

ZIP CHAIN ACTUATOR

Instruction Manual

【NOTE】

Ensure that this instruction manual is delivered properly to the end user of this product.

This manual uses SI units.

Figure in { } are gravitational units and are for reference only.

TSUBAKIMOTO CHAIN CO.

ZIP CHAIN ACTUATOR

Safety Points

- Before using this product (installation, operation, maintenance, inspection, etc.) please thoroughly read this instruction manual and the other attached documents, and operate the product correctly. Familiarize yourself with the equipment, safety information, and precautions listed herein thoroughly before operation. After reading, keep this manual in a convenient place for reference.
- Safety precautions in this manual are classified into two categories: "Warnings" and "Cautions".



Warning

: Death or serious injury may result from misuse of the product



Caution

: Minor or moderate injury, as well as damage to the product, may result from misuse of the product

Failure to follow the instructions under



Caution

may also result in death or serious injury depending on the particular situation.

All precautions described below are important and should always be followed.



Warning

- Do not release the brake when the unit is supporting a load. If the brake is released under loaded conditions, suspended objects may fall or movable parts may suddenly move.
- Do not operate the ZIP CHAIN ACTUATOR in an explosive atmosphere to avoid risk of ignition, explosion, fire, or injury.
- When using to transport people, provide a protective safety device on the equipment to avoid risk of accidental death or damage to the equipment in runaway situations.
- When using for lifting and lowering, provide a safety device on the equipment to prevent materials from falling. Falling materials may cause injury or death, or damage to the equipment.
- When using for hanging, equip safety devices in case of chain breakage. Establish a safety fence, and never stand underneath hanging materials.
- This product can operate at very high speeds. Keep limbs, body, clothing, and accessories away from moving parts, including the ZIP CHAIN ACTUATOR. Items above wound up or caught in moving parts or the ZIP CHAIN ACTUATOR may cause bodily injury or damage to the equipment.
- If the unit is equipped with a terminal box, do not operate the unit without the terminal box covered in place. Once maintenance is complete, the cover must be returned to its original position. Failure to do so may cause electric shock.
- Observe the Labor Safety & Hygiene Regulations, General Criteria, Paragraph 1, Chapter 1, 2nd Edition.
- Transport, installation, wiring, operation, maintenance and inspection:
 - Operate according to the instruction manual.
 - All work on the unit should be performed by personnel with the proper specialized knowledge and skills to avoid explosions, fire, electric shock, injury, or damage to the equipment.
 - When performing electrical wiring, observe all laws and regulations such as electrical equipment standards and internal wiring rules, and follow all cautions. Especially, follow instructions with regard to grounding to prevent electric shock.
 - Shut down the power source and make sure that power will not be turned on accidentally. The same applies to blackout situations.
 - Wear proper work clothes and protective accessories (safety glasses, gloves, safety shoes, etc.)
- Never perform additional work on ZIP CHAIN ACTUATOR



Caution

- Always operate within the specifications on the ZIP CHAIN ACTUATOR nameplate, outline drawings and catalog to avoid risk of injury or damage to the equipment.
- Operate within correct electrical voltage range to avoid risk of motor burnout or fire.
- Before installing the ZIP CHAIN ACTUATOR onto your equipment, confirm the direction in which the input shaft is rotating. Reverse rotation may cause injury or damage to the equipment.
- Keep fingers and materials away from ZIP CHAIN ACTUATOR openings to avoid risk of injury or damage to the equipment.
- Performance and functionality may deteriorate with wear and age of parts. Inspect the product periodically in accordance with the instruction manual. In case of defects or malfunction, stop operation immediately and contact your distributor to avoid risk of electric shock, injury, fire, or damage to the equipment.
- Mini Series hypoid motors and regular hypoid motors get very hot during operation. Do not touch with hands or come into contact with body parts to avoid injury.
- Do not use above the rated load to avoid risk of injury or damage to the equipment.
- Do not remove the nameplate.
- Warranty is valid only if an actuator with the required performance based on Tsubakimoto Chain's selection criteria is used under specified ambient conditions and maintained properly.
- Any modification of this product is outside of the scope of this warranty and Tsubakimoto Chain shall not be held liable.

Thank you for purchasing the ZIP CHAIN ACTUATOR.

This instruction manual provides all information from unpacking and installation to maintenance. Read the manual thoroughly so as to ensure satisfactory performance.

Should you have any questions, please contact your distributor or a Tsubaki representative. When inquiring, please give us the information on the ZIP CHAIN ACTUATOR nameplate.

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Thank you for your purchase of a Tsubakimoto Chain product.

We have taken every effort in confirming the accuracy of the content in this instruction manual. Should you have any questions, or find any errors or omissions, please contact your distributor or a Tsubaki representative.

Please note that the content of this instruction manual is subject to change for improvement.

When contacting us, please let us know the following information as provided on the nameplate of the Zip Chain Actuator.

- Type (model)
- MFG No. (Test No.)

1. Unpacking

1. When unpacking, ensure that the right side is up to avoid injury.
2. Please check the following when you receive your Tsubaki ZIP CHAIN ACTUATOR (herein referred to as "ZCA")
 - (1) Check the packing list included with product to verify that you received what you ordered.
 - (2) Check for damage in transit, loose bolts, etc.
 - (3) Ensure that the product came with an instruction manual, key, and bolt for chain pulling. (Both key and chain pulling bolt are contained in a plastic bag along with the instruction manual.)
NOTE: The following types do not come with a bolt for chain pulling.
 - With motors (and hypoid motor brake)
 - With TERVO
 - With bellows
 - ZCA45

If you find any defective or missing items, please contact your distributor.

2. Transportation

1. Take care when transporting the packaged product as the weight is unbalanced lengthwise.
2. Do not carry by supporting the housing section (plastic portion) only. Damage or toppling may occur. Carry by holding the central drive section (steel portion).
3. Do not carry by supporting the end fitting bracket only. ZIP CHAIN damage or toppling may occur. Carry by holding the central drive section (steel portion).
4. ZCA45
 - When transporting the product, ensure that a hanging bracket or an eyebolt is attached to the central drive section. Do not use a hook (e.g. wire) on the input shaft or chain to avoid risk of short life time or failure of the product due to eccentricity of shaft and deformation of chain.
 - After installation, do not hoist the entire equipment by using a hanging bracket and an eyebolt to avoid risk of falling of hanging bracket, injury by toppling or damage to the equipment. Also, before hoisting, check the weight of ZCA described in outline drawing or instruction manual, and do not hoist ZCA which weighs above the rated load of hanging bracket.
 - Be sure to remove the hanging bracket and/or eyebolt before operating to avoid risk of damage to the equipment and chain by making contact with them.

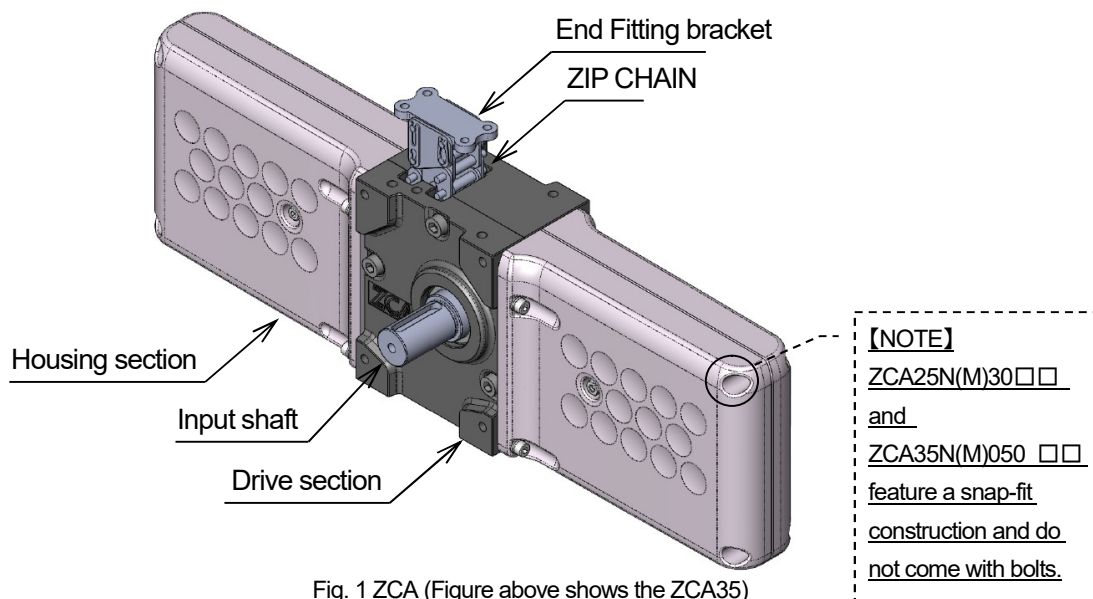


Fig. 1 ZCA (Figure above shows the ZCA35)

3. Installation

1. Ambient Condition

Table 1 Ambient Conditions

Usage Location	Indoors where rain and moisture are not present
Ambient Environment	Normal levels of dust
Ambient Temperature	0 - 60°C (without motor) 0 - 40°C (with motor)
Relative Humidity	Below 85% (no condensation)
Altitude	1000m or less (above sea level)

- To prevent injury, never climb on or hang from the ZCA.
- Hoisting the entire ZCA unit by the end fitting bracket or ZIP CHAIN will cause the weight of the unit to damage the stopper, causing the chain to slip off and the unit to fall, which may cause injury or damage to the unit.
- When packed, ZIP CHAIN is lowered to its minimum stroke position. Do not use in this position. To use the product, pull the ZIP CHAIN up above the minimum stroke position. When doing so, do not operate the input shaft by hand. Insert the accompanying bolt for chain pulling into the tapped end fitting bracket hole and slowly pull up. (Remove the bolt after pulling up the chain and dispose of properly.) It is dangerous to operate the input shaft under load since a load will rotate the input shaft.
ZCA units with motor (hypoid motor with brake) or TERVO are handled differently. Refer to Chapter 9.
The shape of the end fitting bracket will differ when bellows are attached or with a ZCA45. Grasp the end fitting bracket by hand and pull the chain out directly.
- Grease is used for lubricating the ZCA and may spatter. Be careful of the ZCA operating environment (Bellows are recommended if the risk of spattering is not acceptable.), especially in hanging applications where grease may drip.
 Take measures for food production equipment or application where grease must be avoided to prevent grease from dripping or spattering, such as by using an oil pan. Grease may lead to product defects.

6. ZCA can be installed in vertical, horizontal, or hanging application. For installation in horizontal and hanging applications, the unit may be damaged if the unit is used while the bolts are under the weight of the ZCA or additional loads. Ensure that the ZCA is placed in such a manner that the mounting bolts are not subjected to load. (Fig. 2)

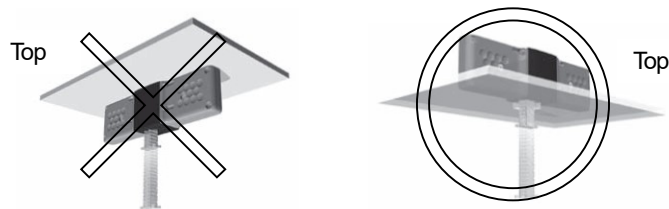


Fig. 2 Sample installation directions

7. When installing a motor, reducer and ZCA, provide a highly rigid cradle to ensure centering accuracy even under maximum loads. Be sure to align the input shaft and transmission shaft to avoid risk of damage to the shaft. Tsubaki recommends its line-up of couplings for connecting the shaft.

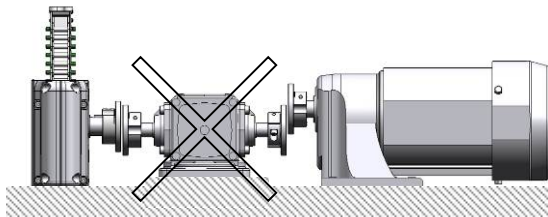


Fig. 3 Example of improper connection to ZCA (misalignment)

8. The holes in the housing section are used to affix both sides of the housing section together (snap-fit construction). There are no bolts for these holes. Do not use these holes to mount the unit, as they lack the strength to hold the unit and may break prematurely. Use only the mounting holes provided on the drive section.
9. When the ZCA is driven by a floating shaft, vibration may occur depending on RPM, which may lead to operational errors. To prevent this, pay close attention to shaft stiffness and coupling backlash.
10. When attaching a chain, gear, or tooth/V belt to the input shaft for drive, verify that any overhang load applied to the shaft falls below the allowable load.
11. When using synchronized ZCAs, there will be individual difference in backlash, resulting in some mis-positioning. Be sure to install a separate mechanism to adjust phase by using a coupling with clamp type, or shim to adjust the height. If the load is not properly balanced, it may cause damage to a unit by operational load exceeding the basic capacity per unit.

Table 2 Coefficient of PT element (f)

Chain	Gear Toothed Belt	V-Belt
1.0	1.25	1.5

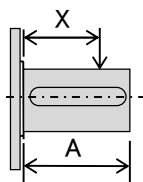


Table 3 Coefficient – Load Position (Lf)

X/A	0.25	0.5	0.75	1.0
Lf	0.9	1.0	1.15	1.25

$$\text{Allowable O.H.L.} \geq \frac{2 \times T \times f \times L_f}{D}$$

O.H.L. : Overhang load N {kgf} (Table 4)

T : Load torque N·m {kgf·m}

D : Pitch diameter of sprocket, gear and pulley (m)

f : Coefficient of PT element (Table 2)

Lf : Coefficient – Load position (Table 3)

Table 4 Allowable O.H.L.

Model		ZCA25	ZCA35	ZCA45
Allowable Overhand Load	N {kgf}	638 {65.0}	946 {96.4}	2065 {210.5}

12. Make the hole on the cradle for the ZIP CHAIN as small as possible to create more contact area with the ZCA mounting face.
13. Securely install the ZCA using the four tapped mounting holes on the unit and end fitting bracket. (Mounting bolts not included.) Refer to Table 5 for mounting bolt size. Use bolts with strength over 10.9 JIS B1051. Tap depth should be according to the strength of the mounting member.

Table 5 Mounting Bolt Size

Model	Body (base)	Body (side)	End Fitting bracket (Bolt through-hole*)
ZCA25	M5	M5	M4 (M3)
ZCA35	M6	M6	M5 (M4)
ZCA45	M8	M8	M8 (M6)

*Tapped holes on the end fitting bracket can be used as bolt through-holes as well. When installing, use bolts with strength over 10.9. Tap depth should be according to the strength of the mounting member.

When mounting, apply an adhesive agent to prevent bolts from loosening. Use the brands shown in Table 6 or their equivalent. Follow instruction provided with each product before applying.

Table 6 Adhesive Agents

manufacturer	Brand
Henkel Japan	#243 (mid-strength)
Three Bond	#1324N (mid-strength)

14. Do not use the ZCA when the load is applied to the mounting bolts. When suspended, ensure that the unit is supported on the ZIP CHAIN exit side. Use a suspension mounting base.
15. Provide safety equipment and a safety fence when using with hanging equipment in case of chain breakage. Never walk or stand underneath hanging loads.

16. Always install safety equipment on the equipment side when using hanging equipment to prevent falling. Falling objects pose a risk of injury or death and damage to the equipment.
Tsubaki will not manufacture or sell ZCA units for situations where there is a danger that can lead to injury or death.

17. Under no circumstance should you stop the stroke by using the included chain stopper. Doing so may severely damage the ZCA internally.

18. Install a linear guide to ensure accurate movement. Loads on the ZCA must be applied only in the traveling direction of the ZIP CHAIN. Incorrect linear guide positioning may cause damage to the ZIP CHAIN resulting from bending or lateral loads. (Fig. 4). Provide a linear guide so that lateral loads or bending moments are not applied directly to the ZIP CHAIN.

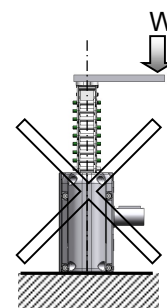


Fig. 4

20. Ensure that the actual stroke is comfortably within the allowable stroke range. Using outside the stroke range will damage the stopper, causing the chain to slip off or causing the end fitting bracket to strike and damage the ZCA drive section.

21. Set the limit switch with consideration of expected coasting caused by inertia. Coasting distance depends on the installation direction and load size, so calculate maximum coasting distance. As a precaution, install a mechanical external stopper within the stroke range.

22. Check the direction of the input shaft rotation and ZIP CHAIN travel in advance. (Refer to Chapter8: Basic Structure). The wrong direction of rotation may cause damage to the equipment. When installing, input extremely low speeds first to confirm the direction of rotation and ZIP CHAIN travel. When using with a motor attached, be aware that the motor connection and chain direction of travel may differ with speed. Refer to Chapter 9: Motor Attachment and confirm the direction of travel.

23. When mounting from the bottom of the drive section, the input shaft keyway will usually face upward at the minimum stroke (see Fig. 5). However, when used synchronously there may be some difference due to backlash and other individual differences. Provide separate equipment to adjust phase when using synchronized ZCAs.

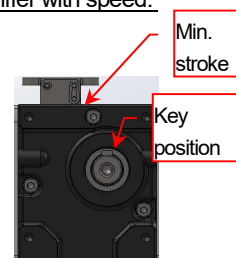


Fig. 5

24. Make sure that the ZIP CHAIN and the opening of the drive section are free of dust and chips, which promote wear and may lead to major accidents such as chain breakage and damage to moving parts.

25. Bellows designed for lifting and hanging applications that are attached and used horizontally will suffer premature damage. Special bellows that incorporate special parts are needed when using horizontally. Contact a Tsubaki representative for more information.

26. Never modify or perform additional work on ZIP CHAIN ACTUATOR

4. Operation

1. Verify that any load, whether static or dynamic, applied to the ZCA falls within basic capacity, allowable input shaft torque, and allowable overhang load.

Table 7 Basic Performance

Model No.	Stroke Code	Stroke (mm)	Basic Capacity※ (N {kgf})	Max. Speed (mm/sec)	Max. Input Rotation Speed (rpm)	Allowable Input Shaft Torque (N·m {kgf·m})	Allowable Input Shaft Overhang Load (N {kgf})	ZIP CHAIN Movement per Input Shaft Rotation (mm)	Approx. Weight (kg)
ZCA25N	030	300	400 {40.8}	1000	630	9.41 {0.96}	638 {65.0}	95.3	1.9
	050	500	330 {33.6}						2.5
ZCA35N	050	500	1000 {102.0}		420	34.7 {3.53}	946 {96.4}	142.9	5.1
	075	750	1000 {102.0}						6.5
	100	1000	600 {61.2}						7.5
ZCA45N	100	1000	2000 {204.0}	500	125	116.6 {11.9}	2065 {210.5}	240	21.0
	150	1500	2000 {204.0}						25.0
	200	2000	1200 {122.5}						30.0

※ Values shown reflect maximum upper limit (0.35G) acceleration when operating.

Values reflect ZCA Actuator mounted with end fitting bracket. In other mountings, such as rotational mounting, the above basic capacity may decrease.

Basic capacity has been restricted for ZCA25N050, ZCA35N100 and ZCA45N200, in order to guarantee its safety factor against buckling. (For bellows, refer to Chapter 10: Bellows)

In situations where only a tensile load is acting on the chain, such as in hanging applications, this restriction can be lifted.

2. Confirm that when ZCA is in operation, the surface temperature of the drive section is within 0°C - 60°C.
3. Do not exceed the maximum input rotation speed.
4. Power should be transmitted through the input shaft. Gear motor or servo motor can be used as a drive source. Due to the extremely high efficiency of the ZCA, any load will cause reverse rotation. A brake is necessary to prevent reverse rotation resulting from coasting and load. Additionally, the braking torque must be more than 150%, and a highly-responsive brake is recommended.
5. There will be bearing and chain sliding frictions regardless of load, so torque is essential even when unloaded. When the ratio for the average unloaded operating torque is higher than the torque required for lifting (ideally roughly 25%), this effect of this torque during start-up will be larger and may prevent smooth operation. Should this occur, select the required input torque to be 150% of the unloaded operating torque and select the required drive source.
6. The average unloaded operating torque may be temporarily heightened when first using the unit. This is the initial breaking in of the unit and will eventually stabilize. You may continue to use the unit as is during this breaking in period.
7. Load time factor (%ED) $[(\text{Operating time} \div (\text{Operating time} + \text{Stopping time}))]$ varies according to the input motor and equipment and therefore corresponds with drive source performance.

8. In sub-zero temperatures, the unit experiences decreased efficiency due to a change in grease viscosity. Ensure that the drive source can accommodate this change.
9. Keep away from the input shaft and ZIP CHAIN when the ZCA is in operation to avoid injury.
10. The following loads may cause decreased ZCA performance, adversely affect the service life, and damage the ZIP CHAIN, drive section, end fitting bracket, etc.
 - 1) Lateral loads: Provide a linear guide in the direction of travel so bending loads are not applied directly to the ZIP CHAIN
 - 2) Shock loads
 - 3) Overloads

5. Maintenance & Inspection

5.1. Inspection

1. Routine inspection (visual checks)

Check the following items every day before operating the ZCA.

- Check for defects in appearance (loose bolts or nuts, etc.)
- Check for unusual movement
- Check for unusual noises
- Check for unusual smells
- Check whether the ZIP CHAIN has enough grease
- Check for wear on the ZIP CHAIN (Fig. 6)

① Check for the oxidized wear dust (rust color) on the following parts

- Between plates
- Front face and end face of the plates
- Outer circumference of the bushings (ZCA45: pins)
- Extended pins

② Ensure that bushings and extended pins are not cracked or broken

(Note: The bush is curled and therefore has a seam. This is not a crack.)

If there are any defects, stop the ZCA, perform lock-out-tag-out safety measures on equipment, and conduct the following periodic inspection

2. Periodic inspection

Check the following items.

- Check for loose bolts and nuts (every 6 months)

Follow the instructions below.

- Remove all loads
- Stop the equipment and perform lock-out-tag-out safety measures.
- Shut off the power source and ensure that power cannot be turned on accidentally
- Perform inspections. When bolts are loose, tighten them to the torque specified in JIS and take measures to prevent them from loosening.
- Turn on the power and return the ZCA to normal operation

- Check for damage to the ZIP CHAIN (every 6 months)

Follow the instruction below.

- Remove all loads
- Stop the equipment and perform lock-out-tag-out safety measures
- Shut off the power source and ensure that power cannot be turned on accidentally
- Fully extend the ZIP CHAIN from the unit
- Check for wear on the outer diameter of the bushings or pins. Ensure that the diameter is within the limits shown in the table below.

Table 8 Pin·Bush wear limit

Model No.	Pin/Bush Outer Dia. Catalog Values (mm)	Pin/Bush Outer Dia. Limit (mm)
ZCA25	φ3.30 (bushing)	φ3.20 (bushing)
ZCA35	φ5.08 (bushing)	φ4.95 (bushing)
ZCA45	φ8.28 (pin)	φ8.00 (pin)

- Ensure that the engaged chain has not suffered extremely decreased rigidity.

Should any of the above occur, stop use immediately. Contact your distributor for replacement with a new ZCA. Your ZCA has reached the end of its service life.

- Turn on the power and return the ZCA to normal operation

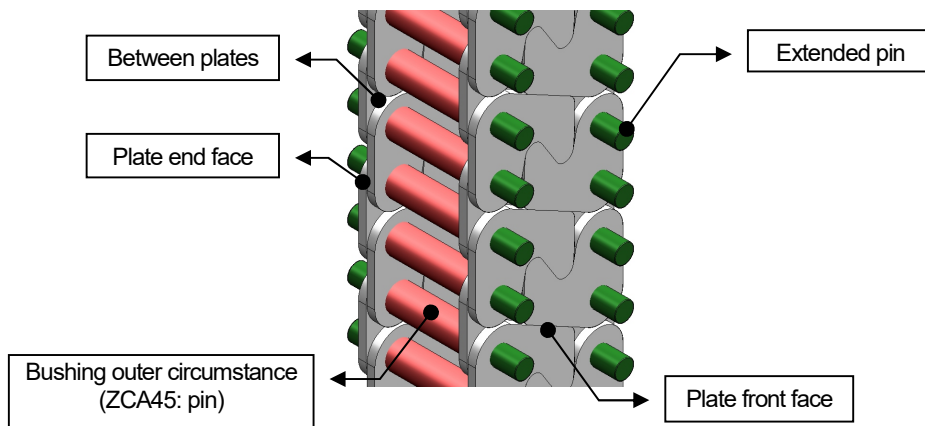


Fig. 6 ZIP CHAIN Inspection Points

- Check for damage unrelated to the ZIP CHAIN (every 6 months)
Follow the instruction below.
 - Remove all loads
 - Stop the equipment and perform lock-out-tag-out safety measures
 - Shut off the power source and ensure that power cannot be turned on accidentally
 - Check the following unrelated to ZIP CHAIN
 - I. Check the end fitting bracket for cracks, distortion, rust, etc.
 - II. Check the drive unit for cracks, distortion, rust, etc.
 - III. Check the input shaft for cracks, distortion, rust, rotational problems, etc.
 - IV. Check the housing for cracks, distortion, etc.

Should any of the above occur, stop use immediately. Contact your distributor for replacement with a new ZCA. Your ZCA has reached the end of its service life.

- Turn on the power and return the ZCA to normal operation

5.2. Maintenance

1. The ZIP CHAIN and drive unit are pre-greased and ready to be used upon delivery. Use the recommended grease shown in Table 9 below. The lubrication cycle with normal use is 12 months for ZCA25 and ZCA35, and 3.5 months for ZCA45, but this will vary depending on the frequency of operation and ambient conditions. Refer to Table 10 for lubrication cycle (for reference only).
2. To lubricate ZIP CHAIN, wipe off any old grease using a brush and apply grease directly to the chain using a different brush. Refer to Fig. 7 for application locations and Table 11 for the amount of grease.

Table 9 Recommended grease

Part	Manufacturer	Grease
ZIP CHAIN & Drive Unit	Showa Shell	*Shell Alvania EP Grease 2
	Idemitsu	Daphne Eponex Grease SR No.2
	EMG marketing Godo Kaisya	Mobilux EP 2
	JX Nippon Oil & Energy	Epinoc Grease AP(N)2

※Grease used in factory prior to shipment

Table 10 Lubrication Cycle

Frequency of Operation	Lubrication Cycle			
	Model	ZCA25	ZCA35	ZCA45
2000 – 2700/day		6 months	4 months	1.5 months
1000 – 2000/day		8 months	5 months	2 months
1 – 1000/day		12 months	12 months	3.5 months

Regular lubrication interval is:

500,000 strokes for ZCA25

350,000 strokes for ZCA35

100,000 strokes for ZCA45

Lubricate based on the above intervals (whichever is shorter).

Table 11 Amount of Grease

Model No.	Base Amount of Grease	Additional Amount of Grease
	Chain and Drive Unit	ZIP CHAIN (per Chain Stroke 100mm)
ZCA25	8g	1.7g/ZIP CHAIN 100mm
ZCA35	15g	2.0g/ZIP CHAIN 100mm
ZCA45	35g	3.5g/ZIP CHAIN 100mm

The above amounts of grease are values that will ensure long life for the unit.

They are not guaranteed values for service life.

- Greasing Procedure

- Remove all loads
- Stop the equipment and perform lock-out-tag-out safety measures
- Shut off the power source and ensure that power cannot be turned on accidentally
- Fully extend the ZIP CHAIN and wipe away any old grease using a brush
- Apply grease directly to the entire outer surface of the ZIP CHAIN using a different brush
Refer to Table 12 and Fig. 7
- Turn on the power and return the ZCA to normal operation

Table 12 ZIP CHAIN Lubrication Points

Part	Range	Note
Bushing/Pin*	All links	Especially the input shaft side
Plate Front Face	All links	Both sides of both plates
Plate End Face	All links	Both sides of both plates
Extended Pin	All links	All extended pins

※ZCA25, ZCA35: bush

ZCA45: pin

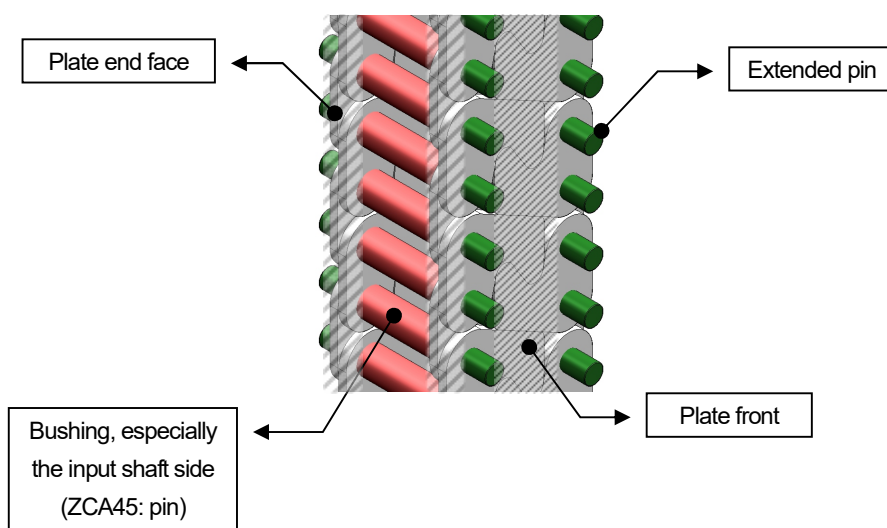


Fig. 7 Where to grease ZIP CHAIN

6. Troubleshooting Guide

Most problems with the ZCA stem from insufficient lubrication, inappropriate selection, or improper installation. In the event of trouble, carry out appropriate measures in accordance with this troubleshooting guide.

Table 13 Troubleshooting

Problem	Possible Cause	Solution
Drive Unit Breakage	① Excessive load	● Reduce the load or replace with a new ZCA with sufficient capacity
	② Inadequate support	● Mount the ZCA to a robust cradle and align accurately
	③ Shock or impact	● Provide a buffer to absorb shock or impact
Input Shaft Breakage	① Misalignment	● Using a cylindrical coupling may cause damage to the shaft. Use an Echt-Flex Coupling. Adjust the concentricity.
	② Excessive overhang load	● Adjust the load to below catalog values
	③ Excessive load	● Refer to “Drive Unit Breakage,” point ①
	④ Shock load	● Install a safety device to absorb the shock load
	⑤ Excessive input	● Refer to “Drive Unit Breakage,” point ①
Bearing Breakage	① Excessive load	● Refer to “Drive Unit Breakage,” point ①
	② Excessive overhang load	● Refer to “Input Shaft Breakage,” point ②
	③ Coupling misalignment	● Refer to “Input Shaft Breakage,” point ①
	④ Coupling adjustment in the axial direction	● Adjust the position and length of the coupling so the input shaft is not subjected to load in the axial direction
Chain Breakage, Excessive Wear, Unusual Noises from Chain	① Excessive load	● Refer to “Drive Unit Breakage,” point ①
	② Improper adjustment/installation	● Provide a guide in direction of travel to prevent lateral load
	③ Lateral load	● Refer to “5 Maintenance & Inspection” in this manual and provide proper lubrication
	④ Insufficient lubrication	● Refer to “5 Maintenance & Inspection” in this manual and provide proper lubrication
Unusual Surface Temperature of Drive Unit (over 60°C)	① Excessive load	● Refer to “Drive Unit Breakage,” point ①
	② Insufficient lubrication	● Refer to “5 Maintenance & Inspection” in this manual and provide proper lubrication
	③ Misalignment	● Refer to “Input Shaft Breakage,” point ①

7. Disposal



Caution

- When disposing of your ZCA, follow all local rules and regulations.
- The material used in the housing is “Polyacetal: POM”. It is shown on the mating surface with the drive unit on the ZCA25N(M)030, 050 and ZCA35N(M)050, 075, 100 only. The material of chain guide used inside the housing for ZCA45 is “Polyacetal: POM”.
- Pay careful attention to safety when disposing of the unit.

8. Diagram of External Dimensions

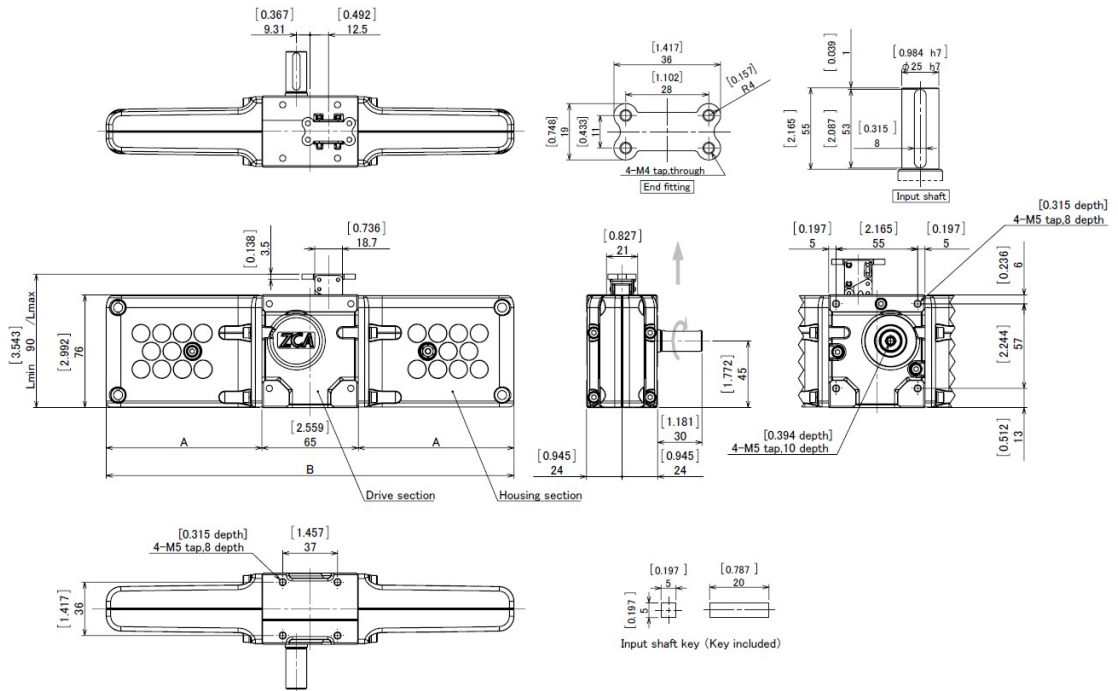


Fig. 8 External Diagram (ZCA25)

Table 14 Diagram

Model No.	Stroke (mm)	A (mm)	B (mm)	Lmax (mm)
ZCA25N030EL	300	105	275	390
ZCA25N050EL	500	149	363	590

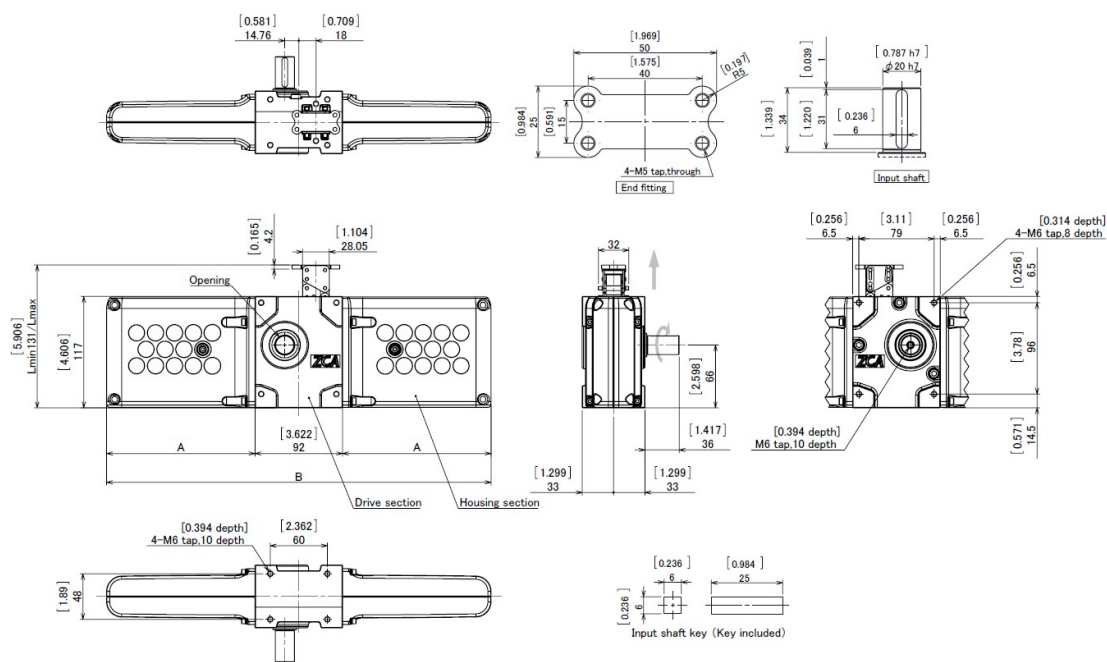


Fig. 9 External Diagram (ZCA35)

Table 15 Diagram

Model No.	Stroke (mm)	A (mm)	B (mm)	Lmax (mm)
ZCA35N050EL	500	156	404	631
ZCA35N075EL	750	218.5	529	881
ZCA35N100EL	1000	281	654	1131

9. With Motor, TERVO

Thoroughly read the separate hypoid motor operating instructions before performing any operations.

Table 17 List of Models with Motor (ZCA25M030, 050)

Model No.		Hypoid Motor		Rated Thrust N[kgf]		Speed (mm/sec)		Allowable start-up frequency (times/min.)	
Size	Stroke	Model				50Hz	60Hz	50Hz	60Hz
		Motor Capacity	Reduction Ratio						
ZCA25	300	006 (60W)	40	※400	{※40.8}	60	73	10	10
			50	※400	{※40.8}	48	58	9	10
			60	※400	{※40.8}	40	48	8	9
		009 (90W)	10	166	{17.0}	243	292	10	10
			15	274	{28.0}	162	195	10	10
			20	382	{39.0}	122	145	10	10
			25	※400	{※40.8}	97	117	10	10
			30	※400	{※40.8}	82	97	10	10
	500	006 (60W)	40	※330	{※33.6}	60	73	10	10
			50	※330	{※33.6}	48	58	9	10
			60	※330	{※33.6}	40	48	8	9
		009 (90W)	10	166	{17.0}	243	292	10	10
			15	274	{28.0}	162	195	10	10
			20	※330	{※33.6}	122	145	10	10
			25	※330	{※33.6}	97	117	10	10
			30	※330	{※33.6}	82	97	10	10

- Rated Thrust values are for operation at 60Hz.
- Model marked with “※” have torque limits.
- Be sure to limit the maximum thrust to 300N {30.6kgf} or less for 500mm stroke with bellows.

Table 18 list of Models with Motor (ZCA35M050, 075, 100)

Model No.		Hypoid Motor		Rated Thrust N [kgf]		Speed (mm/sec)		Allowable start-up frequency (times/min)	
Size	Stroke	Model				50Hz	60Hz	50Hz	60Hz
		Motor Capacity	Reduction Ratio						
ZCA35	500 750	020 (0.2kW)	40	※1000	{※102.0}	91	110	10	10
			50	※1000	{※102.0}	73	88	8	10
			60	※1000	{※102.0}	61	73	7	8
		040 (0.4kW)	10	617	{63.0}	365	438	3	5
			12.5	794	{81.0}	292	351	8	10
			15	941	{96.0}	243	292	10	10
			20	※1000	{※102.0}	183	291	10	10
			25	※1000	{※102.0}	146	175	10	10
			30	※1000	{※102.0}	122	146	10	10
	1000	020 (0.2kW)	40	※600	{※61.2}	91	110	10	10
			50	※600	{※61.2}	73	88	8	10
			60	※600	{※61.2}	61	73	7	8
		040 (0.4kW)	10	※600	{※61.2}	365	438	3	5
			12.5	※600	{※61.2}	292	351	8	10
			15	※600	{※61.2}	243	292	10	10
			20	※600	{※61.2}	183	291	10	10
			25	※600	{※61.2}	146	175	10	10
			30	※600	{※61.2}	122	146	10	10

- Rated Thrust values are for operation at 60Hz.
- Model marked with “※” have torque limits.
- Be sure to limit the maximum thrust to 431N [44.0kgf] or less for 1000mm stroke with bellows.

Table 19 List of Models with Motor (ZCA45M100, 150, 200)

Model No.		Hypoid Motor		Rated Thrust N [kgf]		Speed (mm/sec)		Allowable start-up frequency (times/min)	
Size	Stroke	Model				50Hz	60Hz	50Hz	60Hz
		Motor Capacity	Reduction Ratio						
ZCA45	1000 1500	040 (0.4kW)	60	※2000	{※204.0}	102	122	6	7
			80	※2000	{※204.0}	76	91	4.5	5.5
			100	※2000	{※204.0}	61	73	4	4.5
		075 (0.75kW)	10	617	{63.0}	★500	★500	0.5	1
			12.5	813	{83.0}	490	★500	1	2
			15	980	{100.0}	408	490	2	4.5
			20	1392	{142.0}	306	367	5	9
			25	1765	{180.0}	245	294	10	10
			30	※2000	{※204.0}	204	245	10	10
			40	※2000	{※204.0}	153	183	9	10
			50	※2000	{※204.0}	122	147	7	8
	2000	040 (0.4kW)	60	※1200	{※122.5}	102	122	6	7
			80	※1200	{※122.5}	76	91	4.5	5.5
			100	※1200	{※122.5}	61	73	4	4.5
		075 (0.75kW)	10	617	{63.0}	★500	★500	0.5	1
			12.5	813	{83.0}	490	★500	1	2
			15	980	{100.0}	408	490	2	4.5
			20	※1200	{※122.5}	306	367	5	9
			25	※1200	{※122.5}	245	294	10	10
			30	※1200	{※122.5}	204	245	10	10
	40		※1200	{※122.5}	153	183	9	10	
	50		※1200	{※122.5}	122	147	7	8	

- Rated Thrust values are for operation at 60Hz.
- Model marked with “※” have torque limits.
- Model marked with “★” have speed limits.
- Be sure to limit the maximum thrust to 900N {91.8kgf} or less for 2000mm stroke with bellows.

Table 20 List of Models with TERVO (ZCA25K030, 050)

Model No.		Reducer for Servo Motor		Rated Thrust N [kgf]		Speed (mm/sec)
Size	Stroke	Model				
		Motor Capacity	Reduction Ratio			
ZCA25	300	020 (0.2kW)	5	86	[8.0]	953
			10	199	{20.0}	476.5
			15	330	{33.6}	317.7
			20	※400	{※40.8}	238.3
	500	020 (0.2kW)	5	86	[8.0]	953
			10	199	{20.0}	476.5
			15	※330	{※33.6}	317.7
			20	※330	{※33.6}	238.3

- Values on the above table are for operation at 3000 r/min of the input shaft rotation speed.
- Rated thrust values are obtained by adding no load losses against the rated torque of motor.
- Model marked with “※” have torque limits.
- Be sure to limit the maximum thrust to 300N {30.6kgf} or less for 500mm stroke with bellows.

Table 21 List of Models with TERVO (ZCA35K050, 075, 100)

Model No.		Reducer for servo motor		Rated Thrust N {kgf}		Speed (mm/sec)
Size	Stroke	Model				
		Motor Capacity	Reduction Ratio			
ZCA35	500 750	040 (0.4kW)	40	※1000	{※102.0}	178.6
		075 (0.75kW)	5	236	{24.0}	★1000
			10	549	{55.0}	714.5
			15	848	{86.0}	476.3
			20	※1000	{※102.0}	357.3
	1000	040 (0.4kW)	40	※600	{※61.2}	178.6
		075 (0.75kW)	5	236	{24.0}	★1000
			10	549	{55.0}	714.5
			15	※600	{※61.2}	476.3
			20	※600	{※61.2}	357.3

- Values on the above table are for operation at 3000 r/min of the input shaft rotation speed.
- Rated thrust values are obtained by adding no load losses against the rated torque of motor.
- Model marked with “※” have torque limits.
- Model marked with “★” have speed limits.
- Be sure to limit the maximum thrust to 431N {44.0kgf} or less for 1000mm stroke with bellows.

Table 22 List of Models with TERVO (ZCA45K100, 150, 200)

Model No.		Reducer for Servo Motor		Rated Thrust N[kgf]		Speed (mm/sec)
Size	Stroke	Model				
		Motor Capacity	Reduction Ratio			
ZCA45	1000 1500	040 (0.4kW)	120	※2000	{※204.0}	100
		075 (0.75kW)	20	586	{59.0}	★500
			25	765	{78.0}	480
			30	946	{96.0}	400
			40	1240	{126.0}	300
			50	1578	{160.0}	240
			60	1924	{196.0}	200
			80	※2000	{※204.0}	150
	2000	040 (0.4kW)	120	※1200	{※122.5}	100
		075 (0.75kW)	20	586	{59.0}	★500
			25	765	{78.0}	480
			30	946	{96.0}	400
			40	※1200	{※122.5}	300
			50	※1200	{※122.5}	240
			60	※1200	{※122.5}	200
			80	※1200	{※122.5}	150

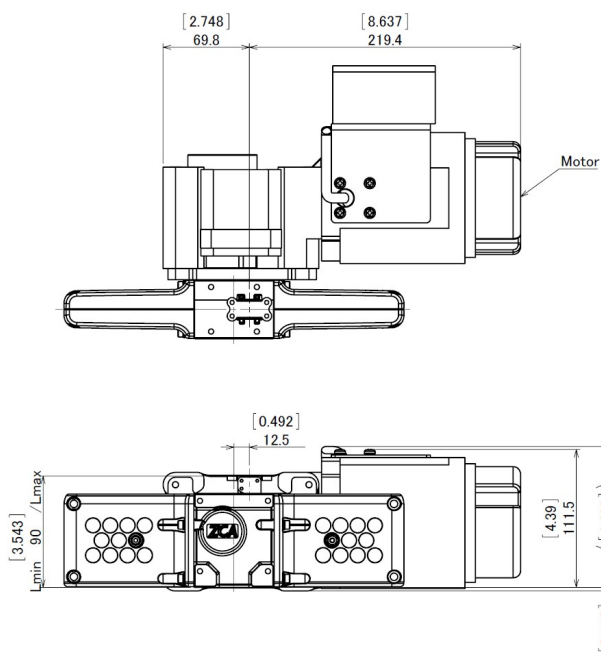
- Values on the above table are for operation at 3000 r/min of the input shaft rotation speed.
- Rated thrust values are obtained by adding no load losses against the rated torque of motor.
- Model marked with “※” have torque limits.
- Model marked with “★” have speed limits.
- Be sure to limit the maximum thrust to 900N [91.8kgf] or less for 2000mm stroke with bellows.

9.1. Transportation

1. Be careful when transporting, as the weight of the ZCA and motor (hypoid motor with brake) is unevenly distributed.
2. Due to risk of damage or falling, do not transport while supporting only the housing (plastic part). Always hold the center of the drive unit (steel area) and the motor when transporting.
3. Due to risk of damage or falling, do not transport while holding only the end fitting bracket or ZIP CHAIN. Always hold the center of the drive unit (steel area) and the motor when transporting.

9.2. Mounting location and environment

1. Motors with reducers are extremely heavy. Use a sturdy, highly rigid cradle that is stable even under maximum loads to ensure proper mounting.
2. When mounting the unit, use the four tap holes on the unit or a separately provided mounting plate and secure the unit firmly. (Mounting bolts not included.) Refer to Table 5 on page 4 for mounting bolt size. Bolts should have a strength classification of 10.9 (JIS B 1051) or over. Bolt penetration depth should be in consideration of the strength of the mounting member. Apply a thread bonding compound when mounting to prevent bolt loosening. Refer to Table 6 on page 4 for major bond products, or use an equivalent product. Comply with manufacturer handling instructions when applying bonding compound.
3. The ZIP CHAIN will be raised 10mm from the lowest stroke limit when packed. Wire and adjust the motor when first operating the ZCA so that the chain can unreel (lift). The chain will enter the drive unit if rotation direction is wrong, causing damage to the ZCA.
4. When a motor is attached with the ZCA25M and ZCA35M, the motor unit and fan cover's bottom surface will extend beyond the bottom surface of the housing section. Contact a Tsubaki representative if the motor area will be used without attachments or if an attachment plate is needed.



Model No.	Approximate mass (kg)	
	Motor Capacity	
	60W	90W
ZCA25M030EL□□	10.0	10.5
ZCA25M050EL□□	10.5	11.0

※Motor unit bottom surface will extend beyond the bottom surface of the housing section.

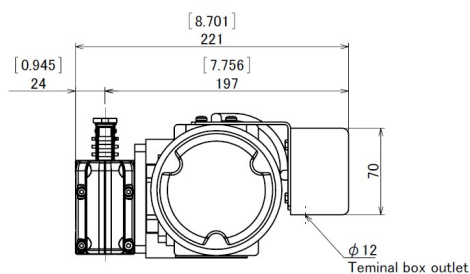


Fig. 11 External Diagram with Motor (ZCA25M)

Model No.	Approximate mass (kg)	
	Motor Capacity	
ZCA35M050EL□□	0.2kW	14.0
ZCA35M075EL□□	0.4kW	18.0
ZCA35M100EL□□	0.4kW	19.0
ZCA35M100EL□□	0.4kW	20.0

Motor Capacity	Unit (mm)					
	C	D	E	F	G	H
0.2kW	80.8	240.2	134.5	3.5	244.5	211.5
0.4kW	91.8	274.7	134.5	11.5	248.5	215.5

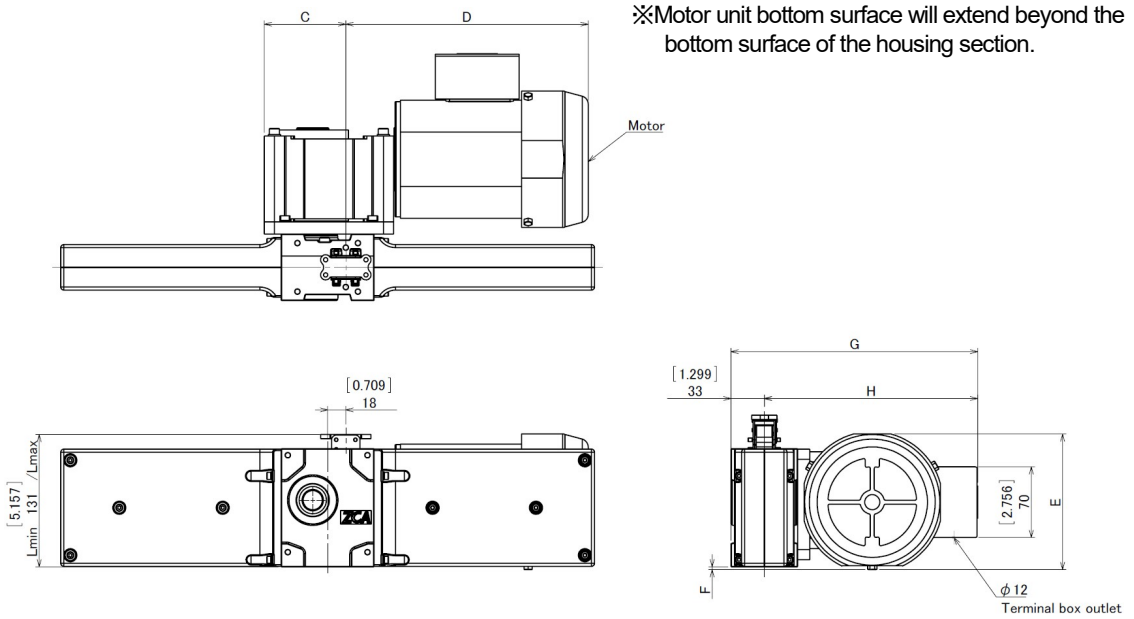


Fig. 12 External Diagram with Motor (ZCA35M)

Model No.	Approximate mass (kg)	
	Motor Capacity	
	0.4kW	0.75kW
ZCA45M100EL□□	35.5	47.5
ZCA45M150EL□□	40.0	51.5
ZCA45M200EL□□	44.5	56.0

Motor Capacity	Unit (mm)			
	C	D	G	H
	0.4kW	0.75kW	0.4kW	0.75kW
0.4kW	114	252.5	225.5	268.5
0.75kW	125	330	317	274

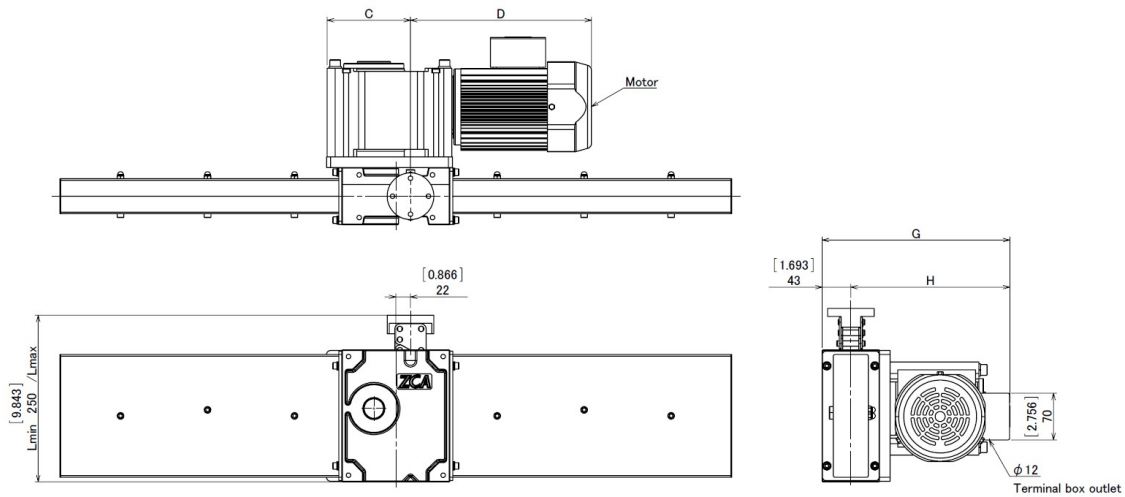


Fig. 13 External Diagram with Motor (ZCA45M)

Approximate mass (kg)	
Model No.	Motor Capacity
	0.2kW
ZCA25K030EL□□	7.0
ZCA25K050EL□□	7.5

Unit (mm)						
Motor Capacity	C	D	E	F	G	H
0.2kW	69.8	123.2	96	3	166	142

※Motor unit bottom surface will extend beyond the bottom surface of the housing section.

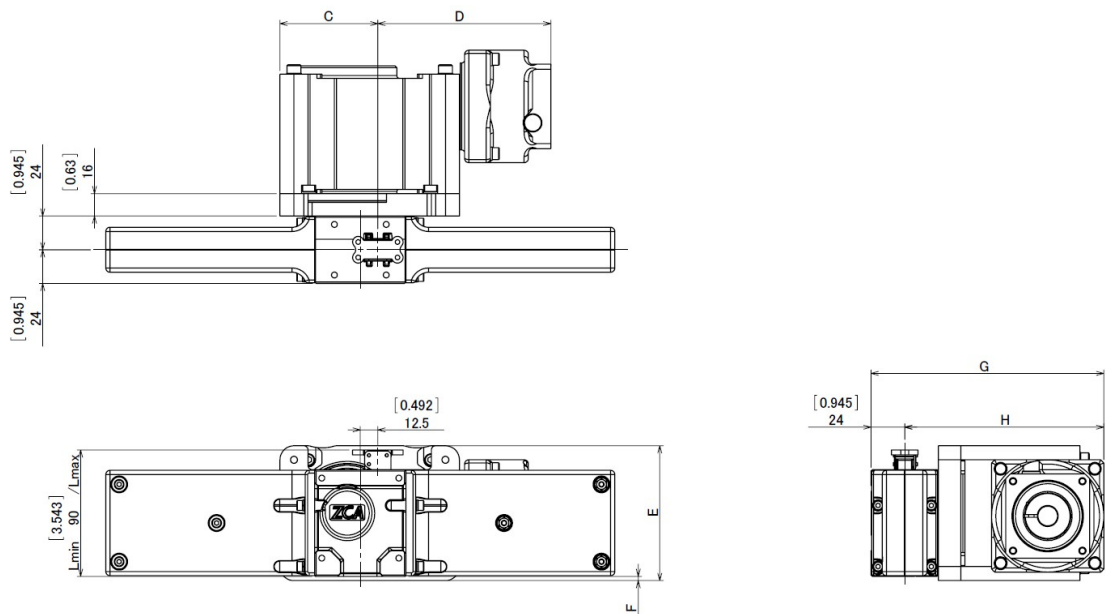


Fig. 14 External Diagram with TERVO (ZCA25K)

Model No.	Approximate mass (kg)	
	Motor Capacity	
	0.4kW	0.75kW
ZCA35K050EL□□	12.0	21.5
ZCA35K075EL□□	13.5	23.0
ZCA35K100EL□□	14.5	24.0

Motor Capacity	Unit (mm)					
	C	D	E	F	G	H
	0.4kW	91.8	132.7	128.5	3.5	203.5
0.75kW	102.8	160.2	136	14	227.5	194.5

※Be aware that dimensions are different depending on the mounting code.

Above values are obtained from "E4HC" for 0.4kW, "G5KC" for 0.75kW.

※"E" dimension for 0.75kW will be about 5mm larger than Lmin.

※Motor unit bottom surface will extend beyond the bottom surface of the housing section.

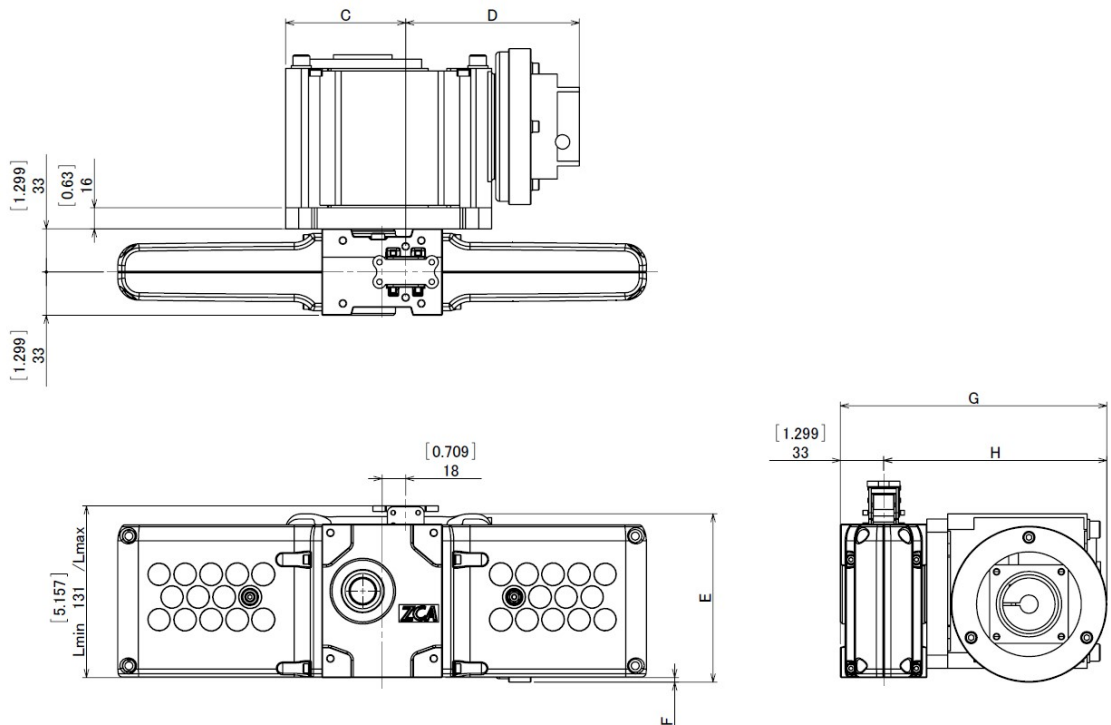


Fig. 15 External Diagram with TERVO (ZCA35K)

Model No.	Approximate mass (kg)	
	Motor Capacity	
	0.4kW	0.75kW
ZCA45K100EL□□	30.0	39.0
ZCA45K150EL□□	34.0	43.0
ZCA45K200EL□□	38.5	47.5

Motor Capacity	Unit (mm)			
	C	D	G	H
	0.4kW	0.75kW	0.4kW	0.75kW
0.4kW	114	110.5	223.5	180.5
0.75kW	125	138	247.5	204.5

※Be aware that dimensions are different depending on the mounting code.
 Above values are obtained from "E4HC" for 0.4kW,
 "G5KC" for 0.75kW.

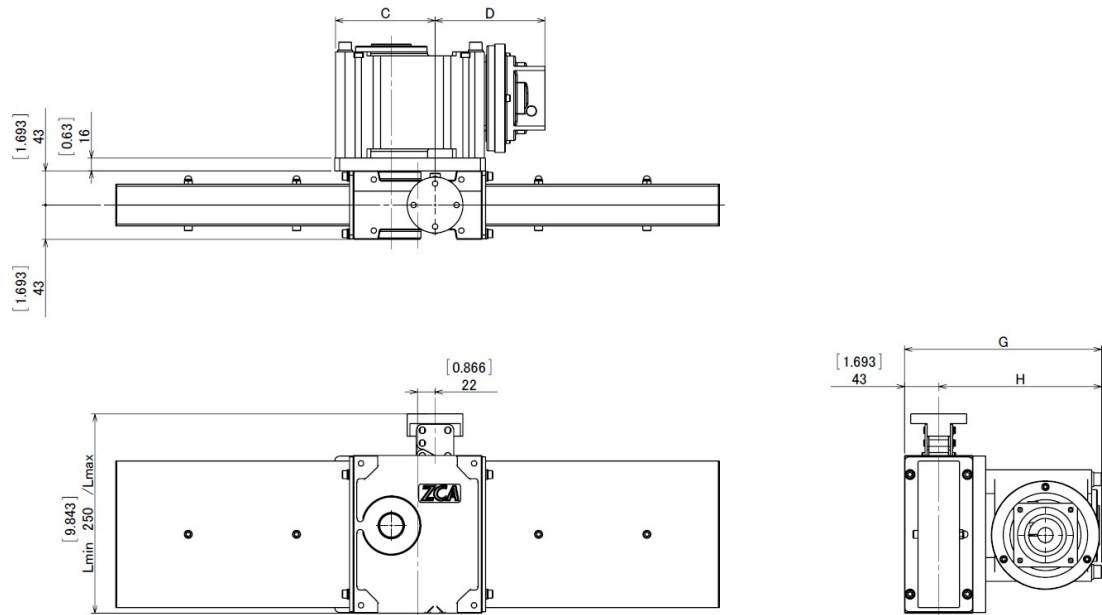


Fig. 16 External Diagram with TERVO (ZCA45K)

9.3. Wiring

■ General Precautions

- 1. Do not operate the unit with the terminal box cover removed.
- 2. Double check that the motor has been wired correctly before performing a test operation. An incorrect phase will cause the ZIP CHAIN to run backwards, causing damage to the equipment.
- 3. Always turn off the power during blackouts.

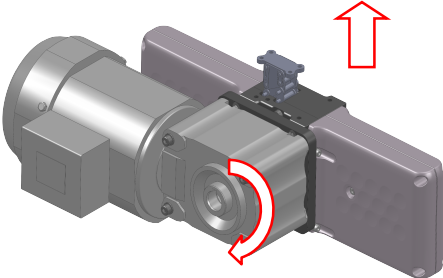
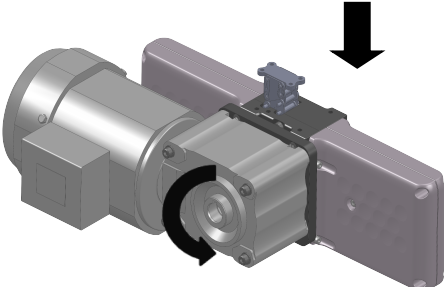
 **Caution**

- Always confirm the rotation direction of the motor before mounting the ZCA to the equipment. Incorrect rotation may cause injury or damage to the equipment.

■ Wire Connection and Rotation Direction

Table 23 Wire Connection and relation to chain direction of travel

Three-Phase Motor (60W to 0.75kW)	
U V W ○ ○ ○ R T	U V W ○ ○ ○ T R
A	B

Chain Direction of Travel	
	

※Relationship of rotation between the input shaft and the output shaft for both hypoid motor and TERVO (reducer for servo motor) is the same.

Table 24 Wire Connection and relation to chain direction of travel (with Hypoid Motor)

	Size	Motor Capacity	Reduction Ratio	Wire Connection A	Wire Connection B
ZCA	25	90W	10		
			15		
			20		
			25		
			30		
		60W	40		
			50		
			60		
	35	0.4kW	10		
			12.5		
			15		
			20		
			25		
			30		
		0.2kW	40		
			50		
			60		
	45	0.75kW	10		
			12.5		
			15		
			20		
			25		
			30		
			40		
		0.4kW	50		
			60		
			80		
			100		

※Model number to be referred to Table 17 to 20 on page 15 to 20

Table 25 Wire Connection and relation to chain direction of travel (with TERVO)

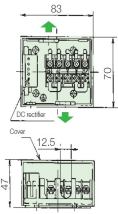
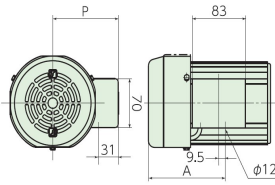
	Size	Motor Capacity	Reduction Ratio	Wire Connection A	Wire Connection B
ZCA	25	0.2kW	5		
			10		
			15		
			20		
	35	0.75kW	5		
			10		
			15		
			20		
		0.4kW	40		
	45	0.75kW	20		
			25		
			30		
			40		
			50		
			60		
			80		
		0.4kW	120		

※Model No, to be referred to Table 20 to 22 on page 15 to 20

■ Standard Terminal Box Specifications

Table 26 Standard Terminal Box

Motor size: 0.2kW / 0.4kW / 0.75kW(resin) ZCA35 / ZCA45

	Terminal box dimensions	Terminal box position												
With brake	  1. Terminal screw size: M3.5 (tightening torque: 0.8 N·m (0.08 kgf·m)) 2. Ground terminal screw size: M4 (tightening torque: 1.2 N·m (0.12 kgf·m)) 3. The terminal box outlet direction can be changed as desired according by changing cover direction.	 <table border="1"> <thead> <tr> <th>Motor size</th><th>A</th><th>P</th></tr> </thead> <tbody> <tr> <td>0.2kW</td><td>119.5</td><td>104.5</td></tr> <tr> <td>0.4kW</td><td>119.5</td><td>104.5</td></tr> <tr> <td>0.75kW</td><td>148.5</td><td>123</td></tr> </tbody> </table>	Motor size	A	P	0.2kW	119.5	104.5	0.4kW	119.5	104.5	0.75kW	148.5	123
Motor size	A	P												
0.2kW	119.5	104.5												
0.4kW	119.5	104.5												
0.75kW	148.5	123												

■ Inverter Drive

• ZCA25M motors (60W, 90W)

A 200V class motor can be driven from the inverter unless it is operated at low frequency or a frequency of 60Hz or higher. 400V class motors cannot be driven by an inverter.

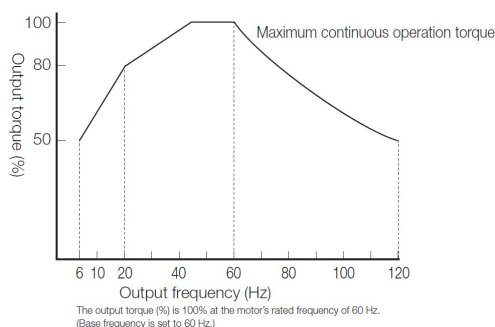
• ZCA35M, ZCA45M motors (0.2kW or more)

The maximum operating frequency is 120Hz, and the low Hz range (low frequency) should be used within the allowable range of the inverter. The 0.75kW motor type is also capable of constant torque operation between 6Hz and 60Hz using a standard motor.

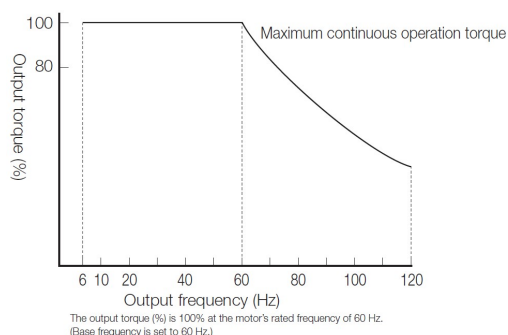
• Frequency and torque characteristics on 0.2kW or larger motor

At high speeds, torque decreases inversely in proportion to the rotation speed because the power becomes constant at kW. In addition, as the rotation speed increases, motor noise, motor fan noise, reduction gear noise, and vibrations also increases.

At low speeds, the operating and cooling efficiency of the motor decreases, so temperature raises. It is required to limit the torque to use.



With a 0.2kW or 0.4kW motor



With a 0.75kW motor

Fig. 17 Output torque from the inverter drive

• Notes on braking

The brake circuit must be operated individually due to its required power supply. See page 34 for more information.

Standard products are shipped with the brake lead wire screwed together with the motor lead wire. The brake lead wire should be unscrewed and connected individually.

The frequency should be 60Hz (1800r/min) or lower during braking. Braking at high speed range over 60Hz may cause mechanical damages, and heating and wear on lining. Make sure to operate at 60Hz or lower frequency.

• Using a 400V class motor for the inverter drive

Devices with a 400V class motor are available for made to order. With a 400V class motor, dielectric breakdown may occur due to high voltage surges (microsurges) generated from the inverter switching. As a result, measures against microsurges are generally required for such motors. Tsubaki 400V class of motor comes standard with micro surge protection. However, with levels in excess of 1200V, a suppression filter or reactor should be installed on the inverter side.

• Other points to note

- Compared with standard power supplies; greater increases in temperature, noise, and vibration should be expected when using an inverter drive.
- To protect the motor from overheating, use an electronic thermal mechanism configured for general-purpose motor characteristics, or use a thermal relay or other device between the inverter and the motor.
- When using at a base frequency of 50Hz, set the output torque to 0.8 times that in the chart above. (with a 0.2kW or 0.4kW motor only)
- 0.2kW and 0.4kW inverter motors are also available.

9.4. Connection, Braking

■ Connection

1. Wiring

Wiring should be performed in accordance with electrical equipment technical standards, indoor wiring regulations, and regulations set forth by the electrical company. Be aware of significant voltage drops caused by long wiring distances.

2. Ground

Ground the motor to prevent leaks from deteriorating insulation. Installing a ground fault interrupter will provide an additional level of safety.

3. Always use a power source as printed on the nameplate.

4. Attaching and removing the plastic terminal box cover

- ✓ Removing the cover
Grasp the side of the terminal box cover as shown in the figure below and pull away to remove the cover
- ✓ Attaching the cover
Press the terminal box cover into the terminal box case from above until it snaps into place.

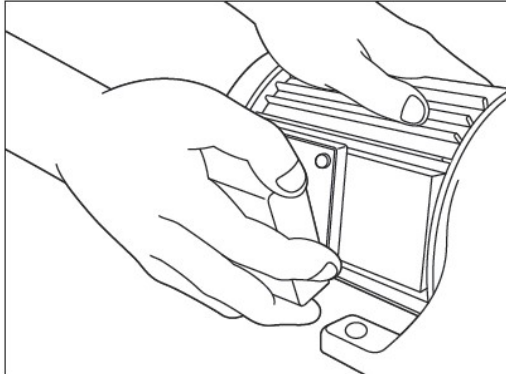


Fig. 18 Attaching and removing the plastic terminal box cover

5. Wiring the brake

ZCA units are shipped standard with AC internal wiring, but response times will differ by connection. Please select your wiring to match your application.

- ✓ To shorten the response time, using DC external wiring is recommended.
- ✓ See Table 27 for examples of different brake connections depending on the application (here, a 3-phase motor).

Refer to the hypoid motor or hypoid motor mini operator manual for more information.

Table 27 Wiring for Hypoid motor mini with brake
(60W, 90W) *Applies to ZCA25

Application		Three-phase motor, standard voltage (200V class)
AC internal wiring	● General use ● Standard shipping specifications	
AC external wiring	● To shorten the stop time	
AC external operation	● When operating the brake individually Note: Use an auxiliary relay MCa with a rated load of 200VAC / 7A or more	200-220 VAC
DC external wiring	● When stopping accuracy is required. Note: Use 200VAC / 10A or more for setting the capacity of locations marked with *.	

Ⓜ: Motor, Ⓟ: Brake, MC: Magnetic contactor, MCa: Auxiliary relay, OCR: Overcurrent relay, C: Capacitor (accessory)
DM200D: DC rectifier, -N-: Protection element (varistor)

*1 After wiring and before turning on the power, make sure the lead wire of the DC rectifier is yellow (or red) on the power side and black on the brake side.

*2 The DC rectifier contains a diode that will be short-circuited by incorrect wiring, resulting in damage to the DC rectifier.

*3 Add protective elements to the contacts as necessary.

*4 When using an inverter, use only in individual AC operation.

*5 When using individual DC switching, the brake power supply can be damaged depending on the wiring length, wiring method, relay type, or other factors. Connect a varistor between the individual DC switching terminals. Connecting closer to the brake power supply (blue lead wire) will be most effective. The specific models of the varistors are as follows. Select a varistor voltage of 470V for DM200D.

Table 28 Wiring for Hypoid motor with brake
(200V class, ※for ZCA35 and ZCA45)

Application		Three-phase motor 200V (0.2kW / 0.4kW)	Three-phase motor 200V (0.75kW)
AC internal wiring	● General use ● Standard shipping specifications		
	● To shorten the stop time		
	● For inverters Place the inverter in the MC section ● When operating the brake individually	※3 Use a supply voltage of 220-254VAC for 0.1 to 0.2kW, and 200-220VAC for 0.4kW for the brake shown in the marked section.	※3 Use a supply voltage pf 200-220VAC for the brake shown in the marked section.
	● When stopping accuracy is required (such as for lifting equipment).		

(M): Motor, (B): Brake, MC: Magnetic contactor, MCa: Auxiliary relay, OCR: Overcurrent relay, DM200D: DC rectifier, -N-: Protection element (varistor)

*1 The brake voltage is 90VDC. (When inputting 200VAC to DM200D)

*2 When using individual DC switching, the brake power supply can be damaged depending on the wiring length, wiring method, relay type, or other factors. Connect a varistor between the individual DC switching terminals. Connecting closer to the brake power supply (blue lead wire) will be most effective. The specific models of the varistors are as follows. Select a varistor voltage of 470V for DM200D.

*3 For *1 in the table above, use an auxiliary relay (MCa) with a contact capacity of 200VAC / 7A or more (resistive load) When using an MC auxiliary contact or auxiliary relay for *2 in the table above, use a device with a contact capacity of 200VAC / 10A or more (resistive load)

Table 29 Models of varistor

Product name	Manufacturer	Model
		For DM200D
Surge Absorber	Panasonic	ERZV14D471
Zetrap	Fuji Electric Device Technology	ENE471D-14A
Ceramic Varistor	Nippon Chemi-Con	TND14V-471KB00AAA0

■ Hypoid Brake Motor Characteristics

Table 30 Characteristics of hypoid motor with brake

(Motor size: 0.2kW, 0.4kW, 0.75kW, three-phase motor as standard *For ZCA35 and ZCA45)

		Hypoid motor		
Motor size	Three-phase	0.2kW	0.4kW	0.75kW
Brake model	Three-phase 200V	SLB02	SLB04	SLB07E
	Three-phase 400V	SLB02	SLB04V	SLB07E 180V
DC rectifier	Three-phase 200V	DM200D		
	Three-phase 400V	DM400D		
Rated torque	Static friction torque (N·m)	1.96	3.92	7.35
	{kgf·m}	0.2	0.40	0.75
	Dynamic friction torque (N·m)	1.57	3.14	5.88
	{kgf·m}	0.16	0.32	0.60
Voltage	Three-phase 200V	90VDC		
	Three-phase 400V	90VDC		180VDC
Current	at 20°C A	0.178	0.232	0.273 (0.142)
Capacity	at 20°C W	16.0	20.9	24.6 (25.5)
Initial gap	mm	0.15 to 0.20	0.15 to 0.20	0.15 to 0.20
Limit gap	mm	0.5	0.5	0.5
Total braking workload	J {kgf·m}	1.85×10 ⁸	1.85×10 ⁸	3.66×10 ⁸
		1.89×10 ⁷	1.89×10 ⁷	3.73×10 ⁸
Allowable start-up frequency		10 times/min		
Braking delay time S (Reference value)	AC internal wiring	0.15 to 0.21	0.14 to 0.17	0.20 to 0.24
	AC external wiring	0.09 to 0.12	0.06 to 0.09	0.10 to 0.13
	AC external operation	0.09 to 0.12	0.06 to 0.09	0.10 to 0.13
	DC external wiring	0.04 to 0.06	0.03 to 0.05	0.04 to 0.06

*1 The rated torque represents the static friction torque and dynamic friction torque after fitting.

*2 The braking delay time is included as a reference and may differ depending on the braking conditions, operating conditions, and individual differences. To shorten the braking delay time (for lifting equipment, etc.), using DC external wiring is recommended.

Table 31 Characteristics of hypoid motor mini with brake
(Motor size: 60W, 90W, three-phase motor as standard, ※Applies to ZCA25)

		Hypoid motor mini	
Motor size	Three-phase	60W	90W
	Single-phase		
Brake model	Three-phase	BXW-04-10M-05-90V	BXW-04-10M-10-90V
	Single-phase		
DC rectifier	Three-phase	DM200D	
	Single-phase	DM100A	
Rated torque	Static friction torque N·m {kgf·m}	0.6 {6.1}	1.0 {10.2}
	Dynamic friction torque N·m {kgf·m}	0.48 {4.8}	0.8 {8.1}
Operating voltage (V)	Three-phase	90VDC	
	Single-phase		
Current (A)	Three-phase	0.076	0.111
	Single-phase		
Capacity (W)		6.8	10
Gap amount (mm)	Initial value	0.05 to 0.25	
	Limit value (three-phase)	0.4	
	Limit value (single-phase)	0.3	
Total braking workload J {kgf·m}	Three-phase	16.5×10 ⁶ {16.8×10 ⁵ }	13.4×10 ⁶ {13.7×10 ⁵ }
	Single-phase	8.0×10 ⁶ {8.16×10 ⁵ }	7.1×10 ⁶ {7.2×10 ⁵ }
Allowable start-up frequency		10 times/min	
Braking delay time S(Reference value)	AC internal wiring	0.08	0.08
	AC external wiring	0.04	0.04
	AC external operation	0.04	0.04
	DC external wiring	0.01	0.01

9.5. Operation

9.5.1 Operation



Warning

- Do not operate the unit without the terminal box cover attached (if a terminal box is provided). Once maintenance work is complete, always return the cover to its original position to avoid shocks.
- Do not come near any rotating parts while in operation to avoid risk of catching body parts in the unit and injury.
- Always turn off the power during blackouts. Injury or damage to the equipment may occur if the power were to suddenly return.
- Do not allow brake to come into contact with water or oil. This may cause the brake to lose torque, resulting in falling or runaway operation.
- Overhauls of gear motor series and hypoid motor mini series should be performed by experienced personnel.



Caution

- The hypoid motor mini series and hypoid motor series will be incredibly hot during operation. Do not touch them to avoid risk of burns.
- Cease operation immediately when any problems occur to avoid risk of shock, injury, or fire.
- Do not use above the rated load to avoid risk of injury or damage to the equipment.
- Always completely stop the motor before starting reverse rotation. Failure to do so may result in runaway operation in the current direction of rotation.

1. Inspection before initial operation

Once you have mounted and wired the unit, check the following before turning on the power.

- Are you using the appropriate interrupters and overload relays?
- Is the wiring correct?
- Is the ground wire securely connected?

In order to prevent danger....

Take ample precautions on the equipment side to prevent any danger that may arise during operation, even danger that has been foreseen or due to the motor not functioning properly.

2. Fluctuations in voltage and frequency

Be aware of any fluctuations in operational capacity when the voltage or frequency of the power supply to the motor is not within the prescribed values. There will be no problems if the motor voltage fluctuates within $\pm 10\%$ of the rated voltage.

3. Load

Subjecting the motor to a current load greater than the rated capacity will have a negative effect on motor and gear life, and it may damage the motor. Do not exceed the rated current value indicated on the motor nameplate.

4. Inspection immediately following first startup after installation or maintenance.
In addition to the preceding points, check the following points immediately following first startup after installation or maintenance.
 - a. Is the direction of rotation correct?
 - b. Is the maximum current within the values indicated on the nameplate?
 - c. Is there any abnormal vibration or noise?
 - d. Is the start-up frequency appropriate?
 - e. Is there any shock or impact load?
5. Start-up frequency
Take the motor inertia, heat generation, etc. into account when setting the allowable start-up frequency.
Always use the unit within the allowable start-up frequency.

9.5.2. Brake construction

Brake torque will decrease when the gap is at its limit. Inspect and replace the brake as necessary every year or every one million rotations, whichever comes first.

As the motor specifications for ZCA25, ZCA35 and ZCA45 are different, maintenance methods and standards should be conducted as per the accompanying motor (hypoid motor) operator's manual.

The gap on the ZCA25 (hypoid motor mini series) cannot be adjusted. When the gap has reached its limit, the brake has also reached its life and cannot be used.

9.6. Lubrication

Use grease to lubricate the reducer area on the motor (hypoid motor mini series and hypoid motor series). The ZCA is shipped from the factory already greased with the prescribed amount and can be used as is.

9.7. Motor troubleshooting guide

Refer to the following troubleshooting guide and implement the appropriate solution should any motor trouble occur. Refer to Chapter 6 for the ZCA troubleshooting guide.

Table 32 Motor troubleshooting guide

Trouble	Cause	Solution
Doesn't turn over when a load is applied (chain doesn't move)	① Low voltage	Check the length of the wiring
	② Gear wear	Repair or replace motor.
	③ Overloaded operation	Decrease the load
Chain is running in reverse	① Wrong connection	Check the connection
Abnormally high heat generation	① Overloaded operation	Decrease the load
	② Start/stop frequency too high	Decrease the frequency
	③ Bearing damage	Repair or replace motor.
	④ Voltage too high or low	Check the voltage
	⑤ Braking frequency too high	Decrease the frequency
	⑥ Load torque/inertia too high	Decrease the load
Loud	① Continuously loud: bearing damage, gear wear	Repair or replace motor.
	② Intermittently loud: gear damage or contamination	Repair or replace motor.
Heavy vibration	① Gear/bearing wear	Repair or replace motor.
	② Improper installation, loose bolts	Tighten all bolts
Leaking grease	① Loose fastenings	Tighten all fastenings
	② Damaged oil seal	Repair or replace motor.
Brake doesn't work	① Wrong brake wiring connection	Check the wiring connection
	② Defective switch	Repair or replace
Doesn't brake well, takes a long time to brake	① Oil/substance on lining	Disassemble and clean
	② Lining has reached its life	Repair or replace
	③ Load inertia too high	Decrease the load inertia
	④ Problem with AC internal wiring	Replace with AC external wiring connection
Motor doesn't turn over (chain doesn't move), motor generates abnormal heat, thermal relay is operating, and breaking is loud	① Wrong brake wiring connection	Check the wiring connection
	② Brake gap too big	Adjust the brake gap
	③ DC module is broken	Repair or replace
	④ Braking coil is broken or shorted	Repair or replace motor.
	⑤ Defective switch contact	Repair or replace

10. Optional

10.1. Input shaft on opposite side

The basic model can be operated in a pair with a unit with the input shaft on the opposite side.

1. Caution

- Install a separate mechanism that matches the height of the ZCA input shaft center when using interlocked. Only use interlocked when the shaft heights of the units are absolutely matched. If the height is not matched, then rotational forces will act on the motor output shafts and ZCA input shafts, leading to shaft damage. We recommend Tsubaki brand couplings for shaft connection.
- There will be individual differences in backlash when using synchronized ZCA units, resulting in some mis-positioning. Be sure to install a separate mechanism to adjust phase by using a coupling with clamp type, or shim to adjust the height.

Mounting direction of motor for the input shaft on opposite side

- Hypoid motor and TERVO can be mounted on the input shaft on opposite side. (Refer to Fig. 19)

Note: Following models have a different direction of motor.

ZCA25: with motor, with TERVO

ZCA35: with motor (0.4kW), with TERVO (0.4W, 0.75kW)

- Maximum speed and maximum input rotation speed are the same.

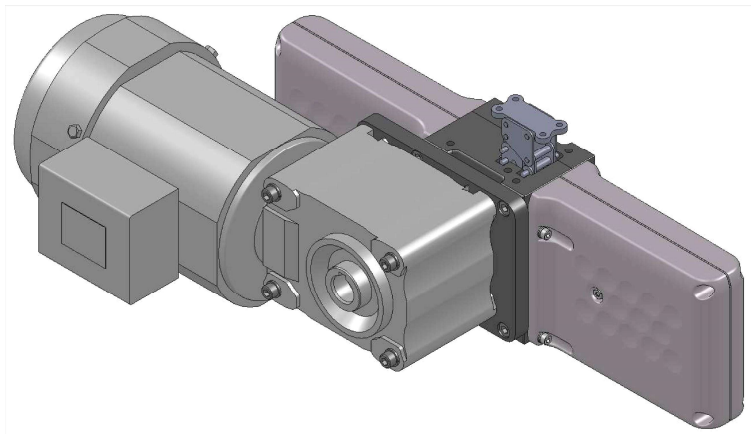
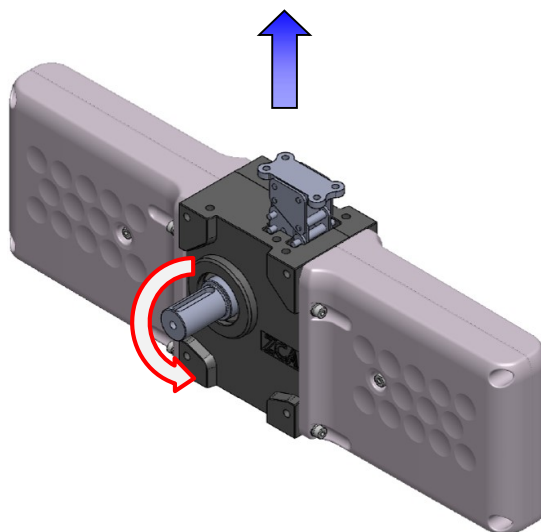


Fig. 19 External Diagram Input shaft on the opposite side with motor (ZCA35, motor size 0.2kW)

2. Direction of input shaft rotation and chain extension

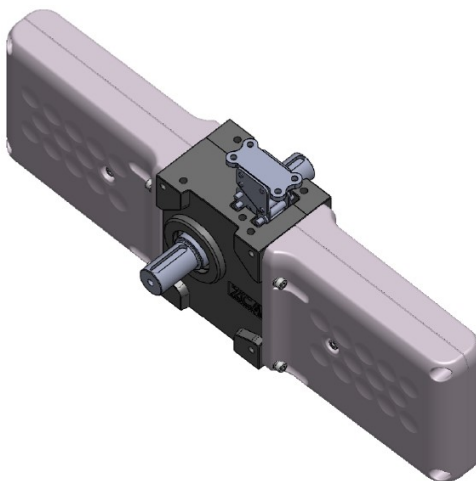


※Same for ZCA25, ZCA45

Fig. 20 Direction of input shaft rotation and chain extension
(Figure above shows the ZCA35)

10.2. Dual shaft specifications

- Can be used interlocked when used in parallel with an input shaft passed through the units.
- Position can be controlled by attaching an encoder to the input and opposite side shafts.
*Encoder motors also available (ZCA35, ZCA45), contact a Tsubaki representative for more information.



※Same for ZCA25, ZCA45

Fig. 21 Dual shaft specifications (Figure above shows the ZCA35)

1. Caution

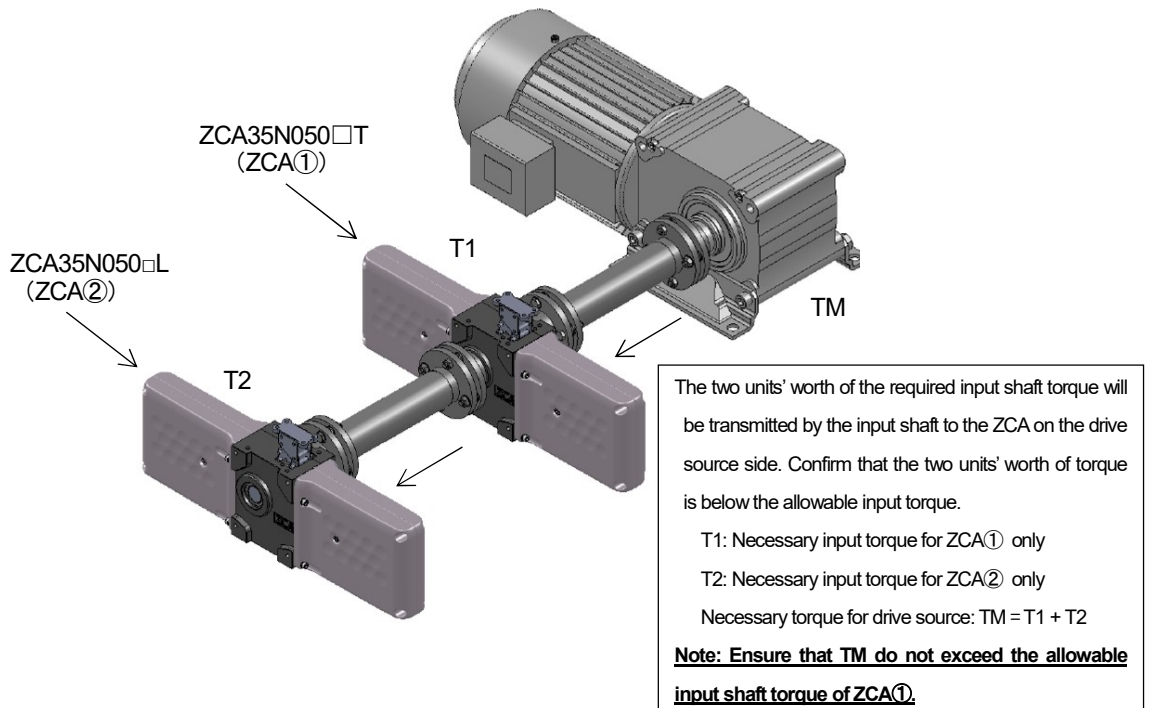


Fig. 22 example of application using Dual Shaft Specifications

10.3. Bellows

- Used in deleterious environments (e.g. dusty environments).
- To prevent grease from spattering

1. Caution

- The bellows have a ventilation hole with filter – the bellows are not completely sealed.
- The bellows are not water resistant.
- When using bellows, the lower limit position will be higher. Please check installation. Using with the lower position than this will cause premature damage to the bellows.
- The bellows will protrude slightly from the ZCA unit. Confirm that there is no interference especially when attaching a pulley, sprocket, or coupling to the input shaft. (See Fig. 23)
- Bellows can be attached after installation. Contact a Tsubaki representative if you need to attach them later.
*Bellows for lateral use cannot be attached except by factory. Request these bellows when ordering.
- When combining bellows and long stroke, some models have the limited basic capacity to secure a safety factor against buckling load. (Refer to Table 33)

Table 33 Basic capacity for combination of bellows and long stroke

Model No.	Lmin (mm)	Lmax (mm)	Allowable stroke (mm)	Basic capacity N {kgf}
ZCA25N050□□-J1	180	680	500	300N {30.6}
ZCA35N100□□-J1	270	1270	1000	431N {44.0}
ZCA45N200□□-J1	465	2465	2000	900N {91.8}

2. Periodic inspection

- Check for damage to the bellows during the regular maintenance. If damage is found, stop operation immediately and contact your Tsubaki representative. Tsubaki recommends replacing any damaged bellows.
- The bellows are expendable and do not have the same expected life as the ZCA unit.
- Attaching bellows designed for lifting and hanging applications in horizontal positions will result in premature damage to the bellows. When attaching in horizontal positions, special bellows incorporating special parts will be needed. Contact a Tsubaki representative for more information.
- Bellows are affixed with a stainless steel band on each end. Check whether the bolts holding the stainless steel band are loose when periodically inspecting the device. Loose bolts may cause the stainless steel band to slip off and damage the bellows. (See Fig. 24)
- When periodically inspecting the ZCA and applying grease, remove the top and bottom clamps and ensure that the bellows do not get in the way. Be sure to tighten the stainless steel band bolts after inspection.

*Tighten the bolts holding the stainless steel band to a torque of 2.7N·m.

Bellows Specification

Thermoplastic polyurethane (black)
comes with air vents with filter

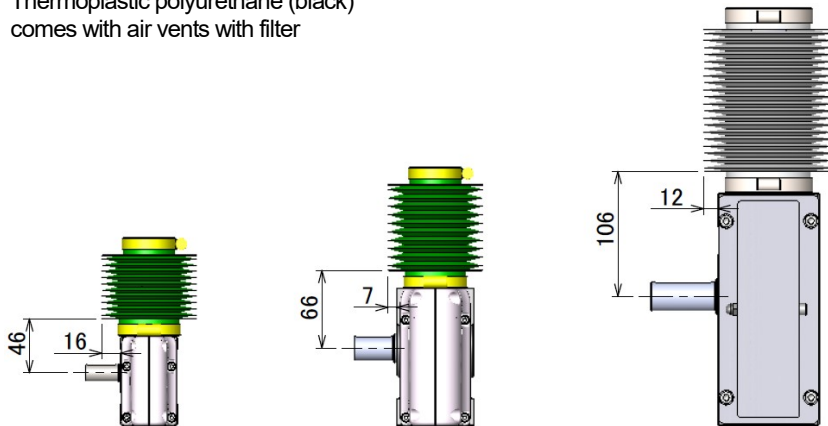


Fig. 23 With bellows attached – 1 (left: ZCA25, middle: ZCA35, right: ZCA45)

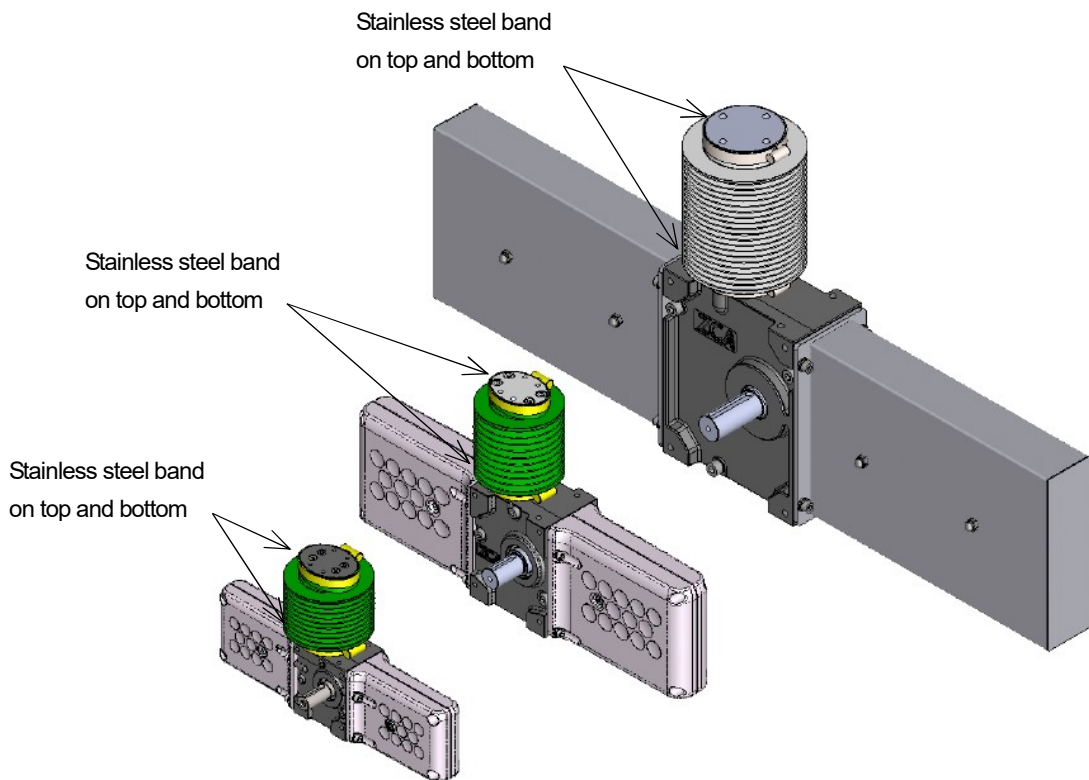


Fig. 24 With bellows attached – 2 (left: ZCA25, middle: ZCA35, right: ZCA45)

10.4. Mounting base

Use to mount the unit when using the ZCA in a hanging application.

- Caution
 - The attachment face of the chain's tip bracket may not be parallel to the work attachment face if the ZCA attachment face is not flat. This may cause the unit to break from the chain's bending load or mis-positioning. Ensure that the ZCA attachment face is flat.
 - The dimensions of the mounting base will vary depending on the combination of motor and options like bellows or grease plate. Contact a Tsubaki representative with the combination of options you are requesting to learn more about the dimensions.

10.5. Grease plate

The grease plate should be used to support chain lubrication.

You cannot reliably lubricate the chain using the grease plate alone. Periodically apply grease directly to the chain. (See pg. 9, Table 10)

1. Caution
 - Grease plate cannot be added later.
 - ZCA35, ZCA45
Grease using four nipples. (Nipples are attached to the grease plate.)
 - ZCA25
Grease using two nipples. (Nipples are attached to the grease plate.)
2. Greasing steps (See Fig. 28)
 - Remove all conveyed items.
 - Stop the equipment and ensure safety from falling objects, etc.
 - Manually pull the ZIP CHAIN from the unit 100mm at a time. (i)
 - Wipe away old grease with a brush. (ii)
 - Grease through the nipples. (See pg. 9, Table 10 for grease volume.) (iii)
*Using all four nipples for ZCA35 and ZCA45, and both nipples for ZCA25
 - Repeat steps i – iii above until the ZIP CHAIN reaches its maximum stroke.
 - Apply a brush directly to the entire outer face of the ZIP CHAIN and evenly apply grease.
 - Cycle the unit without load to ensure the grease has penetrated the entire chain.

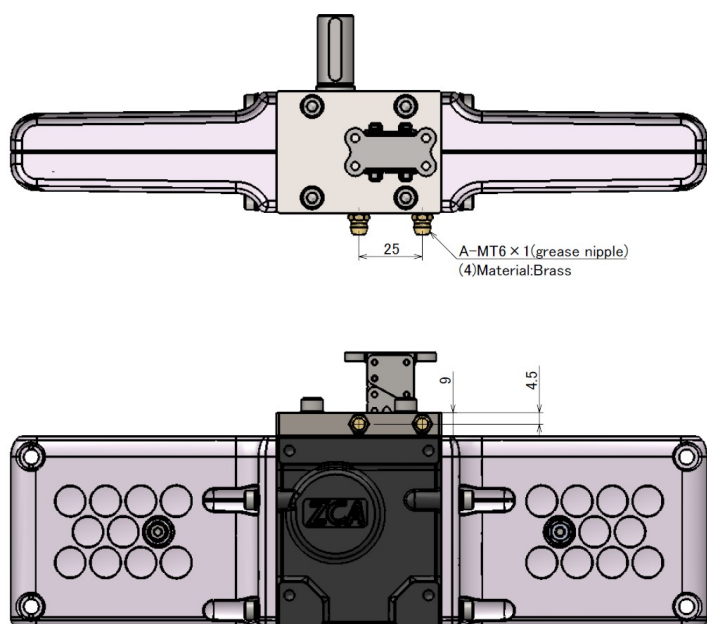


Fig. 25 With grease nipples (ZCA25)

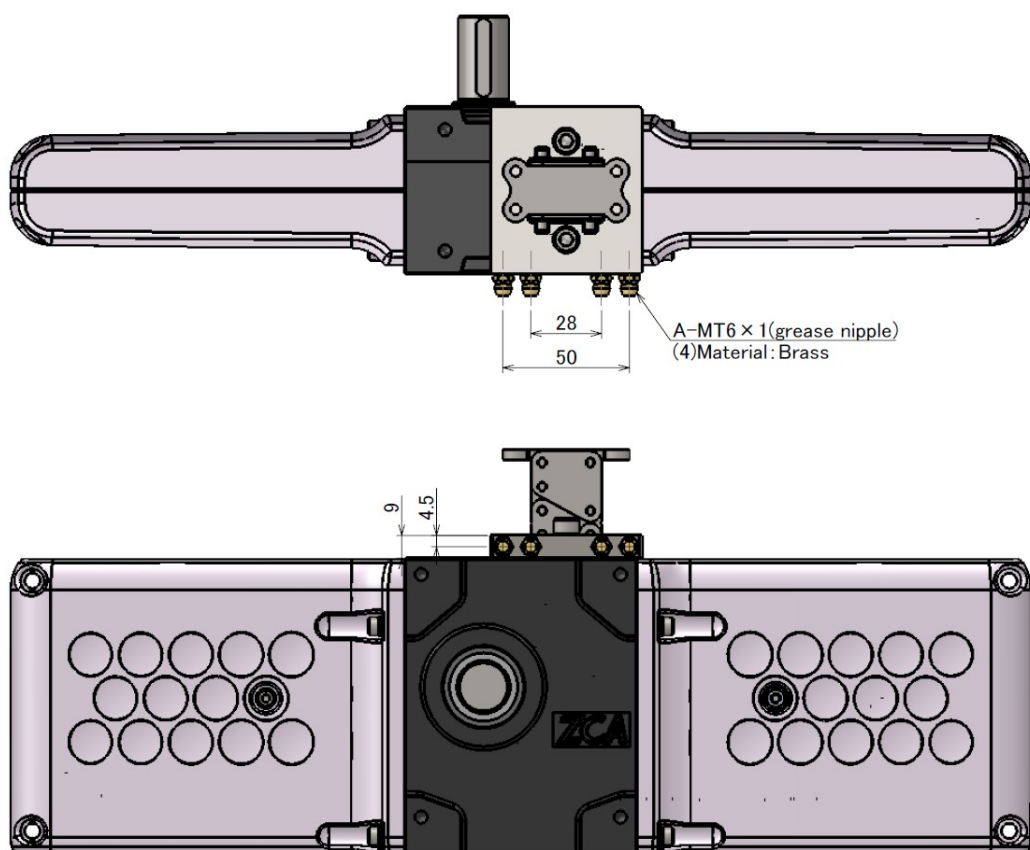


Fig. 26 With grease nipples (ZCA35)

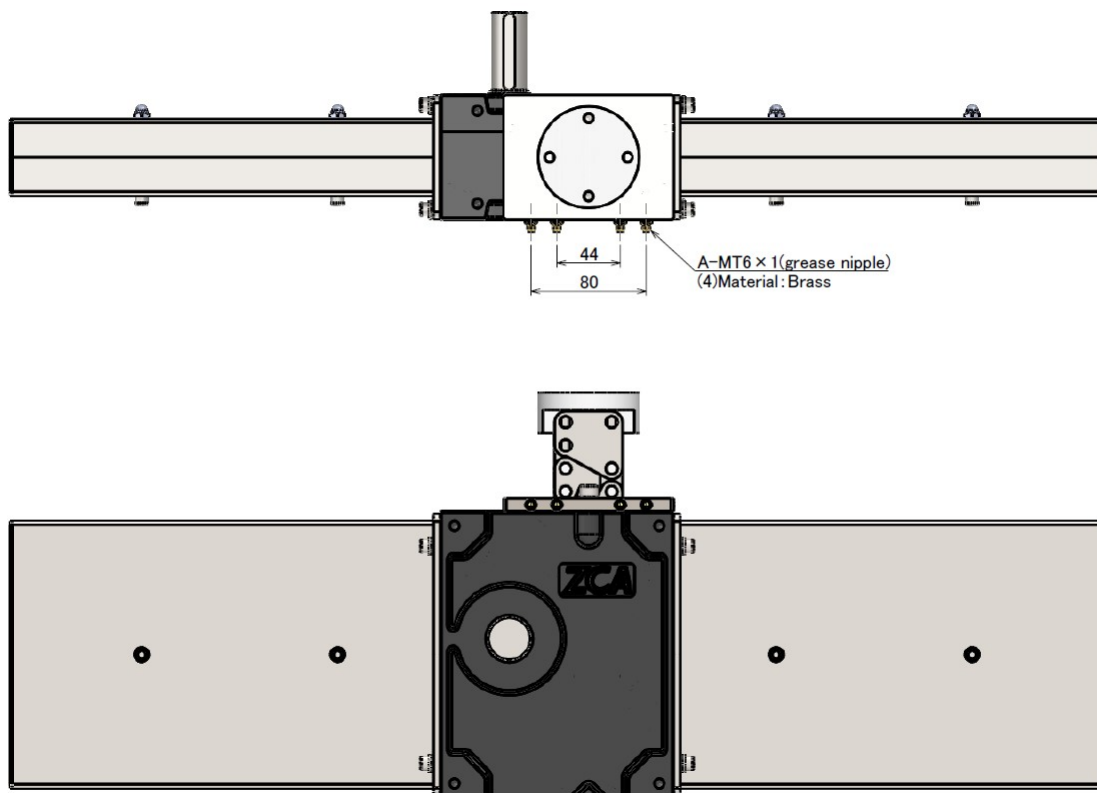
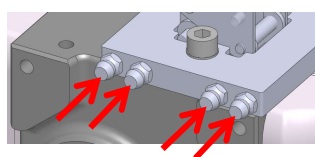


Fig. 27 With grease nipples (ZCA45)



Grease all 4 nipples
*2 nipples for ZCA25

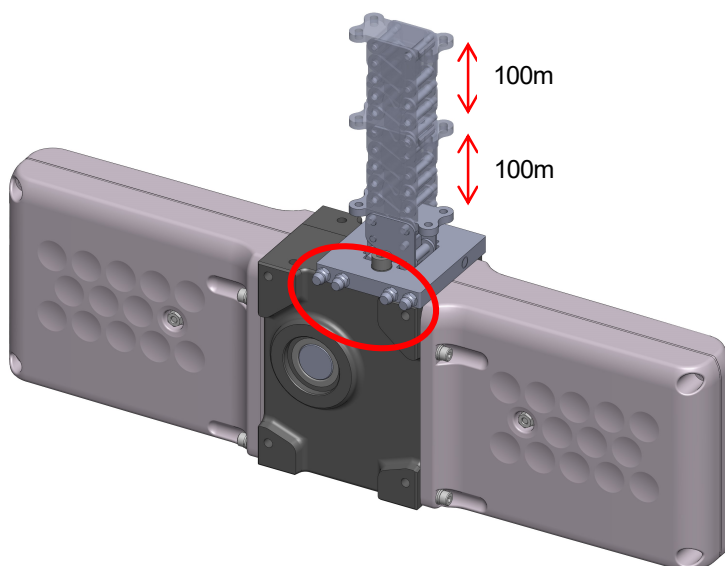


Fig. 28 Greasing method using grease nipples (figure above shows ZCA35)

11. Warranty

1. Free warranty period

18 months effective the date of shipment or 12 months effective the first use of Goods, including installation of Goods to Buyer's equipment – whichever comes first.

2. Free warranty coverage

Should any damage or problems with the Goods arise within the warranty period, given that the Goods were operated and maintained according to the instructions provided in the manual, Seller will repair or replace the defective areas at no charge once the Goods are returned to the Seller. This Warranty is only for the single piece of Tsubaki product, and does not cover the following:

- 1) Any costs related to removal of Goods from the Buyer's equipment for part repair or replacement
- 2) Cost to transport Buyer's equipment or machine to the Buyer's repair shop.
- 3) Costs to reimburse any profit loss due to any repair, damage, or other consequential losses caused to the Buyer.

3. Free warranty exclusions

Seller will charge for any investigation and repair of Goods caused by:

- 1) Improper installation by failing to follow the instruction manual.
- 2) Insufficient maintenance or improper operation by the Buyer.
- 3) Incorrect installation of Goods to other equipment.
- 4) Any modifications or alterations of Goods by the Buyer.
- 5) Any repair by engineers other than the Seller's engineers or those designated by the Seller.
- 6) Operation in an inappropriate environment not specified in the manual.
- 7) Force majeure or forces beyond the Seller's control, such as natural disasters and wrongful conduct by a third party.
- 8) Secondary damage or problems incurred by the Buyer's equipment.
- 9) Defected parts supplied or specified by the Buyer.
- 10) Incorrect wiring or parameter setting by the Buyer.
- 11) The end of life cycle of the Goods under normal usage.
- 12) Loss or damage not liable by the Seller.

4. Engineer dispatch service

Tsubakimoto Chain will also dispatch an engineer to investigate, adjust, or trial test the Seller's Goods at the Buyer's expense. Please contact a Tsubaki representative for more details.

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