S1 (60-sq.)



Standard type

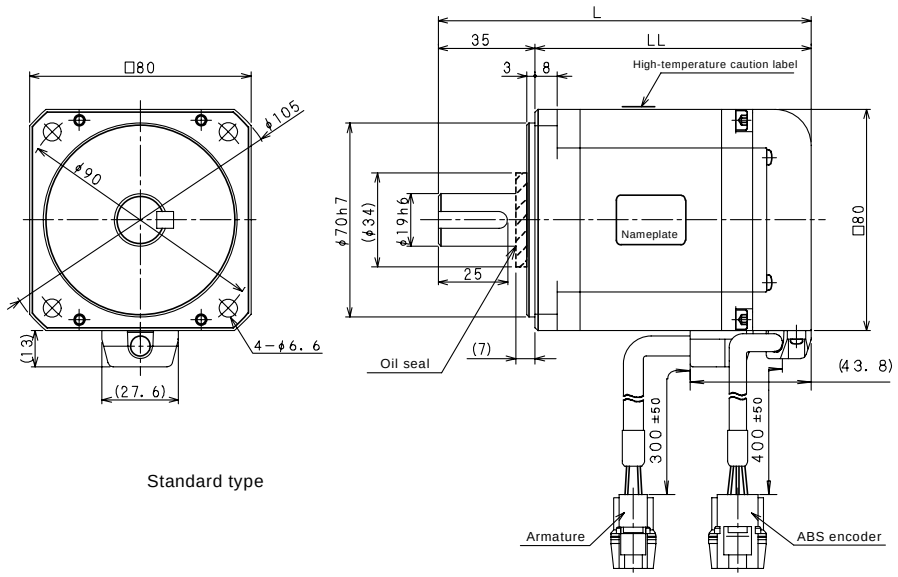


With brake

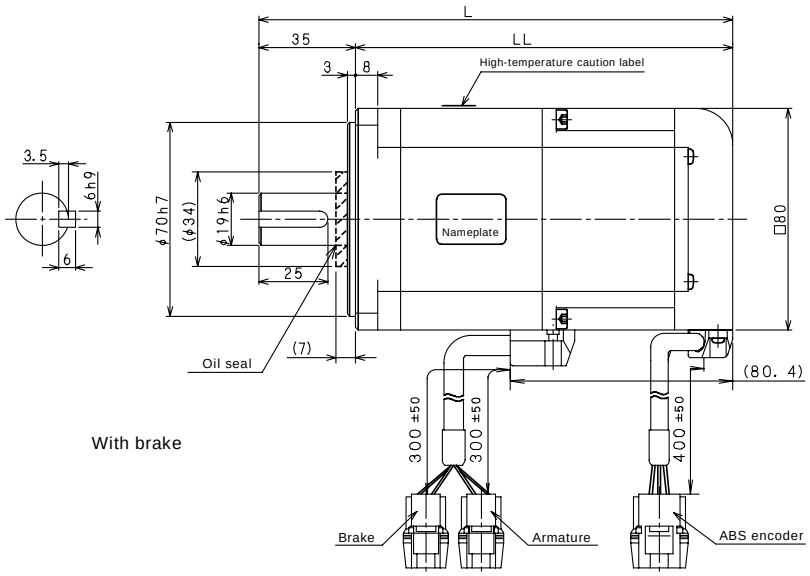
Model VLBSV–	L	LL
ZA02030S1	106.1	76.1
ZA04030S1	128.1	98.1
ZA02030S1–B	140.7	110.7
ZA04030S1–B	162.7	132.7

Note: "–B" signifies the motor with brake.
When the oil seal (shaded area) is attached, take careful precautions to prevent interference of the oil seal.

VLBSV–ZA06030S1, ZA07530S1 (80-sq.)



Standard type

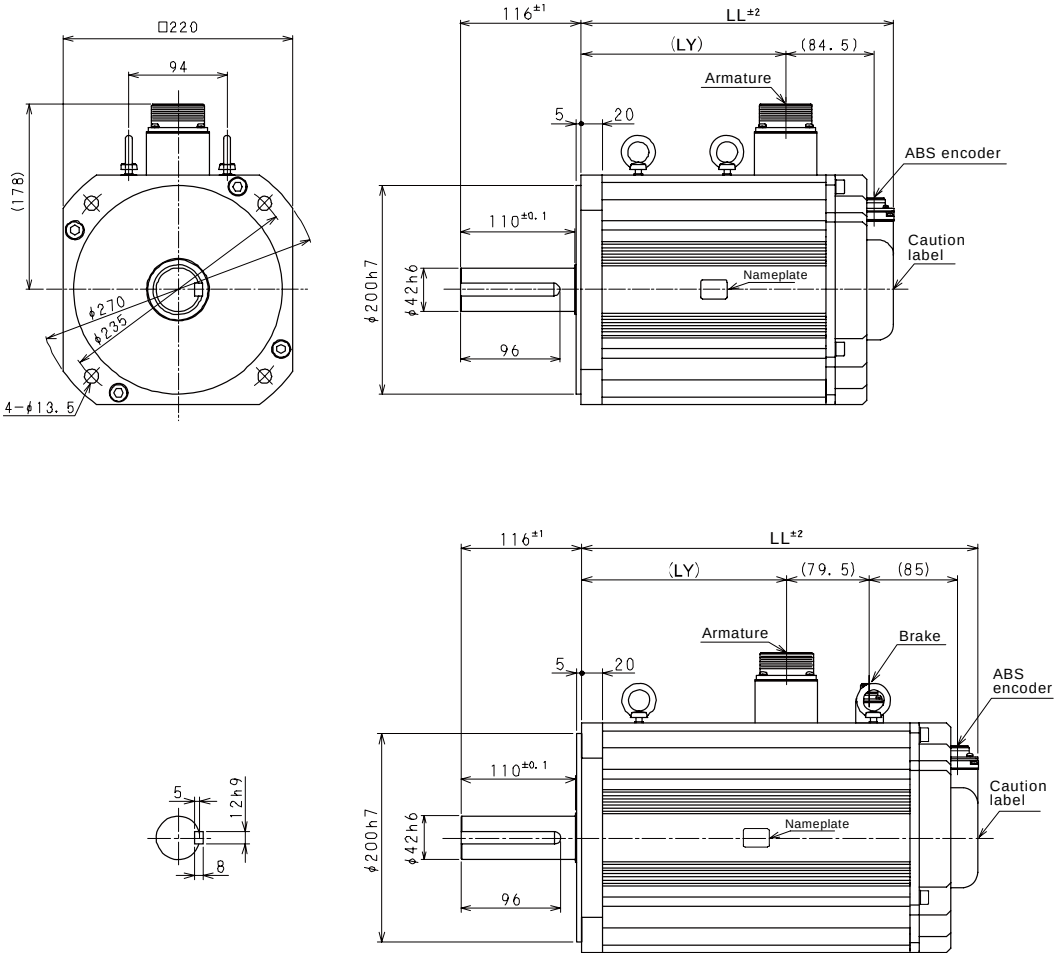


With brake

Model VLBSV–	L	LL
ZA06030S1	134.7	99.7
ZA07530S1	143.7	108.7
ZA06030S1–B	171.3	136.3
ZA07530S1–B	180.3	145.3

Note: "–B" signifies the motor with brake.
When the oil seal (shaded area) is attached, take careful precautions to prevent interference of the oil seal.

VLBSV–ZA11K15S1, ZA14K15S1 (220-sq.)

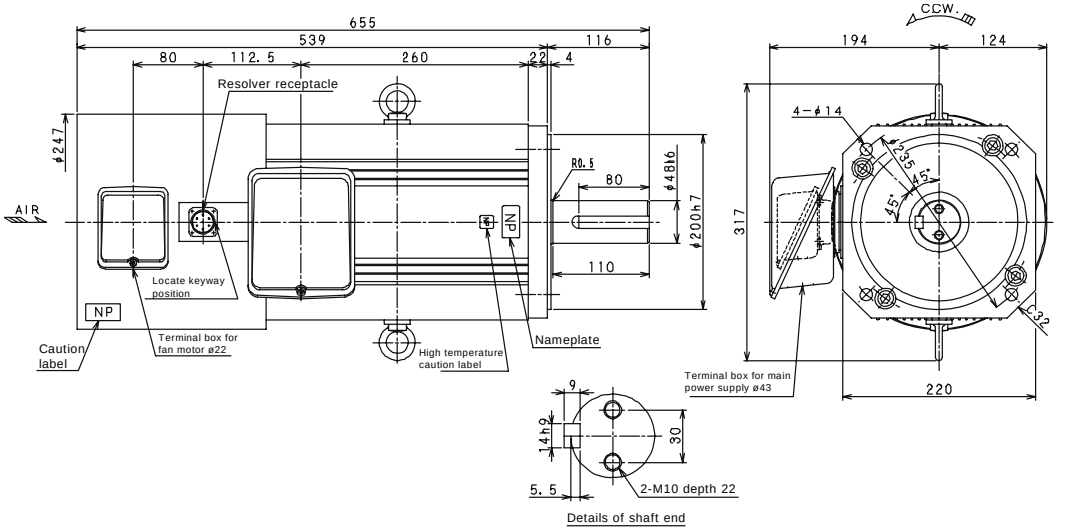


Model VLBSV–	LL	LY
ZA11K15S1	300	196
ZA14K15S1	360	256
ZA11K15S1–B	380	196
ZA14K15S1–B	440	256

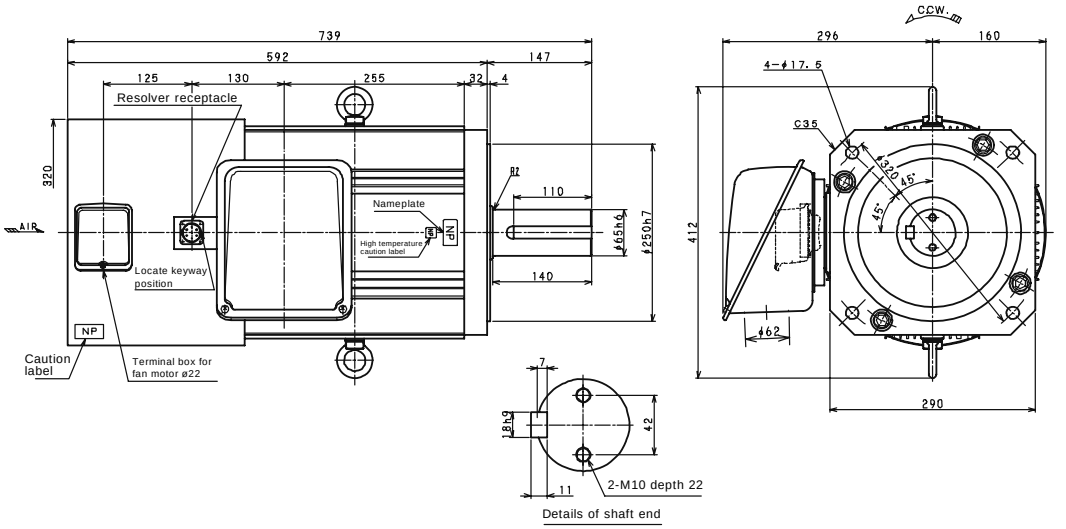
Note: "–B" signifies the motor with brake.

4.3.3 VLBSG Type Servo Motor

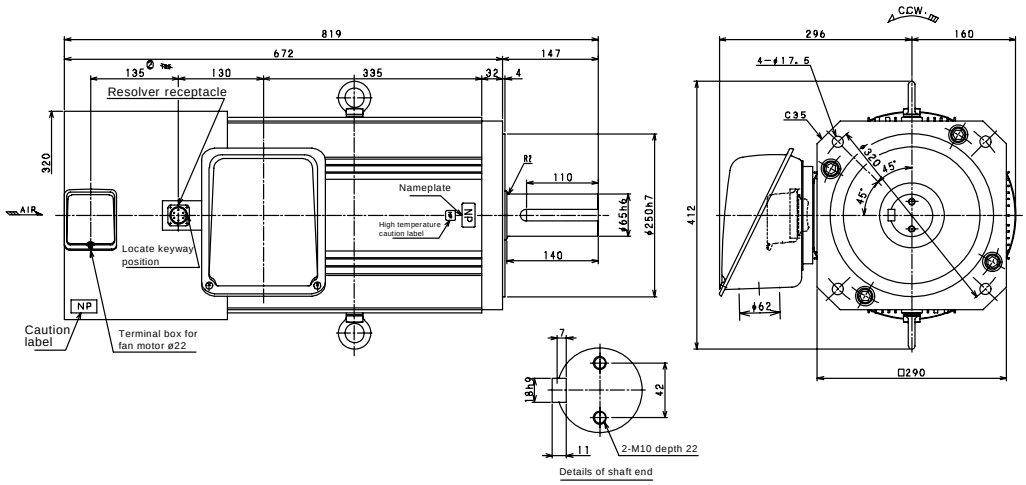
VLBSG–A20K20 (220-sq.)



VLBSG–A33K20 (290-sq.)

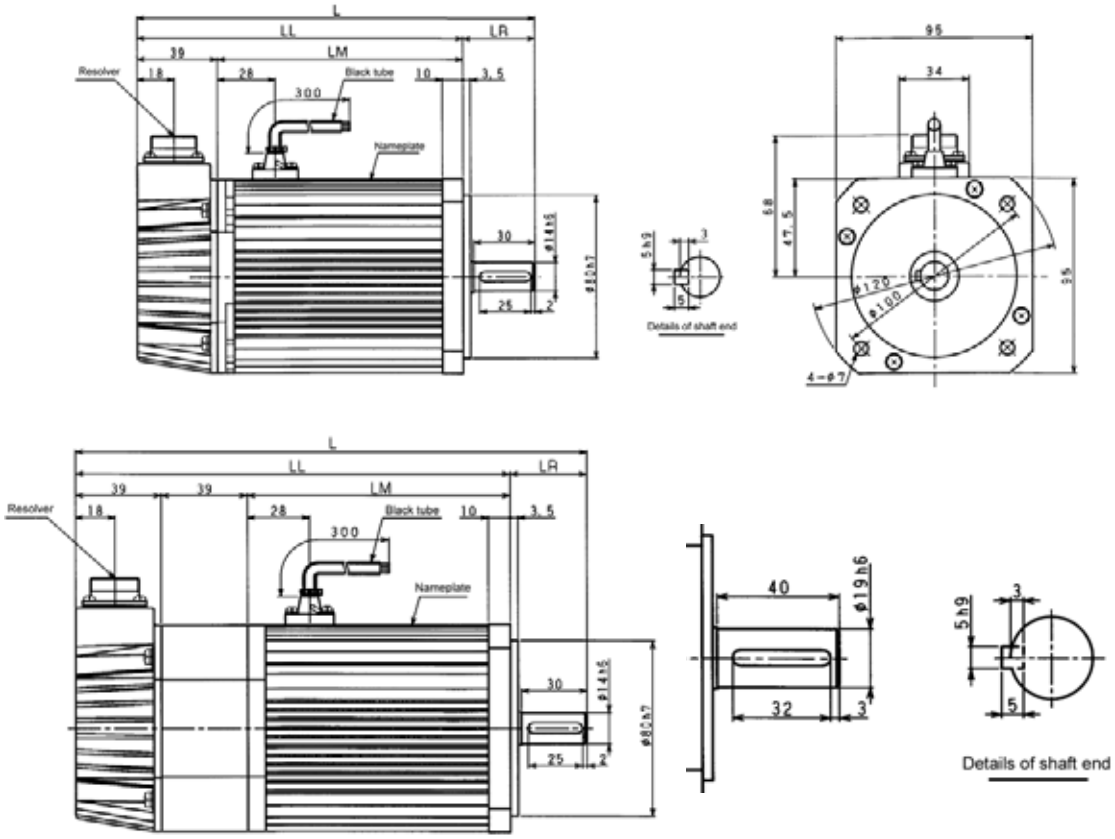


VLBSG–B55K20 (290-sq.)



4.3.4 VLBST–V Type Servo Motor

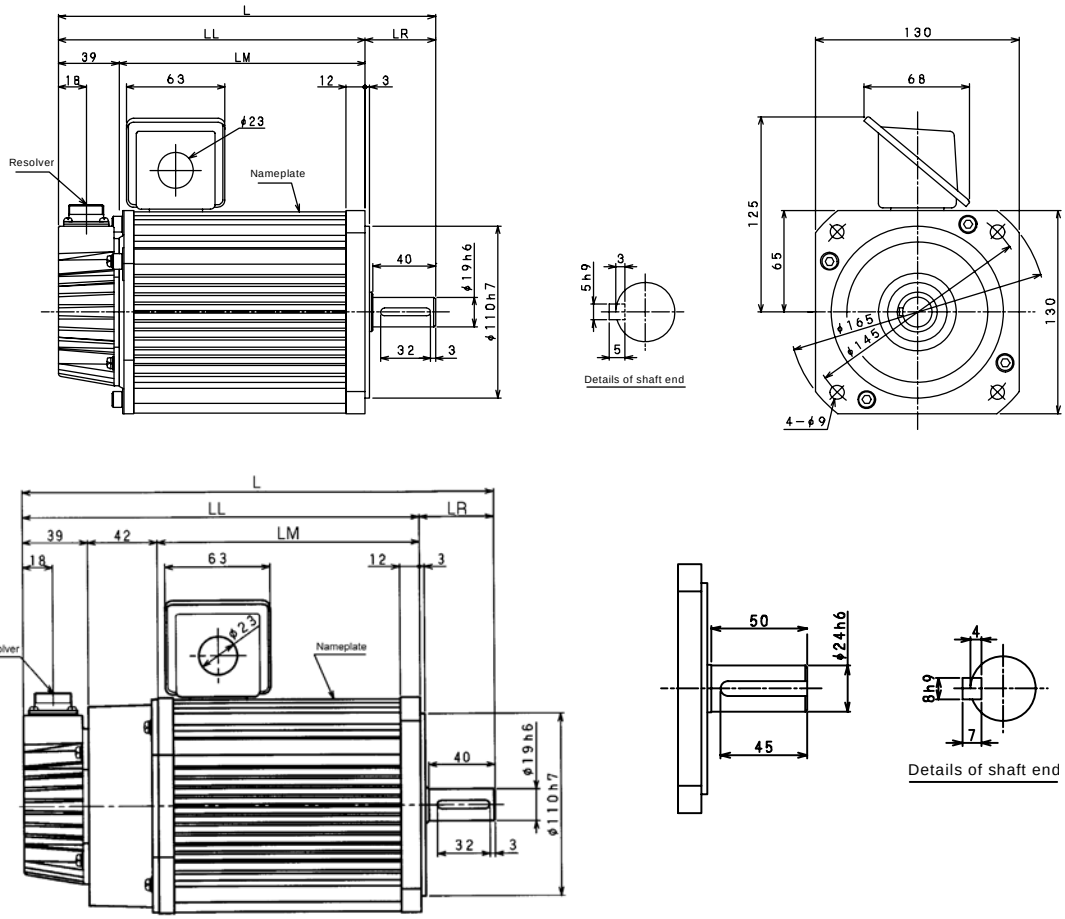
VLBST–04015V, 05030V, 08030V (95-sq.)



* The dimensions of the 04015V and 08030V shaft end are shown below.

Type	L	LL	LM	LR
04015V	235	190	151	45
05030V	193	158	119	35
08030V	235	190	151	45
04015V–B	274	229	151	45
05030V–B	232	197	119	35
08030V–B	274	229	151	45

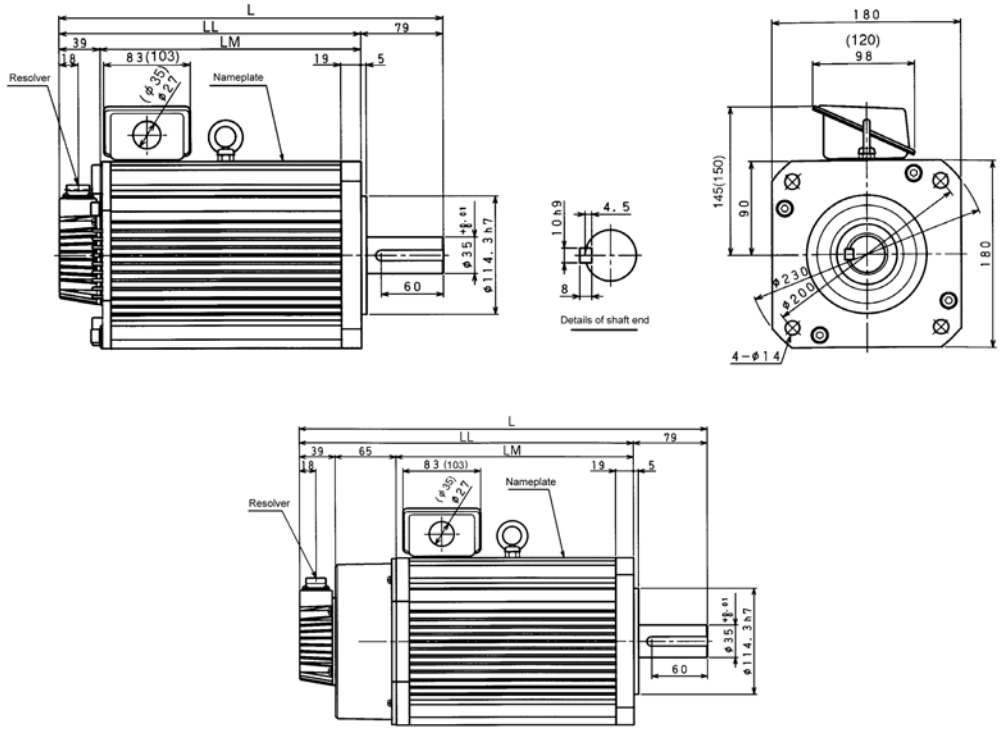
VLBST–08015V, 10015V, 15015V, 14030V, 18030V, 24030V (130-sq.)



* The dimensions of the 15015V and 24030V shaft end are shown below.

Type	L	LL	LM	LR
08015V	223	178	139	45
10015V	241	196	157	45
15015V	291	236	197	55
14030V	223	178	139	45
18030V	241	196	157	45
24030V	291	236	197	55
08015V–B	265	220	139	45
10015V–B	283	238	157	45
15015V–B	333	278	197	55
14030V–B	265	220	139	45
18030V–B	283	238	157	45
24030V–B	333	278	197	55

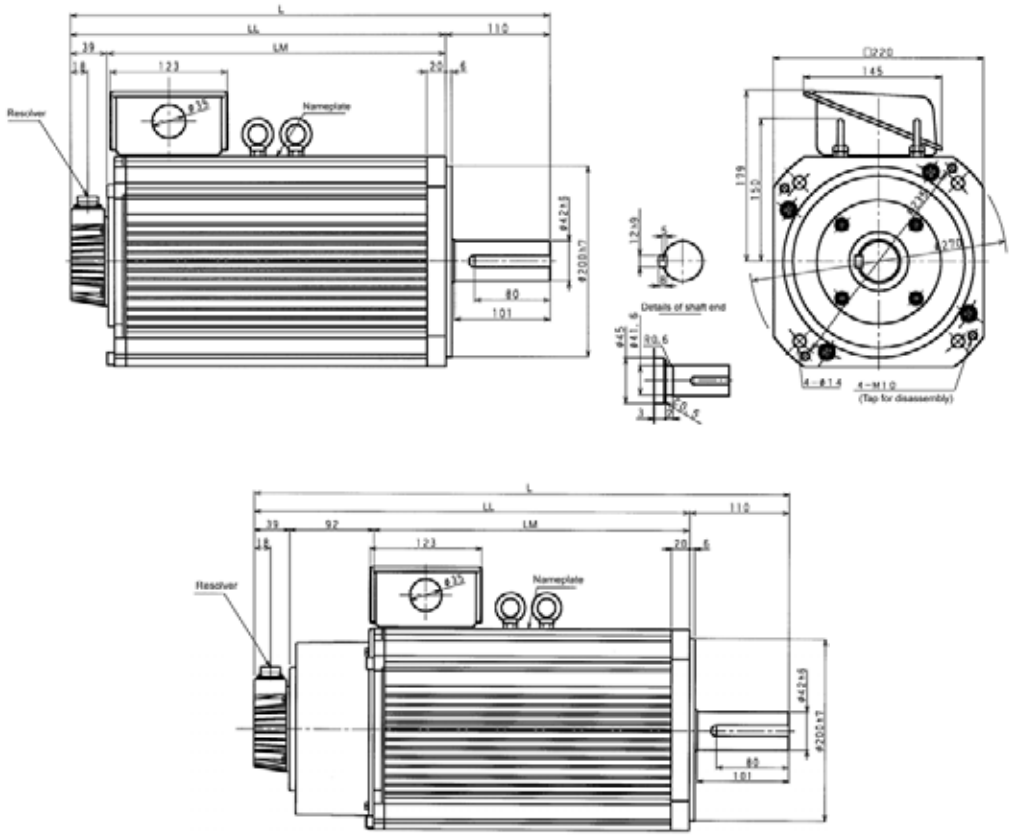
VLBST–26015V, 37015V, 50015V, 37030V, 55030V, 65030V (180-sq.)



* The dimensions of the 50015V, 55030V and 65030V shaft end are shown below.

Type	L	LL	LM	Hook bolt
26015V	317	238	199	Not provided
37015V	367	288	249	Provided
50015V	417	338	299	Provided
26015V–B	386	307	203	Not provided
37015V–B	436	357	253	Provided
50015V–B	486	407	303	Provided
37030V	317	238	199	Not provided
55030V	367	288	249	Provided
65030V	417	338	299	Provided
37030V–B	386	307	203	Not provided
55030V–B	436	357	253	Provided
65030V–B	486	407	303	Provided

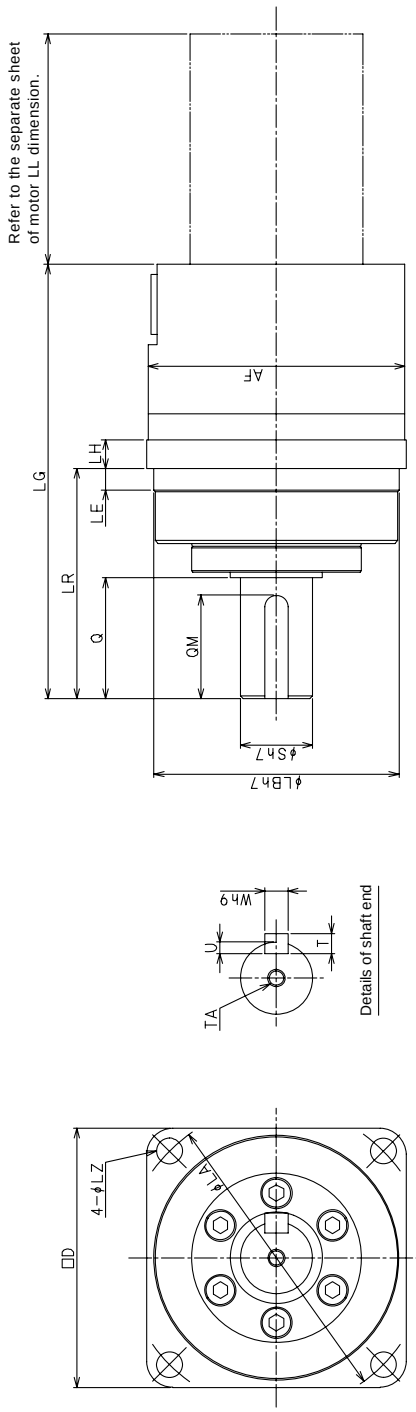
VLBST–75020K, 10K20V (220-sq.)



Type	L	LL	LM	Hook bolt
75020V	424	314	275	Provided
10K20V	504	394	355	Provided
75020V–B	509	399	268	Provided
10K20V–B	589	479	348	Provided

4.3.5 Servo Motor with Reduction Gear

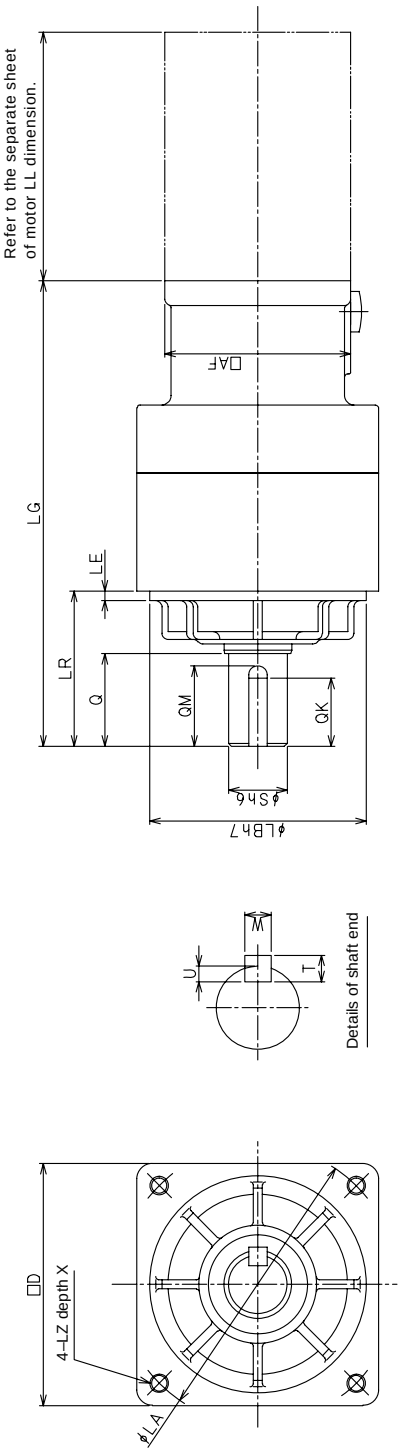
HPG series reduction gear (V series) made by Harmonic Drive Systems



Type of reduction gear HPG-	Dimension [mm]															
	LG	LR	LH	LE	LB	AF	®D	LA	LZ	Q	QM	S	W	U	T	TA
14A–05·11·21·33·45–J6AB®	122	58	8	2.5	56	®60	60	70	5.5	28	25	16	5	3	5	M4 X 8
14A–05·11–J6AZ®	122	58	8	2.5	56	®60	60	70	5.5	28	25	16	5	3	5	M4 X 8
20A–33·45–J6JBLA	146.5	80	10	7.5	85	ø89	90	105	9	42	36	25	8	4	7	M6 X12
20A–05·11·21·33·45–J6GC®	151	80	10	7.5	85	ø89	90	105	9	42	36	25	8	4	7	M6 X12
20A–05·11–J6HB®	158	80	10	7.5	85	®100	90	105	9	42	36	25	8	4	7	M6 X12
32A–33·45–J6NDLA	237	133	13	12.5	115	ø122	120	135	11	82	70	40	12	5	8	M10X20
32A–11·21·33·45–J6NC®	237	133	13	12.5	115	ø122	120	135	11	82	70	40	12	5	8	M10X20

Type © as per the specifications table.

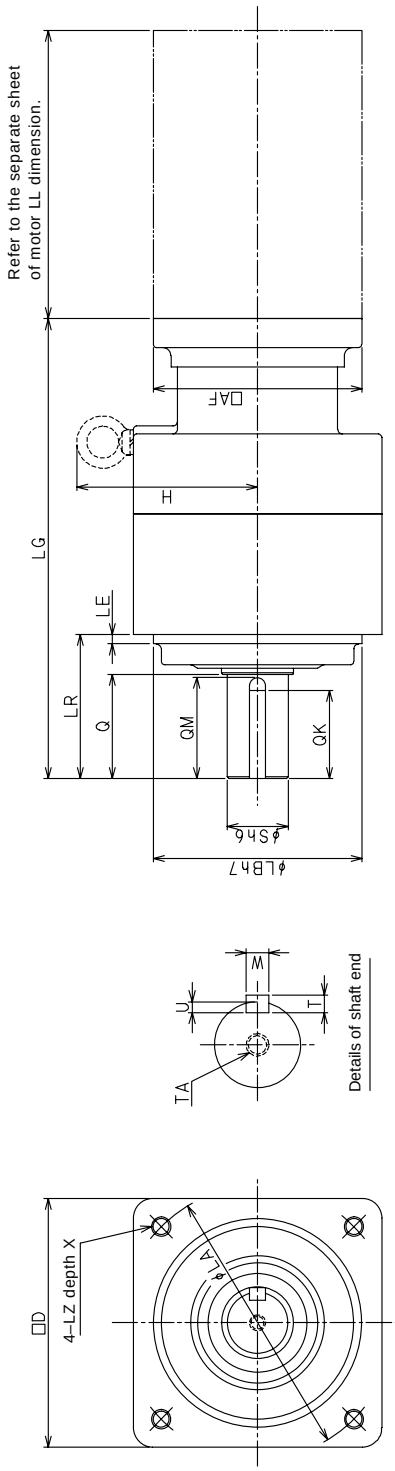
Able reduction gear (VRKF–, VRSF–) (V series) made by NIDEC SHIMPO
[Frames B and C]



Type of reduction gear VR®F–(LB)–	Dimension [mm]															
	LG	LR	®AF	LE	LB	®D	LA	LZ	X	Q	QM	QK	S	W	U	T
3B·5B·S9B–SAA	99.5	32	40	3	50	52	60	M5	12	20	18	16	12	4	2.5	4
15B·25B–SAA	110	32	40	3	50	52	60	M5	12	20	18	16	12	4	2.5	4
25C–SAA	142	50	40	3	70	78	90	M6	20	30	26	22	19	6	3.5	6
3B·5B–SBB	104.5	32	60	3	50	52	60	M5	12	20	18	16	12	4	2.5	4
5C·S9C–SBB	139.5	50	60	3	70	78	90	M6	20	30	26	22	19	6	3.5	6
15C·25C–SBB	150	50	60	3	70	78	90	M6	20	30	26	22	19	6	3.5	6
3C·5C–SCC	143.5	50	80	3	70	78	90	M6	20	30	26	22	19	6	3.5	6

The external view of standard backlash type is identical with that of low backlash type.

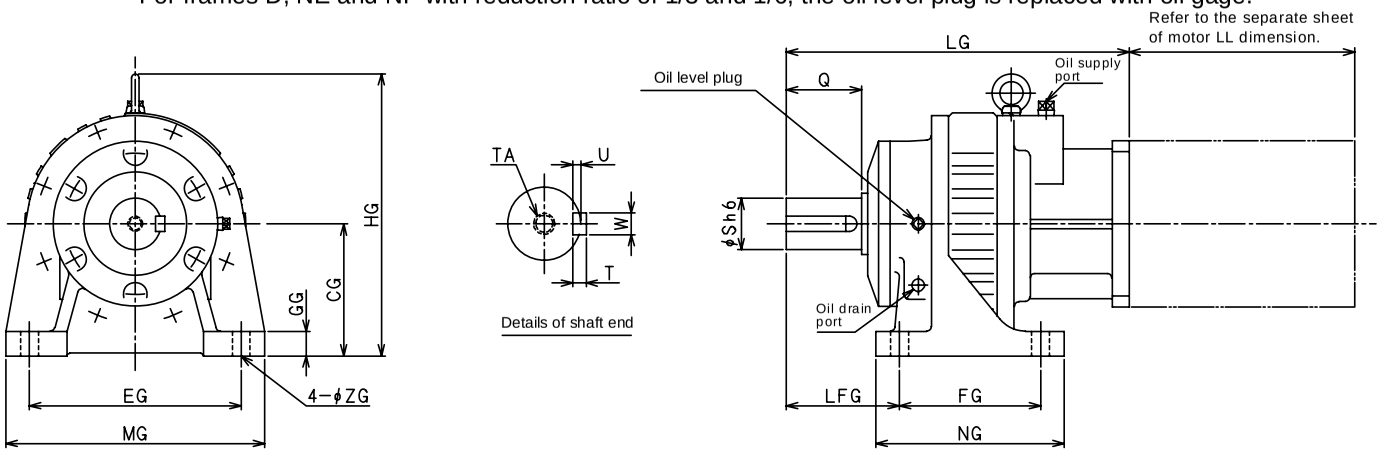
Able reduction gear (VRKF–, VRSF–) made by NIDEC-SHIMPO [Frames D, E, F and G]



Type of reduction gear VR®F-	Dimension (mm)																				
	LG	LR	®AF	LE	LB	®D	LA	LZ	X	Q	QM	QK	S	W	U	T	TA	H
(LB)–25D–SBB	165	61	60	5	90	98	115	M8	20	40	35	30	24	8	4	7	–	–
(LB)–S9D–SCC	158.5	61	80	5	90	98	115	M8	20	40	35	30	24	8	4	7	–	–
(LB)–15D–SCC	171	61	80	5	90	98	115	M8	20	40	35	30	24	8	4	7	–	–
(LB)–25E–SCC	210	75	80	5	110	125	135	M10	20	55	52	45	32	10	5	8	–	–
(LB)–3D·5D–SEC	177	61	130	5	90	98	115	M8	20	40	35	30	24	8	4	7	–	–
(LB)–5E·S9E–SEC	215	75	130	5	110	125	135	M10	20	55	52	45	32	10	5	8	–	–
(LB)–15E·25E–SEC	235	75	130	5	110	125	135	M10	20	55	52	45	32	10	5	8	–	–
(LB)–3E·5E·S9E–SED	215	75	130	5	110	125	135	M10	20	55	52	45	32	10	5	8	–	–
(LB)–3E·5E·S9E–SFE	245	75	174	5	110	125	135	M10	20	55	52	45	32	10	5	8	–	–
25F–TEC	270	90	130	6	130	155	170	M12	24	65	63	55	38	10	5	8	–	113
15F–TED	285	90	130	6	130	155	170	M12	24	65	63	55	38	10	5	8	–	113
25G–TED	344	115	130	6	170	200	220	M16	35	85	80	65	50	14	5.5	9	M10X20	135
5F–TFE	281.5	90	180	6	130	155	170	M12	24	65	63	55	38	10	5	8	–	113
9F·15F–TFE	307	90	180	6	130	155	170	M12	24	65	63	55	38	10	5	8	–	113
15G·25G–TFE	366	115	180	6	170	200	220	M16	35	85	80	65	50	14	5.5	9	M10X20	135

The external view of standard backlash type is identical with that of low backlash type.
Frames F and G are provided with an eyebolt, respectively.
Frame G is provided with tap on the shaft end.

ERK: With base, output shaft facing sideways.
The position and profile of oil supply port, oil drain port and oil level plug differ with the motor model.
For frames D, NE and NF with reduction ratio of 1/3 and 1/6, the oil level plug is replaced with oil gage.

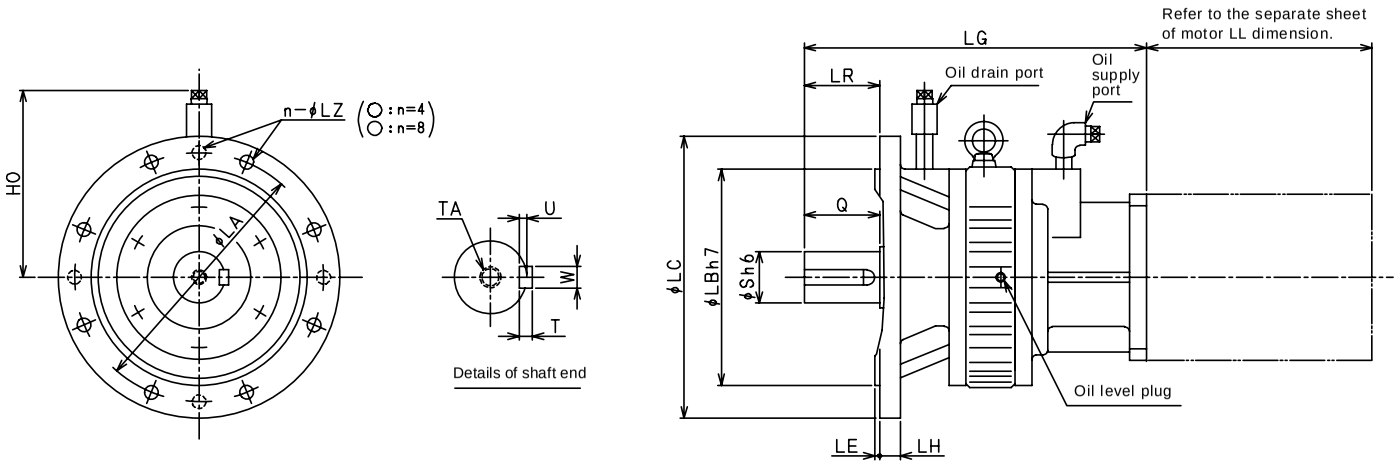


Type of reduction gear ERK–(NB)–	Dimension (mm)															
	LG	NG	FG	LFG	MG	EG	GG	CG	HG	ZG	Q	S	W	U	T	TA
®B–TEC	223	135	105	75	175	145	16	115	221	12	40	28	8	4	7	–
®C–TEC	264	170	130	95	220	180	22	115	241	15	55	38	10	5	8	–
®C–TED	264	170	130	95	220	180	22	115	241	15	55	38	10	5	8	–
®D–TEC	334	200	150	120	275	225	26	140	299	19	80	55	16	6	10	–
®D–TED	334	200	150	120	275	225	26	140	299	19	80	55	16	6	10	–
®D–TFE	364	200	150	120	275	225	26	140	299	19	80	55	16	6	10	–
®NE–TFE	408	300	250	150	360	300	30	185	Note 1 399	22	110	75	20	7.5	12	M16X30
®NE–TFF	498	300	250	150	360	300	30	185	Note 1 399	22	110	75	20	7.5	12	M16X30
®NF–TFF	542	365	295	195	425	350	35	210	Note 2 454	25	140	95	25	9	14	M16X30

Note 1: For the type with reduction ratio of 1/3, 1/6 and NB type, HG = 389.

Note 2: For the type with reduction ratio of 1/6 and NB type, HG = 444.

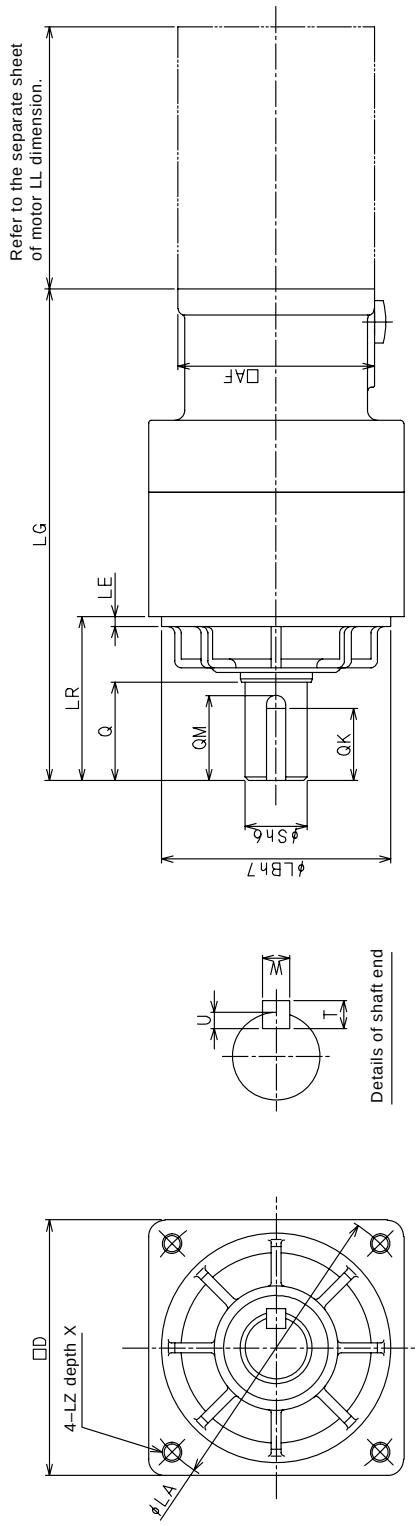
ERK: With flange, output shaft facing down.
The position and profile of oil supply port, oil drain port and oil level plug differ with the motor model.
For frames D, NE and NF with reduction ratio of 1/3 and 1/6, the oil level plug is replaced with oil gage.



Type of reduction gear ERKV–(NB)–	Dimension (mm)															
	LG	LR	LC	LB	LE	LH	LA	n	LZ	HO	Q	S	W	U	T	TA
®B–TEC	223	40	200	130	4	14	165	4	12	131	40	28	8	4	7	–
®C–TEC	264	55	250	180	4	18	215	4	15	Note 1 168	55	38	10	5	8	–
®C–TED	264	55	250	180	4	18	215	4	15	168	55	38	10	5	8	–
®D–TEC	334	80	300	230	5	22	265	8	15	199	80	55	16	6	10	–
®D–TED	334	80	300	230	5	22	265	8	15	199	80	55	16	6	10	–
®D–TFE	364	80	300	230	5	22	265	8	15	199	80	55	16	6	10	–
®NE–TFE	408	110	400	300	8	25	350	8	19	232	110	75	20	7.5	12	M16X30
®NE–TFF	498	110	400	300	8	25	350	8	19	232	110	75	20	7.5	12	M16X30
®NF–TFF	542	140	450	350	8	25	400	8	19	261	140	95	25	9	14	M16X30

Note 1: For the type with reduction ratio of 1/3 and 1/6, HO = 181.

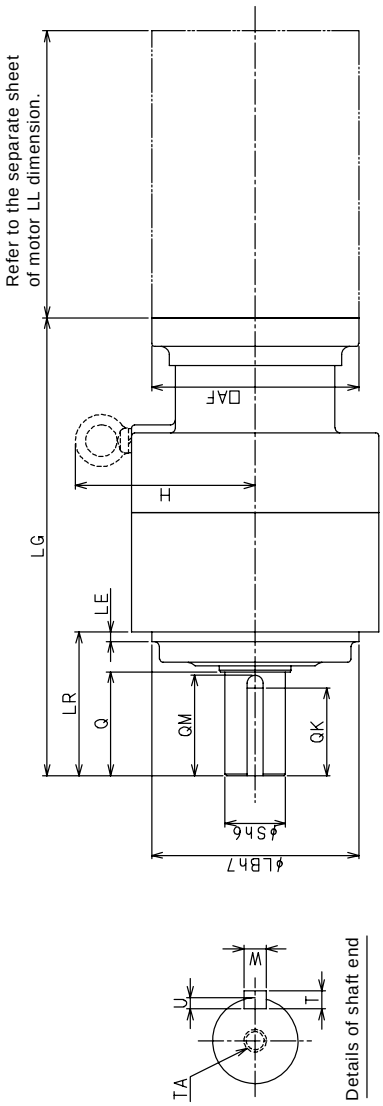
Able reduction gear (VRSF–) (T series) made by NIDEC-SHIMPO [Frame C]



Type of reduction gear VRSF– (LB) –	Dimension (mm)															
	LG	LR	Q	QM	QK	S	W	U	T	□D	LA	LB	LE	LZ	X	□AF
3C・5C–SDB	143.5	50	30	26	22	19	6	3.5	6	78	90	70	3	M6	20	95
3C・5C–SDC	153.5	50	30	26	22	19	6	3.5	6	78	90	70	3	M6	20	95

The external view of standard backlash type is identical with that of low backlash type.

Able reduction gear (VRKF–, VRSF–) (T series) made by NIDEC-SHIMPO
[Frames D to G]



Type of reduction gear VR□F–	Dimension (mm)																			
	LG	LR	Q	QM	QK	S	W	U	T	TA	□D	LA	LB	LE	LZ	X	H	□AF
(LB)–S9D–SDB	168.5	61	40	35	30	24	8	4	7	——	98	115	90	5	M8	20	—	95
(LB)–15D–SDB	181	61	40	35	30	24	8	4	7	——	98	115	90	5	M8	20	—	95
(LB)–25E–SDB	220	75	55	52	45	32	10	5	8	——	125	135	110	5	M10	20	—	95
(LB)–S9D–SDC	168.5	61	40	35	30	24	8	4	7	——	98	115	90	5	M8	20	—	95
(LB)–15D–SDC	181	61	40	35	30	24	8	4	7	——	98	115	90	5	M8	20	—	95
(LB)–25E–SDC	220	75	55	52	45	32	10	5	8	——	125	135	110	5	M10	20	—	95
(LB)–3D·5D–SEC	177	61	40	35	30	24	8	4	7	——	98	115	90	5	M8	20	—	130
(LB)–5E·S9E–SEC	215	75	55	52	45	32	10	5	8	——	125	135	110	5	M10	20	—	130
(LB)–15E–SEC	235	75	55	52	45	32	10	5	8	——	125	135	110	5	M10	20	—	130
(LB)–3E·5E·S9E–SED	215	75	55	52	45	32	10	5	8	——	125	135	110	5	M10	20	—	130
(LB)–3E·5E–SFE	245	75	55	52	45	32	10	5	8	——	125	135	110	5	M10	20	—	174
25F–TEH	270	90	65	63	55	38	10	5	8	——	155	170	130	6	M12	24	113	130
15F–TED	285	90	65	63	55	38	10	5	8	——	155	170	130	6	M12	24	113	130
25G–TED	344	115	85	80	65	50	14	5.5	9	M10×20	200	220	170	6	M16	35	135	130
9F–TFJ	307	90	65	63	55	38	10	5	8	——	155	170	130	6	M12	24	113	180
15G·25G–TFJ	366	115	85	80	65	50	14	5.5	9	M10×20	200	220	170	6	M16	35	135	180

The external view of standard backlash type is identical with that of low backlash type.
Frames F and G are provided with an eyebolt, respectively.
Frame G is provided with tap on the shaft end.

4.4 Dynamic Brake Characteristics

The table below shows the stop time and number of revolutions when the motor that is running independently at rated speed is stopped with a dynamic brake. The dynamic brake is realized by directly short-circuiting the motor output terminals with a contactor. No special resistors are included.

Motor model VLBSV–	Inertia magnification a=0 (single motor) Set resistance R=0		Example reference inertia magnification a=5			Remarks
	Stop time Tsm [ms]	No. of rev. Nrm [rev.]	Set resist-ance R [Ω]	Stop time Ts [ms]	No. of rev. Nr [rev.]	Short-circuit current I [Arms]
05015	35	0.32	0	210	1.92	8.8
10015	30	0.29	0	180	1.74	20
15015	30	0.32	0	180	1.92	31
20015	190	2.93	1.0	630	5.28	17
30015	170	2.67	1.0	750	4.08	39
50015	200	3.20	0.5	570	3.90	55
75015	200	3.16	0.5	750	3.96	95
10030	75	1.99	1.0	450	6.60	18
18030	75	2.10	0.5	360	5.58	41
24030	70	2.01	0.5	420	5.10	67
30030	590	19.3	1.0	1320	18.1	32
45030	580	18.8	0.5	1260	15.9	69
70030	590	19.3	0.2	1020	16.1	114
10K30	750	24.9	0.2	1260	14.9	189
ZA00330	9	0.11	0	58	0.66	0.48
ZA00530	8	0.11	0	50	0.64	1.08
ZA01030	6	0.08	0	30	0.44	2.28
ZA02030	16	0.4	1.0	95	1.90	3.28
ZA04030	14	0.4	1.0	82	1.43	7.2
ZA06030	32	1.0	1.0	130	2.45	11.0
ZA07530	28	0.9	1.0	120	2.07	12.8
ZA11K15	155	2.47	0.2	410	2.88	155
ZA14K15	170	2.74	0.2	410	2.77	198

Motor model VLBSG–	Inertia magnification a=0 (single motor) Set resistance R=0		Example reference inertia magnification a=5			Remarks
	Stop time Tsm [ms]	No. of rev. Nrm [rev.]	Set resist-ance R [Ω]	Stop time Ts [ms]	No. of rev. Nr [rev.]	Short-circuit current I [Arms]
A20K20	540	11.9	0.2	1100	10.0	185
A33K20	1500	32.8	0.2	3000	22.3	279
B55K20	1200	26.5	0.2	1500	19.0	236

Motor model VLBST–	Inertia magnification a=0 (single motor) Set resistance R=0		Example reference inertia magnification a=5			Remarks
	Stop time Tsm [ms]	No. of rev. Nrm [rev.]	Set resist-ance R [Ω]	Stop time Ts [ms]	No. of rev. Nr [rev.]	Short-circuit current I [Arms]
04015V	18	0.07	0	48	0.43	5.4
08015V	14	0.17	0	82	0.99	8.0
10015V	14	0.18	1.0	78	0.69	10.0
15015V	17	0.24	1.0	82	0.70	15.0
26015V	48	0.74	0.5	170	1.74	24.5
37015V	52	0.82	0.5	170	1.38	39.5
50015V	58	0.95	0.5	190	1.42	50.0
75020V	185	4.08	0.5	410	3.78	70.0
10K20V	190	4.21	0.5	580	3.87	130.0
05030V	31	0.27	0	78	1.58	7.2
08030V	41	0.35	0	86	2.09	12.3
14030V	50	1.58	1.0	180	3.85	11.5
18030V	45	1.44	1.0	160	2.68	19.0
24030V	60	1.91	0.5	160	3.19	29.0
37030V	175	5.69	0.5	360	5.81	49.0
55030V	260	8.50	0.5	500	6.55	64.0
65030V	280	9.35	0.5	600	6.69	87.0

Caution: The stop time and number of revolutions given above are the values from the dynamic brake ON to the motor stop.
Actually, it takes about 40 ms from a command from the servo amplifier to the dynamic brake ON, and add 40 ms to the above values.

The stop time (T_s) and number of revolutions (N_r) when the motor is running at rated speed under load and no resistors are used can be figured out from the following equations.

$N_r = (a+1) \times N_{rm}$ (revolutions)

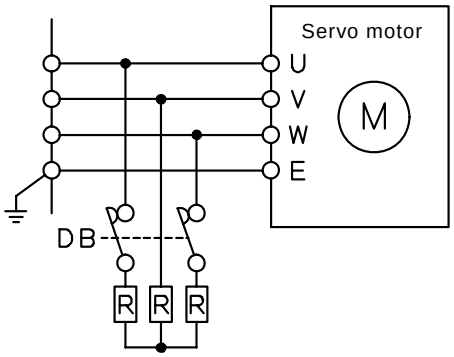
$T_s = (a+1) \times T_{sm}$ (ms)

where,

a = Load inertia/Motor inertia

When using resistors, it is recommended to refer to the values of set resistance given in the above table. Use three (3) resistors of the same type. Select the resistor capacity per resistor (I^2R), considering the stop time.

The main contact of the dynamic brake contactor is a normal close contact. If the contact is wrong, the servo amplifier may be damaged.



Appendix	Appendix

Appendix 1 Maintenance and Inspection

As the BS servo motor has no abrasion parts, special troublesome inspection is unnecessary. The following inspection provides a yardstick. Appropriate maintenance and inspection can be added and inspection intervals can be shortened according to the operating condition, environmental condition, etc.
NEVER disassemble the motor. If it needs to be disassembled, contact us immediately.

Check intervals	Check item	Procedures	Remarks
Daily inspection	Vibration	Make sure that any vibration other than the regular one is not involved.	
	Noise	Make sure that any noise other than the regular one is not heard.	
	Odor	Make sure that no smell of burning is involved.	
	Visual appearance	Make sure that no obstacle stands in the way of the cooling or air passage. Also make sure that the surface is not stained with oil or coolant liquid.	Improve the ventilation. Clean the surface with a waste cloth or by blowing the air.
	When the reduction gear is provided	Make sure that no oil leaks.	
Regular inspection (One (1) year or 3,000 hours)	Insulation resistance	Turn off the power of the servo amplifier and disconnect the armature cable from the amplifier. Then measure the resistance at the terminal of the single motor, using a 500 V megger.	OK if the resistance is 10 MΩ or over.
	Mounting of motor Link of load	Make sure that all bolts are tightened completely. Make sure that the pulley and coupling are clamped completely.	

Check intervals	Check item	Procedures	Remarks
Regular inspection (One (1) year or 3,000 hours)	Wiring	Make sure that the cable covering is not damaged, and that the connections are screwed completely.	
	Connector	Make sure that no water or oil has entered the connections, and that the connector is clamped completely.	
	When the oil seal is attached	Disengage the motor from the machine and make sure that the lip is not worn out excessively or not deteriorated.	If it is found abnormal, contact us.
	When the reduction gear is provided	Change the oil. (When grease-lubricated, oil change is not required.)	Fill the specified oil to the specified level according to the reduction gear instruction manual provided separately.
Overall inspection (Five (5) years or 20,000 hours)	Replacement of consumable parts	The motor is disassembled to check for or replace the consumable parts (bearing, oil seal, etc.) as necessary.	Contact us.

CAUTION	DO NOT disassemble the motor. Otherwise, you may get injured, or the motor may be damaged.

Appendix 2 Storage

When the BS servo motor is to be stored for a long period of time, take careful precautions on the following points.

(1) Store the motor indoor and at a clean vibration-free place with little change in temperature.

Item	Specifications
Storage temperature	–10 ~ +75°C (non-freezing)
Storage humidity	30 ~ 90 %RH (non-condensing)
Atmosphere	Corrosive gas, dirt or dust or metal chips should not be involved.
Vibration	10 m/S^2 (1 G) or less

(2) To prevent rust development on the bearing, turn by hand the shaft under no load every three (3) months and make sure that it can turn smoothly, without causing abnormal noise.

(3) Before using the motor, check for the bearing and measure the insulation resistance again.

(4) Even if the installed motor is not used for a long term, run it under no load for five (5) minutes every three (3) months.

Appendix 3 Troubleshooting

Troubles will originate from both the motor side and amplifier side.
This paragraph deals with the troubles characteristic of the motor. For the alarm displays and troubles of the amplifier, see the Amplifier Engineering Handbook provided separately.

Phenomenon	Possible cause	Inspection	Remedy	Alarm of amp.
The motor will not start.	The motor has overloaded.	Disengage the motor from the machine and operate the motor independently.	• Perform check on the machine side. • Reduce the load. • Increase the motor capacity.	AL17 (MOL) AL18 (POL)
	Connection failure of armature cable.	Check the wiring for short-circuit, grounding, missing connection or wrong connection.	Compare with the connection diagram.	AL01 (OC) AL15 (OCS) AL16 (VAS)
	Connection failure of resolver cable.	Check the wiring for short-circuit, grounding, missing connection or wrong connection.	Compare with the connection diagram. Use of an exclusive cable is recommended.	AL06 (RELV) AL19 (RESERR)
	The brake is not released (when the brake is attached).	• Make sure that 24 V is applied to the brake. • Turn the motor by hand.	Correct the brake power supply and wiring.	AL18 (POL)
	Illegal setting of motor code.	Make sure that the motor code is set legally in the servo amplifier parameter.	Specify the motor code correctly. For the operating procedures, see the Amplifier Engineering Handbook provided separately.	
	Motor failure.	• Make sure that the resistance is 10 MΩ or over when measured with a 500 V megger. • Measure the coil resistance. The resistance between wires should be ±10 % or less of the specified value.	Replace the motor with a new one.	

Phenomenon	Possible cause	Inspection	Remedy	Alarm of amp.
Unstable motor rotation.	The grounding is not performed.	• Make sure that the motor grounding wire is connected properly to the amplifier. • Make sure that the amplifier grounding is performed correctly.	• Compare with the connection diagram. • Perform wiring correctly.	
	Connection failure of resolver cable.	• Connection failure. • Make sure that the resolver cable is separated from the motor drive cable.	Compare with the connection diagram. Use of an exclusive cable is recommended.	
	Illegal setting of motor code.	Make sure that the motor code is set legally in the servo amplifier parameter.	Specify the motor code correctly. For the operating procedures, see the Amplifier Engineering Handbook provided separately.	
	Faulty adjustment of servo amplifier.	Faulty adjustment of response.	Adjust properly. For details, see the Amplifier Engineering Handbook provided separately.	
	Large load fluctuation.	Make sure that neither load torque nor load inertia has fluctuated largely.	Readjust the servo amplifier.	
The motor runs uncontrollable.	Wiring failure of armature and resolver cables.	Make sure of the wiring.	Compare with the connection diagram.	AL19 (RESERR)
	Illegal setting of motor code.	Make sure that the motor code is set legally in the servo amplifier parameter.	Specify the motor code correctly. For the operating procedures, see the Amplifier Engineering Handbook provided separately.	
	Faulty adjustment of servo amplifier.	Faulty adjustment of response.	Adjust properly. For details, see the Amplifier Engineering Handbook provided separately.	

Phenomenon	Possible cause	Inspection	Remedy	Alarm of amp.
The motor overheats.	The ambient temperature is high.	Make sure that the ambient temperature is 40°C or less.	Reduce the ambient temperature to below 40°C.	
	The motor surface is contaminated.	Make sure that the motor surface is not contaminated with oil or dust.	Clean the surface with a waste cloth or by blowing the air.	
	The motor has overloaded.	Disengage the motor from the machine and operate the motor independently.	• Reduce the load. • Increase the motor capacity.	AL17 (MOL) AL18 (POL)
	Illegal setting of motor code.	Make sure that the motor code is set legally in the servo amplifier parameter.	Specify the motor code correctly. For the operating procedures, see the Amplifier Engineering Handbook provided separately.	
	Illegal setting of amplifier parameter. Faulty adjustment of servo amplifier.	• Make sure that the resolver cable length is identical with the parameter value. • Make sure that the motor is not hunting.		
Abnormal noise is involved in the motor.	The motor is mounted incorrectly.	• Make sure that all motor set screws are tightened completely. • The coupling is not misaligned. • Make sure that the load is not unbalanced.	• Tighten the screws completely. • Align the coupling. • Balance the load.	
	Machine malfunction.	• Check to see if the noise is caused from the motor or machine. • Operate the motor independently.	Adjust the machine.	
	Faulty adjustment of servo amplifier Illegal setting of motor code.	• Make sure that the motor is not hunting. • Make sure that the motor code is set legally.	• Adjust the motor. • Set the motor code legally.	

Phenomenon	Possible cause	Inspection	Remedy	Alarm of amp.
Abnormal noise is involved in the motor.	Motor failure.	Check for the noise and vibration near the bearing.	Replace the bearing with a new one.	
	Normal condition (when the brake is attached).	• Noise is caused from the brake hub and disc. • A rubbing noise of the brake disc and lining is heard.		
	Normal condition (when the oil seal is attached).	Light sound is caused.	Adjust the lip position so that the oil splash can barely reach it.	
Nasty smell or smoke comes from the motor.	Connection failure of servo amplifier. Illegal setting of motor code.	• Make sure that the combination of amplifier and motor is as specified. • Make sure that the motor code is set legally.	• Replace the motor. (The motor has burnt.)	
	Sequence error.	Make sure that the motor has not been operated with the brake released.		

If the nonconformity cannot be repaired even after the above inspection has been done and the measures have been taken, advise us of the details (i.e., the contents in the Trouble Reporting Card).

Trouble Reporting Card

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Customer's contact	Company name	
	Division/Department	
	Contact person	
	TEL	FAX
Motor model	VLBS□-□□□□□□□□-□□□□	
Motor serial number		
Model of combined servo amplifier	VL□□X-□□□P□-□□□	
Amplifier serial number		
Amplifier ASSY number		
Operating condition	During installation Run years: ___ years (___ hours run/day)	
Phenomena of nonconformity	Will not start/Unstable rotation/Uncontrollable/Overheat / Abnormal noise and nasty smell/Others	
Alarm generated	A.L	
Details of nonconformity	What was caused with what operation?	

BS Motor VLBS Engineering Handbook

Standard Motor Edition 1

TOSHIBA MACHINE CO.,LTD.

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