

Standard AC Motors

Installation

Installation

Introduction

Induction Motors

Reversible Motors

Electromagnetic Brake Motors

V Series

Clutch & Brake Motors

Synchronous Motors

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Waterright Dust-Resistant Motors

Torque Motors

Right-Angle Gearheads

Linear Heads

Brake Pack

Accessories

Installation

Installation

■ Handling the Motor

● Handling

Always carry the motor by placing it in the original package. If the motor must be carried by itself during testing or for assembly into equipment, take note of the following points:

- Hold the motor so that the output shaft points upward.
- Hold the motor not by its output shaft or motor cable, but by the motor body.

● Storage

Temperature and humidity are important considerations since the storage condition has an influence on the life of motors. Storage in places where there are large temperature and humidity variations will reduce the stator's insulation performance. Moreover, leaving the motor for extended periods in places with high temperature and humidity is likely to lead to grease deterioration inside the ball bearing and corrosion. When storing for long periods, it is recommended to coat the output shaft with an anti-corrosion agent, seal the motor in a polyethylene bag and store in a place with normal temperature and humidity.

■ Installation Conditions

Install the motor, gearhead and brake pack in a location that meets the following conditions. Use in a location that does not satisfy these conditions could damage the product.

- Indoors (This product is designed and manufactured to be installed within another device.)
- Ambient temperature:
Motors: $-10\sim+50^{\circ}\text{C}$ ($+14\sim+122^{\circ}\text{F}$) (non-freezing)
[$-10\sim+40^{\circ}\text{C}$ ($+14\sim+104^{\circ}\text{F}$) for some motors]
SB50W: $[0\sim+40^{\circ}\text{C}$ ($+32\sim+104^{\circ}\text{F}$)]
- Ambient humidity: 85% or less (non-condensing)
- Not exposed to explosive, flammable or corrosive gases
- Not exposed to direct sunlight
- Not exposed to dust
- Not exposed to water, oil or other liquids
- A place where heat can escape easily
- Not exposed to continuous vibration or excessive impact
- Installation Category II, Pollution Degree 2, Class I Equipment
Only for the products that are certified by EN/IEC Standards and conform to EN/IEC Standards.
Installation Category III, Pollution Degree 3 for some products

■ Motor and Gearhead Combinations



When connecting gearheads, be sure to match the pinion shafts and frame size. For details, refer to the page where each product is listed.

● Decimal Gearhead Combinations

The **GN**, **GE** and **GU** type gearheads are available with decimal gearheads (sold separately) with a gear ratio of 10:1 (Decimal gearhead for the **OGN** type is not available). They should be used in applications in which large enough gear ratio cannot be attained with a single gearhead.

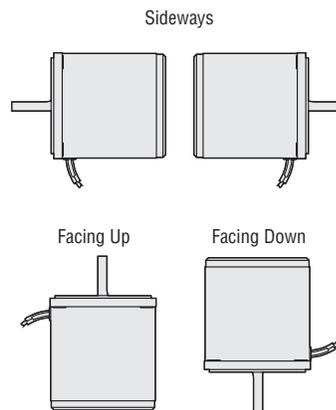
Note

- Although the gear ratio of 10:1 of the decimal gearhead theoretically translates into 10 times increase of torque available on the output shaft, it is not possible to make full use of this torque. The permissible torque in actual use is limited by the physical construction of the gearhead and is expressed as its rated maximum torque.

■ Gearhead and Motor Installation

● Motor Installation Direction

Motors can be mounted freely in any direction as shown below. Regardless of how the motor is mounted, take care not to apply an overhung load or thrust load on the shaft. Make sure the cable does not contact the mounting surface causing undesirable force on the cable.



● Mounting Motor/Gearhead to Machinery

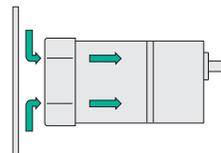
The motor flange is provided with a pilot section that serves as a guide not only when assembling the motor and gearhead but also when mounting the motor onto machinery. The following figures show the mounting examples of the motor and gearhead onto machinery. Dedicated mounting bracket shown below is provided as an accessory.

- Mounting Brackets → Page C-264



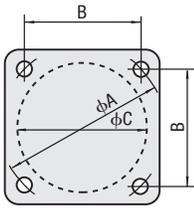
Dedicated Mounting Bracket

When mounting motors that have a built-in cooling fan at the rear, leave a space 10 mm (0.39 in.) or more behind the fan cover or make ventilation holes so as not to block the cooling intake.



● Dimensions of Mounting Holes

The dimension of the four motor mounting holes is shown as pitch diameter in the dimensions for each product. The distance between the mounting holes is shown in the table below.



Unit = mm (in.)

Motor Frame Size	A	B	C*
□42 (□1.65)	48 (1.89)	33.94 (1.336)	37.6 (1.4803)
□60 (□2.36)	70 (2.76)	49.50 (1.949)	54 (2.1260)
□70 (□2.76)	82 (3.23)	57.98 (2.283)	64 (2.5197)
□80 (□3.15)	94 (3.70)	66.47 (2.617)	73 (2.8740)
□90 (□3.54)	104 (4.09)	73.54 (2.895)	83 (3.2677)
□104 (□4.09)	120 (4.72)	84.85 (3.341)	94 (3.7008)

*"C" indicates the dimensions of flange pilot diameter for the round shaft type.

● Mounting the Load

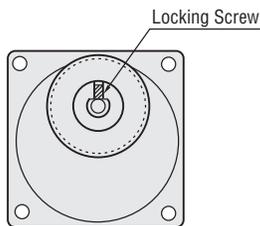
◇ For Parallel Shaft Gearhead, Round Shaft Type

The output shafts of high-power gearheads are provided with a key slot to secure the load, while the output shafts of gearheads with comparatively low power have been given a shaft flat. Round shaft motors come in two types: those with or without a shaft flat on the motor output shaft.

● When Using a Shaft Flat

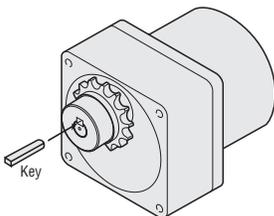
With a shaft flat, use a locking screw to ensure that the load does not slip.

We recommend using double point screws or other screws with strong locking power.



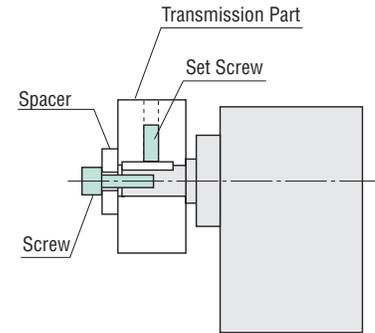
● When Using a Key Slot

Secure the load shaft using the key included with the gearhead after machining the key slot on the equipment to be connected (sprocket etc.).



● When Using an Output Shaft End Tapped Hole

Use the output shaft end tapped hole [M5 10 mm (0.39 in.) deep min. or M6 12 mm (0.47 in.) deep min.] to help prevent the transmission part from becoming detached.



Example of Using the Output Shaft End Tapped Hole

On round shaft types, the output shaft is machined to the accuracy of h7 in dimension and 2/100 or less in eccentricity. Therefore, when connecting a load to the shaft of the device, take measurements using a dial gauge or similar instrument so that there is no eccentricity. When the shaft center of two shafts does not align, use a flexible coupling (**MCL** coupling) etc. to avoid unnecessary strain on the shaft.

The same procedure should be applied when securing a load to gearheads.

● Flexible couplings → Page C-269

Unit = mm (in.)

Motor Frame Size	Shaft Diameter h7
□42 (□1.65)	$\phi 5 \begin{smallmatrix} 0 \\ -0.012 \end{smallmatrix}$ ($\phi 0.1969 \begin{smallmatrix} 0 \\ -0.0005 \end{smallmatrix}$)
□60 (□2.36)	$\phi 6 \begin{smallmatrix} 0 \\ -0.012 \end{smallmatrix}$ ($\phi 0.2362 \begin{smallmatrix} 0 \\ -0.0005 \end{smallmatrix}$)
□70 (□2.76)	$\phi 6 \begin{smallmatrix} 0 \\ -0.012 \end{smallmatrix}$ ($\phi 0.2362 \begin{smallmatrix} 0 \\ -0.0005 \end{smallmatrix}$)
□80 (□3.15)	$\phi 8 \begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$ ($\phi 0.3150 \begin{smallmatrix} 0 \\ -0.0006 \end{smallmatrix}$)
	$\phi 10 \begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$ ($\phi 0.3937 \begin{smallmatrix} 0 \\ -0.0006 \end{smallmatrix}$)
□90 (□3.54)	$\phi 10 \begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$ ($\phi 0.3937 \begin{smallmatrix} 0 \\ -0.0006 \end{smallmatrix}$)
	$\phi 12 \begin{smallmatrix} 0 \\ -0.018 \end{smallmatrix}$ ($\phi 0.4724 \begin{smallmatrix} 0 \\ -0.0007 \end{smallmatrix}$)
□104 (□4.09)	$\phi 14 \begin{smallmatrix} 0 \\ -0.018 \end{smallmatrix}$ ($\phi 0.5512 \begin{smallmatrix} 0 \\ -0.0007 \end{smallmatrix}$)

◇ For Right-Angle Gearhead

Mounting method for right-angle, hollow shaft types

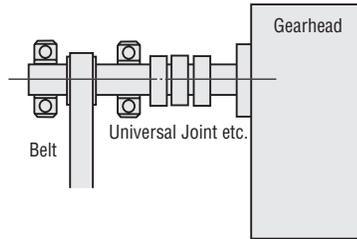
→ Page C-237

● Permissible Overhung Load and Permissible Thrust Load

When a chain, gear, belt, etc. is used as the transmission mechanism, the overhung load (a load applied in the right-angle direction of the output shaft) is always applied on the output shaft. Since the overhung load acts on the output shaft and its bearing directly, it has an influence on the life of gearhead. Be careful not to exceed the permissible value (specifications value).

If the overhung load greatly exceeds the permissible value, it will lead to the shortening of bearing life or damage to the bearing, as well as warping of the output shaft or fatigue loss after repeated load. In such situations, a support such as the one shown to the right must be designed to take up the overhung load.

Since connecting a transmission mechanism directly to the output shaft exerts an unbalanced load on the shaft, connect mechanisms as close to the gearhead as possible.



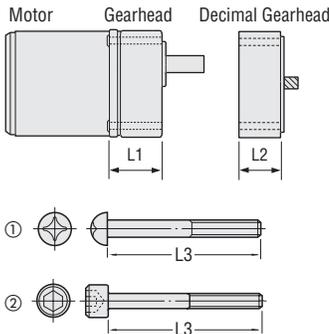
When using transmission mechanisms involving helical gears or worm gears, they are subject not only to overhung load but to thrust load (a load applied in the axial direction of the output shaft) as well. Ensure that the thrust load does not exceed the permissible value in the table.

Refer to page C-16 for the calculating formula of overhung load, and page C-17 for the permissible value (specifications value) of overhung load or thrust load.

● Dimensions for Mounting Screws

◇ GN Gearheads, GE Gearheads, GU Gearheads, Right-Angle Gearheads

- To assemble the motor and gearhead, use the screws included with the gearhead.
- Mounting screws to machinery (M8) are not included with right-angle gearhead. The screws must be purchased separately.

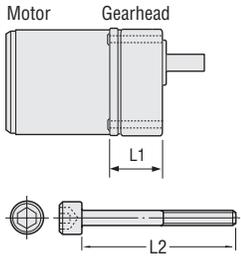


Model	Gearhead			Mounting Screw		Drawing
	L1 mm (in.)	L1+L2 mm (in.)	L3 mm (in.)	Size		
0GN3KA~180KA	31 (1.22)	—	40 (1.57)	No.4-40UNC	①	
2GN3SA~185A	37 (1.46)	—	50 (1.97)	No.8-32UNC		
2GN25SA~180SA	47 (1.85)	—	60 (2.36)	No.10-24UNC		
3GN3SA~185A	39 (1.54)	—	50 (1.97)			
3GN25SA~180SA	49 (1.93)	—	65 (2.56)			
4GN3SA~185A	39 (1.54)	—	50 (1.97)			
4GN25SA~180SA	49.5 (1.95)	—	65 (2.56)	1/4-20UNC		
5GN3SA~185A	49.5 (1.95)	—	65 (2.56)			
5GN25SA~180SA	67.5 (2.66)	—	80 (3.15)	1/4-20UNC		
5GE□SA, 5GU□KA	72.5 (2.85)	—	95 (3.74)			
2GN10XS (Decimal gearhead)	—	73 (2.87)	85 (3.35)	M4 P0.7	①	
3GN10XS (Decimal gearhead)	—	79 (3.11)	90 (3.54)	M5 P0.8		
4GN10XS (Decimal gearhead)	—	81.5 (3.21)	95 (3.74)			
5GN10XS (Decimal gearhead)	—	104.5 (4.11)	120 (4.72)	M6 P1.0	②	
5GE10XS, 5GU10XKB (Decimal gearhead)	—	112.5 (4.43)	140 (5.51)			
4GN□RH, 4GN□RAA	—	—	15 (0.59)	M5 P0.8		
5GN□RH, 5GN□RAA	—	—	20 (0.79)	M6 P1.0		
5GE□RH, 5GE□RAA, 5GU□RH, 5GU□RAA	—	—	20 (0.79)			

- Mounting screws: 4 flat washers and hexagonal nuts are included.
- Hexagonal nuts are not included with the right-angle gearhead.
- The values of L1+L2 refer to sizes when a decimal gearhead is connected with a gearhead of 25:1 or greater in gear ratio.
- Enter the gear ratio in the box (□) within the model name.

◇ BH Series, BHF Series

The screw shown below is included with the motor.

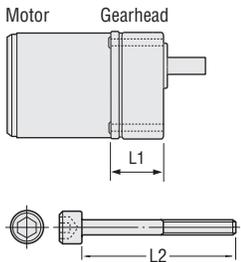


Motor/Gearhead		Mounting Screw	
Model	L1 mm (in.)	L2 mm (in.)	Size
BH162 □-□, BH162 □T-□, BHF62 □T-□, BHF62 □MT-□	82.5 (3.25)	100 (3.94)	M8 P1.25

- Mounting screws: 4 flat washers, spring washers and hexagonal nuts are included.
- Screws are not included with **BH** Series and **BHF** Series right-angle shaft combination type.
- Enter **F**, **E** or **S** (power supply voltage) in the box (□) within the model name.
Enter the gear ratio in the box (□) within the model name.

◇ V Series

The screw shown below is included with the gearhead.

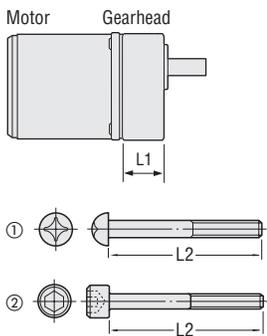


Gearhead		Mounting Screw	
Model	L1 mm (in.)	L2 mm (in.)	Size
GV2G5~25	41 (1.61)	50 (1.97)	M4 P0.7
GV2G30~120	45 (1.77)	55 (2.17)	
GV2G150~360	50 (1.97)	60 (2.36)	
GV3G5~25	45 (1.77)	65 (2.56)	M6 P1.0
GV3G30~120	50 (1.97)	70 (2.76)	
GV3G150~360	55 (2.17)	75 (2.95)	
GV4G5~25	48 (1.89)	65 (2.56)	
GV4G30~120	53 (2.09)	70 (2.76)	M8 P1.25
GV4G150~360	58 (2.28)	75 (2.95)	
GVH5G5~18	52.5 (2.07)	75 (2.95)	
GVH5G25~100	65.5 (2.58)	90 (3.54)	
GVH5G120~300	71.5 (2.81)	95 (3.74)	
GVR5G5~15	52.5 (2.07)	75 (2.95)	M8 P1.25
GVR5G18~36	65.5 (2.58)	90 (3.54)	
GVR5G50~180	77.5 (3.05)	100 (3.94)	

- Mounting screws: 4 flat washers, spring washers and hexagonal nuts are included.

◇ GC Gearheads, GCH Gearheads

The screw shown below is included with the gearhead.

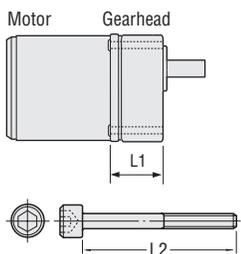


Gearhead		Mounting Screw		
Model	L1 mm (in.)	L2 mm (in.)	Size	Drawing
5GC3.6KA~18KA	42 (1.65)	65 (2.56)	M6 P1.0	①
5GC25KA~180KA	60 (2.36)	80 (3.15)		
5GCH□KA	65 (2.56)	95 (3.74)		②

- Mounting screws: 4 flat washers and hexagonal nuts are included.
- Since **GC** and **GCH** gearhead are attached from the gearhead side, L1 shows the length of the gearhead only.
- Enter the gear ratio in the box (□) within the model name.

◇ FPW Series

The screw shown below is included with the motor.



Geared Motor		Mounting Screw	
Model	L1 mm (in.)	L2 mm (in.)	Size
FPW425 □2-□□	59 (2.32)	80 (3.15)	M5 P0.8
FPW540 □2-□□	72.5 (2.85)	90 (3.54)	M6 P1.0
FPW560 □2-□□	74.5 (2.93)	90 (3.54)	
FPW690 □2-□□	82.5 (3.25)	100 (3.94)	M8 P1.25

- Mounting screws: 4 flat washers and hexagonal nuts are included.
- Stainless steel screws are included.
- Enter the gear ratio in the box (□) within the model name.
Enter **A**, **C** or **S** (power supply voltage) in the box (□) within the model name.
Enter **U** or **E** (capacitor model) in the box (■) within the model name.

Connecting the Motor

Lead Wire for Power Supply

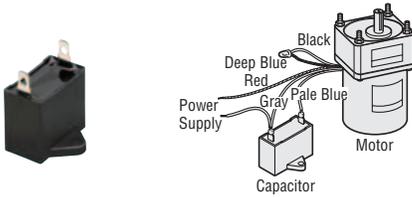
For power supply, use a thicker lead wire than the motor lead wire.
 Frame size 42 mm (1.65 in.): AWG24, AWG22
 Frame size 60 mm (2.36 in.) or larger: AWG20

How to Connect a Capacitor

When motors are running, a voltage of almost twice the motor power supply voltage is applied across the terminals of the capacitor. The terminal should be insulated for safety. Use the capacitor cap provided to insulate the terminals.

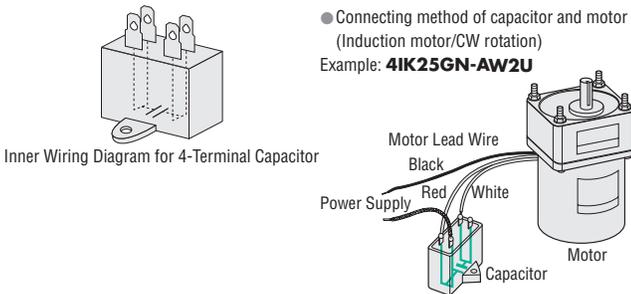
2-Terminal Capacitor

● Connecting method of capacitor and motor (CW rotation)
 Example: **4SK15GN-AUL**



4-Terminal Capacitor

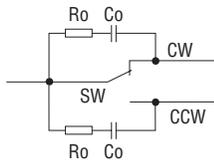
Terminals of the capacitor are connected inside as shown in the figure. For lead wire connection, use one lead wire per terminal.



● Connecting method of capacitor and motor (Induction motor/CW rotation)
 Example: **4IK25GN-AW2U**

Contact Capacity

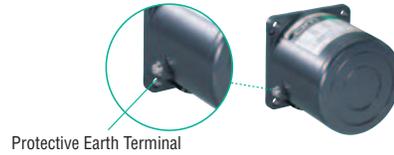
Connect a CR circuit for surge suppression shown on the right to protect the contact.



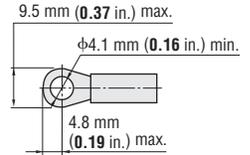
Code	Contact Capacity, Others	Note
SW	125 VAC 5 A min. or 250 VAC 5 A min. (Inductive load)	-
Ro, Co	Ro = 5~200 Ω Co = 0.1~0.2 μF 200 W (400 W)	Accessories EPCR1201-2 Page C-275

Grounding the Motor

Ground the protective earth terminal ⊕ of the motor.



Applicable crimp terminal:
 Round terminal with insulation
 Terminal screw size: M4
 Applicable lead wire: AWG18 min.



For motors without a protective earth terminal, any one of the four mounting bolts may be used to attach the ground wire to the motor case. If necessary, remove all paint that may impede conductivity around the bolt mounting hole.



Terminal Box Type (Reference)

Connect the ground wire to the protective earth terminal inside the terminal box.



Conduit Box Type

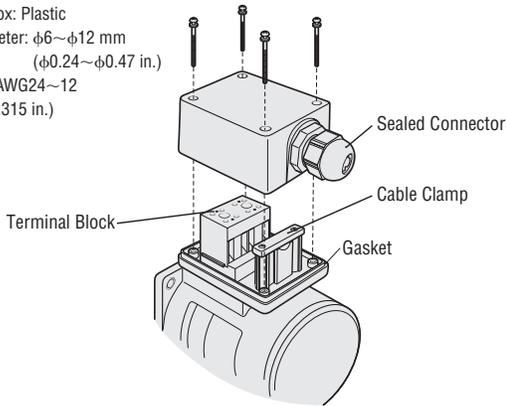
Conduit box mounted motors have a ground lead wire (green wire). Connect the ground wire to this green lead wire.



● Motor with Terminal Box

◇ Terminal Box: World K Series [25 W~90 W (1/30 HP~1/8 HP)], V Series, BH Series, BHF Series

Material of terminal box: Plastic
 Applicable cable diameter: $\phi 6 \sim \phi 12$ mm
 ($\phi 0.24 \sim \phi 0.47$ in.)
 Applicable lead wire: AWG24~12
 Strip length: 8 mm (0.315 in.)



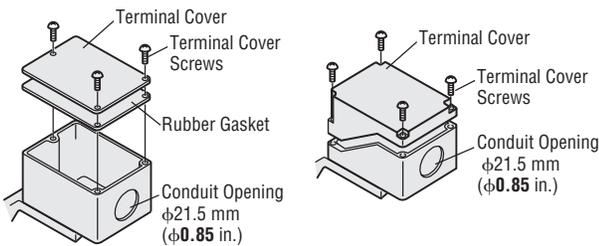
- When connecting cables to the terminal block, loosen the screw on the insertion port for the lead wire and insert the lead wire with a screw driver. Then tighten the screw securely.
- Cable entry is possible at one side of the terminal box.

◇ Conduit Box Type

Conduit box type is available for induction motors.

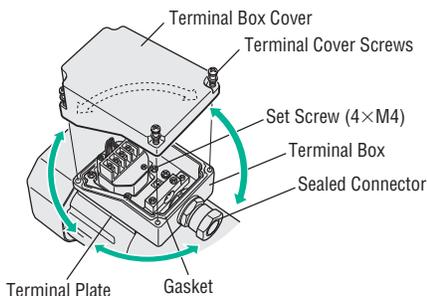
- Open the terminal box and connect the wires.
- Use applicable cable ground and conduit for conduit opening.
- After connecting, close the terminal box with the terminal cover.

**Single-Phase 25 W (1/30 HP), Single-Phase 60 W (1/12 HP),
 40 W (1/19 HP) / Three-Phase 90 W (1/8 HP)**



◇ Terminal Box: BH Series Electromagnetic Brake Motor BHF Series Electromagnetic Brake Motor

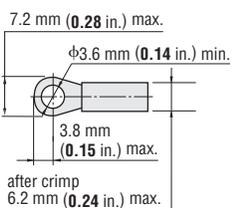
Material of terminal box:
 Die cast aluminum
 Applicable cable diameter:
 $\phi 8 \sim \phi 12$ mm ($\phi 0.31 \sim \phi 0.47$ in.)
 Applicable lead wire:
 AWG18 min.



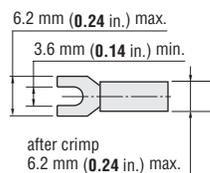
- Cable entry is possible at four sides of the terminal box.

● Applicable Crimp Terminals

Round Terminal with Insulation



U-Shape Terminal with Insulation



■ Brake Pack

● Fuse Capacity

When a brake pack is used to stop the motor instantaneously, a large amount of braking current will flow into the motor for approximately 0.4 seconds. Therefore, when connecting a fuse to the power line, select one with an appropriate capacity by referring to the braking current (listed in "braking current," as provided with a brake pack) for the motor being used.

