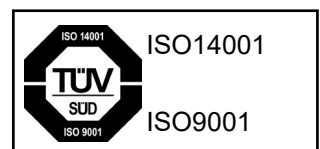


LA Series

Linear Actuator Manual

(DC motor models for Closed-Loop Positioning)

- Thank you very much for your purchasing our LA series linear actuator.
- Be sure to use sufficient safety measures when installing and operating the equipment so as to prevent an accident resulting in a serious physical injury damaged by a malfunction or improper operation.
- Product specifications are subject to change without notice for improvement purposes.
- Keep this manual in a convenient location and refer to it whenever necessary in operating or maintaining the units.
- The end user of the actuator should have a copy of this manual.





SAFETY GUIDE

For linear actuator series/servo driver system



Read this manual thoroughly before designing the application, installation, maintenance or inspection of the actuator.



Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious personal injury.



Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate personal injury and/or damage to the equipment.

LIMITATION OF APPLICATIONS:

The equipment listed in this document may not be used for the applications listed below:

- * Space equipment
- * Aircraft, aeronautic equipment
- * Nuclear equipment
- * Household apparatus
- * Vacuum equipment
- * Automobile, automotive parts
- * Amusement equipment
- * Machine or devices acting directly on the human body
- * Instruments or devices to transport or carry people
- * Apparatus or devices used in special environments
- * Instruments or devices to prevent explosion

Safety measures are essential to prevent accidents resulting in death, injury or damage of the equipment due to malfunction or faulty operation.

NOTICES TO USE AN ACTUATOR

Notices for designing and application: Always read the relating technical documents for the purpose.

- Do not insert your hand, etc. into the operation area of the output rod (output shaft) of the linear actuator.
- High thrust is outputted from the output rod. Inserting your hand into the operation area may cause injury.
- LA series: Maximum thrust of 49N (5kgf)



WARNING

- Use the actuator and motors only in a specified environment.
- Use the actuator and motors with the following indoor conditions:
 - Ambient temperature: 0 to 40°C
 - Ambient humidity: 20% to 80%RH (No condensation)
 - Vibration: 24.5m/S² or less
 - No water or oil drips
 - No corrosive or explosive gas



CAUTION

Install the actuator and motors with the applied equipment precisely following the relating instruction manuals.

- Align the shaft of actuator and motors with the applied equipment precisely following the relating instruction manuals.
- Secure the output rod (output shaft) of the actuator to the paired unit properly according to the technical documents.
- If the alignment is not precise, vibration will occur, resulting in damage to the bearing.



CAUTION

Notices for operation: Always read the relating technical documents for the purpose.

- Do not apply thrust exceeding the actuator's and motor's maximum thrust.
- Using the actuator by exceeding its maximum thrust may cause lower precision or failure.
- LA series: Maximum thrust of 49N (5kgf)



CAUTION

- Do not plug actuators or motors directly to the commercial power supply.
- An actuator or a motor cannot run without paired driver unit.
- Direct connection to the commercial power supply will damage the actuator or motor, and may cause fire.



CAUTION

- Do not hit actuators and motors.
- As an actuator or a motor houses an encoder, do not hit it with a wooden hammer or others.
- When an encoder is fault, the actuator or the motor runs uncontrollably.



CAUTION

- Do not pull lead wires.
- Pulling lead wires will damage wire connections, causing uncontrolled rotation.



CAUTION

- Do not use the output rod for any purposes involving hitting to stop.
- It may cause damage in the actuator driving system, resulting in failure or a shorter life.



CAUTION

- Do not operate the actuator with wet hands.
- It may cause an electric shock.



CAUTION

- Do not touch the main body during operation.
- The output rod generates high thrust. It may run away due to wrong wiring, etc.
- The surface of the actuator may become very hot during operation.



CAUTION

- The output rod has no self-holding function.
- It cannot hold the load in case of alarm stop or power shutdown. Provide an external function to avoid danger.



CAUTION

- Do not repair, disassemble, or modify it.
- It may cause an electric shock, injury, or fire. Also, the initial performance may not be reproduced.



CAUTION

NOTICES TO USE A DRIVER UNIT

Notices for designing and application: Always read the relating technical documents for the purpose.

 CAUTION Always use the driver unit in the specified environment. ● The control unit is for indoor use only. Observe the following conditions: - Install it with vertical orientation having enough space from other devices. - 0 to 40°C, 95%RH or less (No condensation) - No vibration, no shock - No water or oil drips - No corrosive gas, no explosive gas, no dust, or no powder.	 CAUTION Make sufficient noise suppression and grounding. ● Electric noise on a signal wire may cause result in unit malfunction or unexpected occurrence of troubles. Keep the following conditions: - Separate signal wires from power lines. - Make electric wires short as much as possible. - Actuators and control units should be grounded at one single point having grounding resistance class 3 or more. - Do not use a power line filter into motor circuit.
---	---

Notices for operation: Always read the relating technical documents for the purpose.

 WARNING Do not change wiring whenever power supply is active. ● Turn power OFF at first, then disconnect or connect connectors or wires. Getting an electric shock or abnormal damage may occur by changing wire during power active.	 WARNING Do not touch a terminal after at least five minutes from power-OFF. ● Even after power-OFF, electric charge remains in the control unit. To avoid an electric-shock-accident, inspection must start after five minutes from power-OFF. ● The control unit should be housed in a cabinet box designed not to touch electric parts easily/
 CAUTION Do not make a withstanding voltage test. ● Do not make a withstand test or a voltage resistance test. The test causes damage to the control unit. ● For this type of use, consult with us.	 CAUTION Do not operate a control unit by means of power ON/OFF operation. ● The frequent power ON/OFF operation may cause deterioration of the electric elements. ● Start/stop operation should be performed by means of input signals.
 CAUTION In case of power failure, turn off the power of the control unit and driver. ● Failure to do so may cause injury or damage to the device due to sudden restart.	 CAUTION Do not touch the actuator with wet hands. ● It may cause an electric shock.
 CAUTION Do not repair, disassemble, or modify it. ● It may cause an electric shock, injury, or fire. Also, the initial performance may not be reproduced.	

Abandonment of an actuator and servo driver:

 CAUTION Abandon an actuator and motor as industrial waste. ● Upon disposal, disassemble it as much as possible, separate parts with indicated materials according to the markings, and dispose of them as industrial waste.
--

Contents

Chapter 1	Outlines of the LA series	1
1-1	Features	1
1-2	Ordering information	1
1-3	External view	2
1-4	Specifications	3
1-4-1	Actuator specifications	3
1-4-2	Encoder specifications	4
1-5	Accuracy	5
1-6	Testing system and standards for testing	5
1-6-1	Testing system	5
1-6-2	Standard for testing	6
1-7	Allowable loads	8
Chapter 2	Notices at system design and on usage	9
2-1	Environment	9
2-2	Fundamental notices on usage	9
2-3	Actuator installation	9
2-4	Load direction	10
2-5	Stroke limits	10
Chapter 3	Connections	12
3-1	Motor connection and moving direction	12
3-2	Color of encoder leads	12
3-3	Treatment of encoder leads	12
3-4	Motor lead extension	12
3-5	Encoder lead extension	13
Chapter 4	Control unit	16
Chapter 5	Trial operation	18
5-1	Relationship between input signal and actuator rod	18
Chapter 6	Storing	19
6-1	Storing place	19
6-2	Anti-corrosion	19
6-3	Storing posture	19

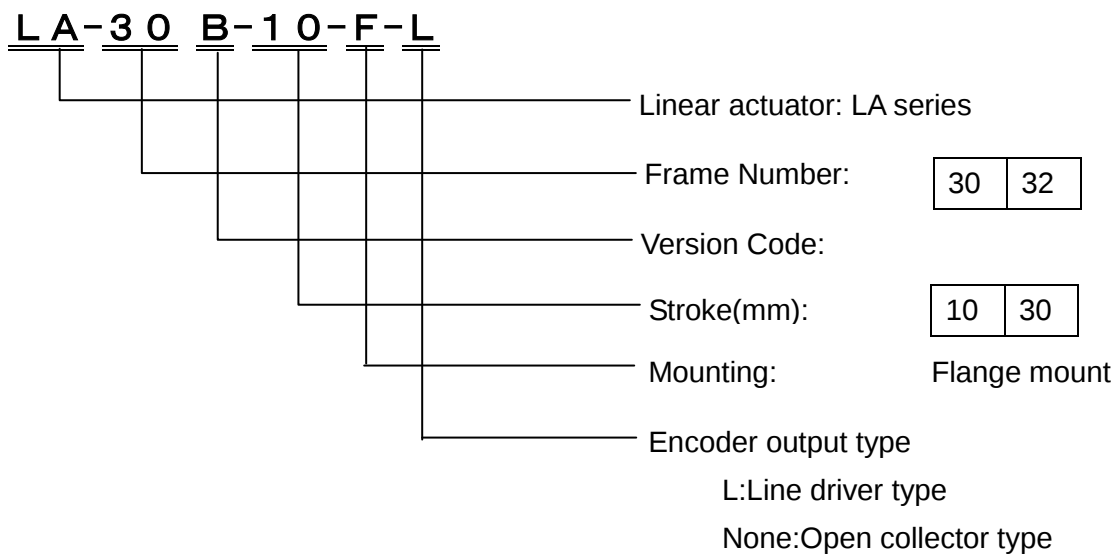
Chapter 1 Overview of the LA series

The LA series actuators (DC motor model) are linear actuators incorporating a precise ball screw, a DC motor for closed-loop positioning, and a Harmonic drive® component having small size, high precision, and no backlash. With a dedicated control unit, the actuators offer remarkable preciseness in positioning and the smoothest motion from top speed to extremely low speed responding to input signals.

1-1 Features

- ◆ Ultra-high positioning accuracy in sub-micron-meter-meter order
- ◆ High repeatability in positioning
- ◆ High thrust, small size
- ◆ Closed-loop positioning
- ◆ Low vibration, No skip step, Low heat radiation
- ◆ Long travel

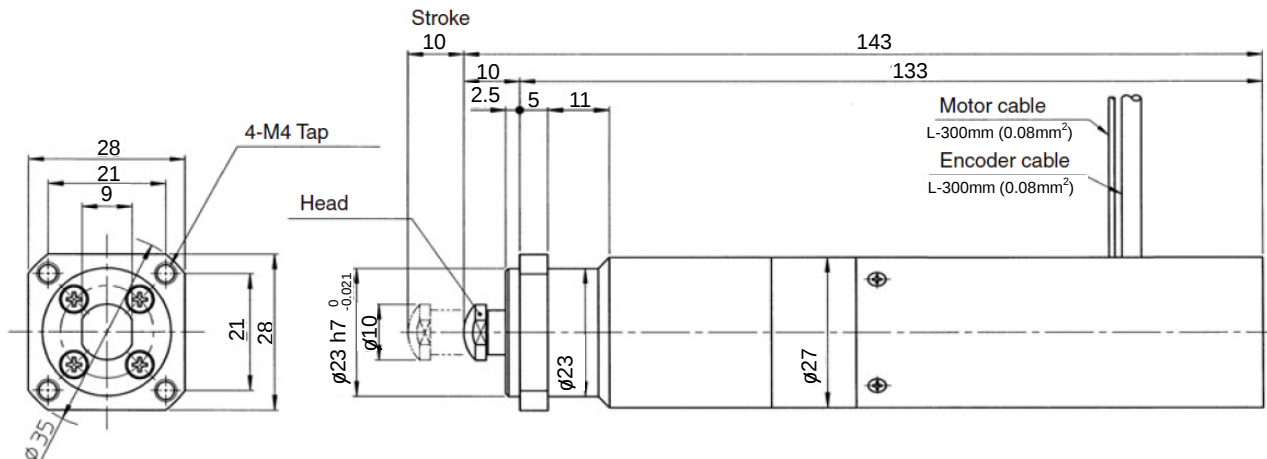
1-2 Ordering information



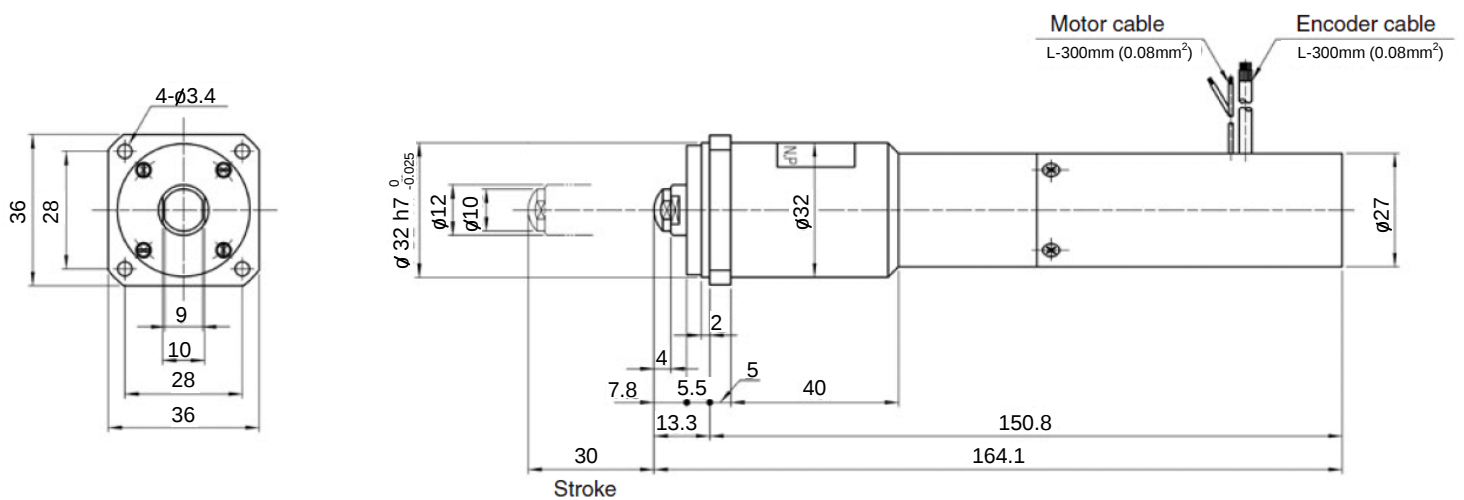
1-3 External view

■ LA-30B-10-F

Unit:mm



■ LA-32-30-F



1-4 Specifications

1-4-1 Actuator specifications

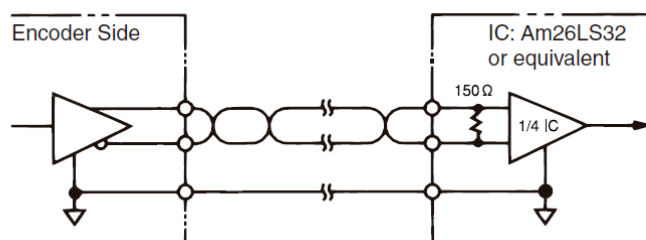
Specifications \ Models		LA-30B-10-F	LA-32-30-F
Resolution per encoder pulse		0.0174 μ m	
Stroke		10 mm	30mm
Rated speed		0.5 mm/sec	
Maximum speed		0.9 mm/sec	
Maximum load capacity		49N(5 kgf)	
Motor	Model	MDC02-1C22	
	Rated voltage	DC 12V	
	Rated current	0.5 A	
	Excitation	Permanent Magnet	
	Insulation class	B class	
	Withstand voltage	AC 500V, 1 minute	
	Insulation resistance	100M Ω or more (by DC500V insulation tester)	
	Enclosure	Totally Enclosed	
Reduction device		Harmonic drive, Ratio: 1/80	
Linear motion mechanism		Ball screw, ϕ 4 lead: 0.5mm	M5 Lead screw, lead: 0.5mm
Ambient temperature		10°C to 25°C	
Lubrication		Grease	
Storage temperature		-20°C to +50°C	
Mass		320g	550g

※Dc servomotor needs brush replacing.

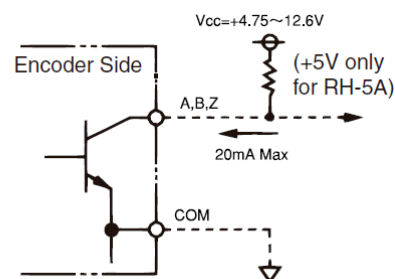
1-4-2 Encoder specifications

Signal output	Open collector	Line driver
Resolution	360 pulses/rev	
Output channel	3 channels (A, B, Z)	
Power supply	DC5V, $\pm 5\%$, 60mA Max	DC5V, $\pm 5\%$, 170mA Max
Output level	$V_{OL} \leq 0.5V$	
Output current	$I_{OL} \leq 20mA$	
Signal power supply	$+5V \leq V_{CC} \leq +15V$	—
Allowable signal voltage	36VDC Max	—
Signal rise time	1 μ S Max. ($R_L=1k\Omega$)	0.1 μ S Max. ($R_L=1k\Omega$)
Signal fall time	1 μ S Max. ($R_L=1k\Omega$)	0.1 μ S Max. ($R_L=1k\Omega$)
Max. response frequency	100kHz	
Light source	LED	

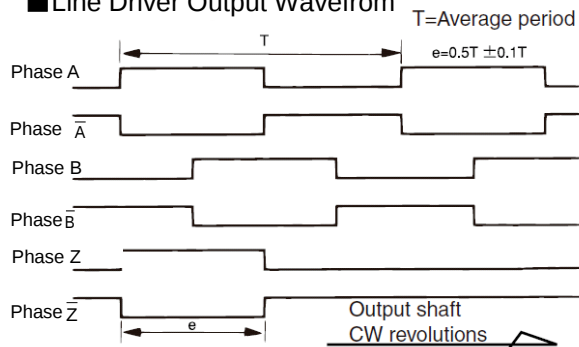
Line Driver Output Circuit



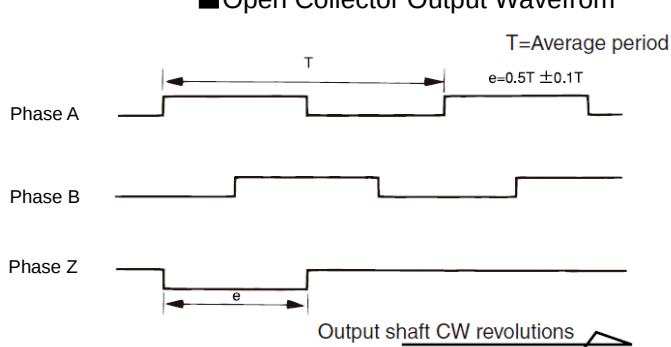
Open Collector Output Circuit



Line Driver Output Waveform



Open Collector Output Waveform



Colors of Encoder Cables

Cable Color	Line Drive	Open Collector
Brown	PhaseA	PhaseA
Blue	Phase $\bar{A}$	—
Red	PhaseB	PhaseB
Green	Phase $\bar{B}$	—
Yellow	PhaseZ	PhaseZ
Orenge	Phase $\bar{Z}$	—
White	Power Supply	Power Supply
Black	Ground(COM)	Ground(COM)
Shield	Floating	Floating

1-5 Accuracy

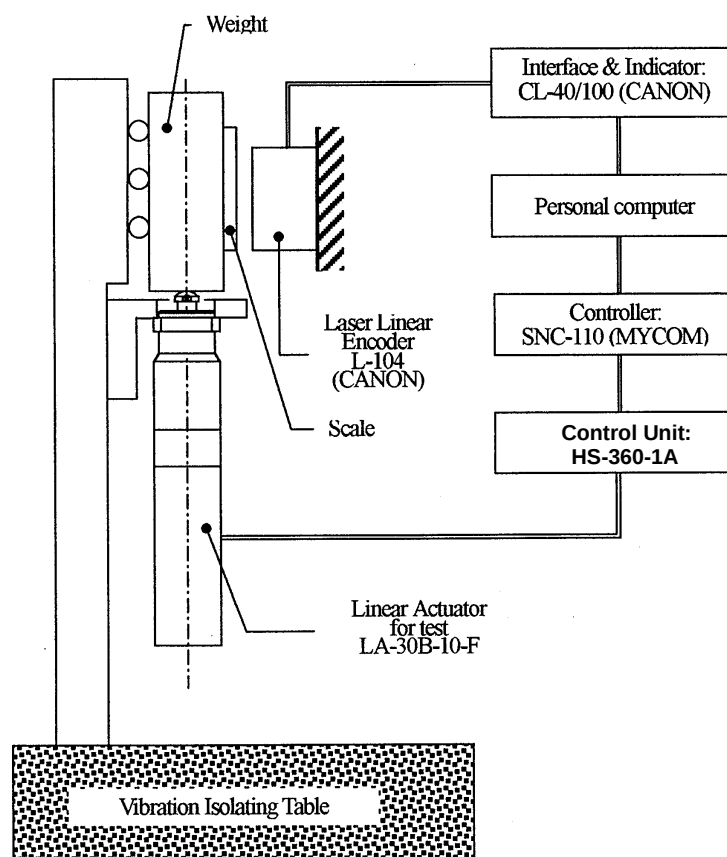
Items	Stroke	Accuracy	Pay Load
Repetitive accuracy	1 mm	$\pm 0.1\mu\text{m}$ or less	9.8~49N (1~5kgf)
Full stroke positioning accuracy	Full stroke	10 μm or less for 10mm travel	
Short stroke positioning accuracy	Stroke:40 μm 0.4 μm pitch	2 μm or less for 40 μm travel	
Lost motion	1 mm	5 μm or less	

Note: Measuring temperature: 20°C $\pm$ 1°C

1-6 Testing system and standards for testing

1-6-1 Testing system

The LA series linear actuators are guaranteed with the following tests under JIS B6201 standard using our original measuring system.



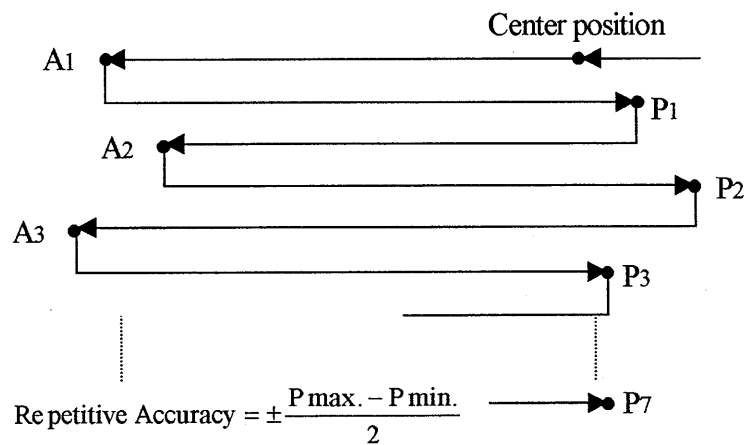
Main instruments:

Laser Linear encoder:	CANON	L-104
	Resolution:	0.01 μm
	Repeatability:	0.01 μm or less
Interface and Indicator:	CANON	CL-40
Control unit:	Harmonic drive®	HA-360-1A
Controller	MYCOM Co.	SCN-110
Personal Computer		

1-6-2 Standard for testing

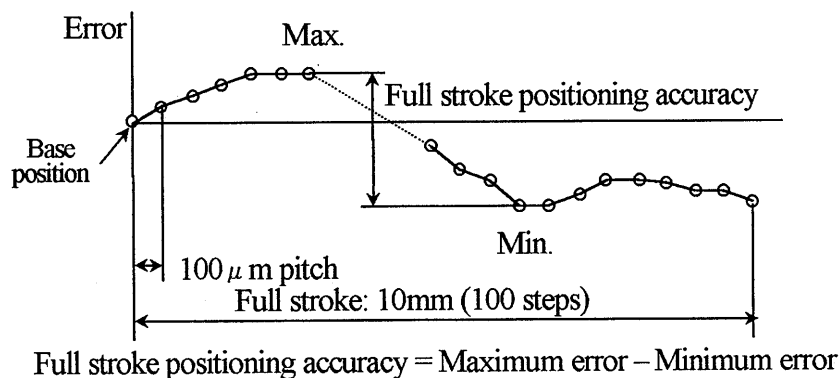
(1) Repetitive positioning accuracy

- Actuator rod moves toward pushing direction until the stroke center.
- The rod moves 1mm toward pushing direction. The position is named [A₁].
- The rod draws 1mm toward pulling direction, and the position is measured. The position is named [P₁].
- The rod moves 1mm toward pushing direction [A₂]. Then it draws 1mm toward pulling direction, and the position is measured. The position is named [P₂].
- Above push-pull motion is repeated seven times in total. Then seven positions [P₁, P₂, ..., P₇] are measured. The repetitive accuracy is obtained as a half of difference from the maximum measured value to the minimum value.



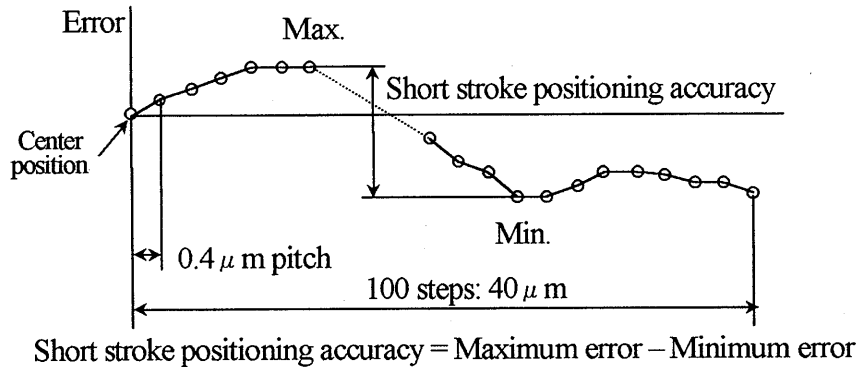
(2) Full stroke positioning accuracy

- Actuator rod moves 5.3mm distance toward pulling direction from the stroke center. Then it moves 0.3mm toward pushing direction. The position is assigned to "Base position".
- From the base position, the rod moves 10mm toward pushing direction by 100μm pitch measuring every position.
- Position errors are calculated for every position by subtracting the actual position value from its ideal value. The full stroke positioning accuracy is obtained as the difference of the maximum error and the minimum error.



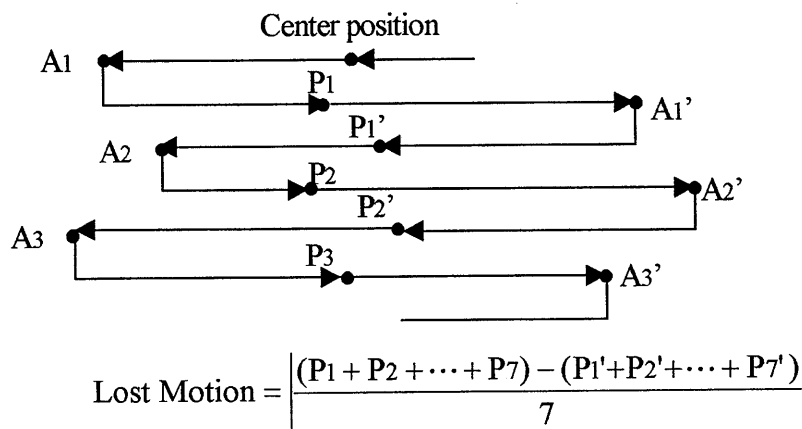
(3) Short stroke positioning accuracy

- A. Actuator rod moves toward pushing direction until the stroke center. The position is assigned to "Base position".
 - B. Form the base position, the rod moves pushing direction 100 steps by $0.4\mu\text{m}$ pitch measuring every position. (Total measuring range is $40\mu\text{m}$.)
 - C. Position errors are calculated for every position by subtracting the actual position value from its ideal value.
- The full stroke positioning accuracy is obtained as the difference of the maximum error and the minimum error.



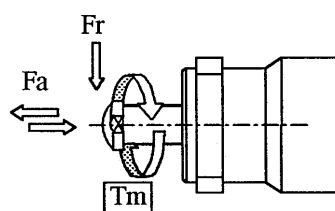
(4) Lost motion

- A. Actuator rod moves toward pushing direction until the stroke center. The position is named $[A_0]$.
- B. Form $[A_0]$, the rod moves 1mm toward pushing direction. The position is named $[A_1]$.
- C. The rod draws 1mm toward pulling direction, and the position is measured. The position is named $[P_1]$.
- D. The rod draws 1mm toward pulling direction $[A_1']$ in succession.
- E. Then it moves 1mm toward pushing direction, and the position is measured. The position is named $[P_1']$.
- F. Above push-pull motion is repeated seven times in total. Then seven pairs of positions ($P_1, P_1', P_2, P_2', \dots, P_7, P_7'$) are measured. The lost motion is obtained as the difference between the average of $[P_1, P_2, \dots, P_7]$ and $[P_1', P_2', \dots, P_7']$.



1-7 Allowable loads

Allowable loads to the output rod are as follows:



Load	Allowance
Fa: Axial Load	49N (5kgf) or less
Fr: Side Load	Inhibited
Tm: Rotary Torque	5kgf·cm (0.49N·m) or less

Chapter 2 Notices at system design and on usage

2-1 Environment

Install and use the actuators in the environment as follows:

- Indoor
- Ambient temperature: +10~+25°C, The temperature fluctuation is recommended to be within $\pm 1^{\circ}\text{C}$ to obtain the best positioning accuracy.
- Ambient humidity: 35~80% RH (Non-condensation)
- Vibration: Less than 2G (19.6 m/s^2) (No vibration is recommended, fundamentally)
- No water or oil drip
- No corrosive gas, no explosive gas, no dust, no powder

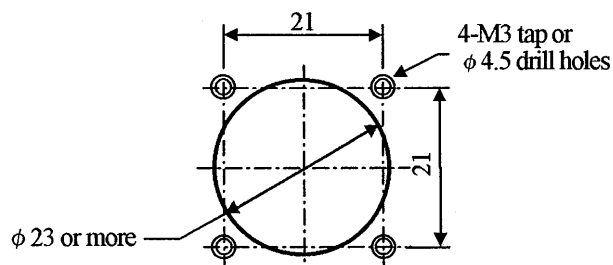
2-2 Fundamental notices on usage

Do not loose any screws of the actuator, nor disassemble the actuator. Loosening and disassembling may cause a malfunction, poor accurate positioning, short life, and abnormal noise of the actuator.

2-3 Actuator installation

No limitation on install direction. However, pay attention to holding force when the actuator is installed vertically. The following drawing is machining dimensions for the attachment.

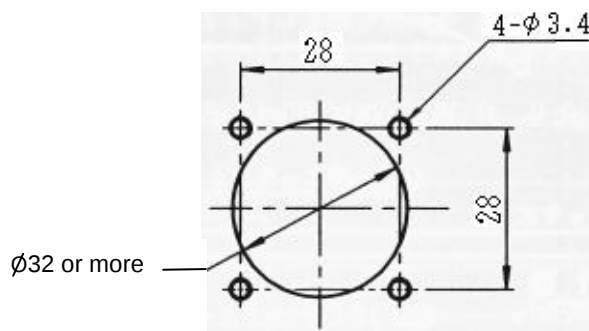
■ LA-30B-10-F



The actuator flange provides four M4 tapped holes, which are available to use for M3 screws.

Install the actuator firmly using M3 or M4 screws.

■ LA-32-30-F



The flange for mounting the LA-32-30-F has four through holes 3.4mm in diameter drilled in it. Tap M3 on the mating side and securely fasten the flange using four M3 screws.

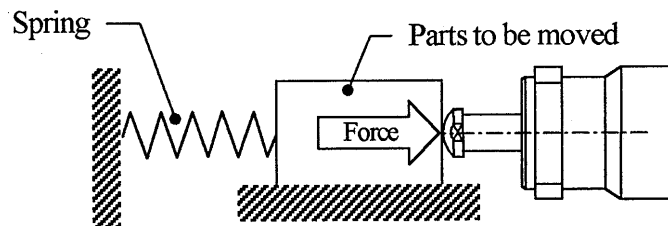
2-4 Load direction

The load direction to the output rod should be one way of pushing direction. In order to move a parts toward pulling direction, force of 1 kgf (9.8N) to 3 kgf (29N) by means of a spring or a pneumatic cylinder should be applied to the rod end.

To get high positioning accuracy, pre-load of 1 kgf (9.8N) to 3 kgf (49N) should also be applied to the rod end, because of no pre-load mechanism in the actuators.

A hemisphere shaped screw is attached on the rod end. Do not apply force from the direction other than pushing one for keeping high mechanical characteristics such as positioning accuracy.

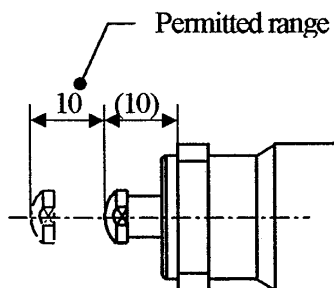
The hardness of the part to attach the actuator load should be $H_{RC} 55 \sim 65$.



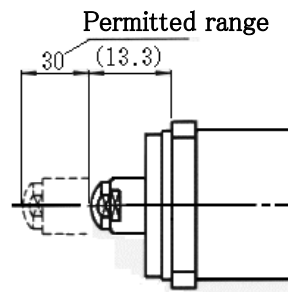
2-5 Stroke limits

Do not move actuator rod exceeding the stroke limit shown below. Otherwise, performance of the actuator may be worse, and life may be shorten. Three indication lines are marked on the rod side face.

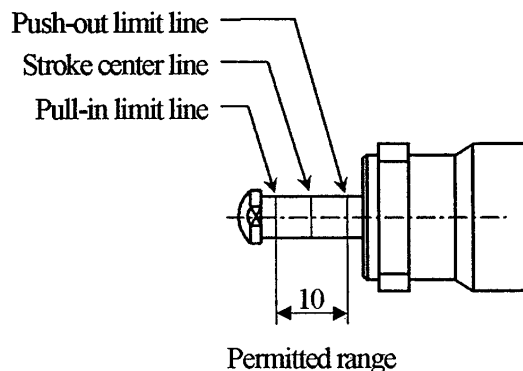
■ LA-30B-10-F



■ LA-32-30-F

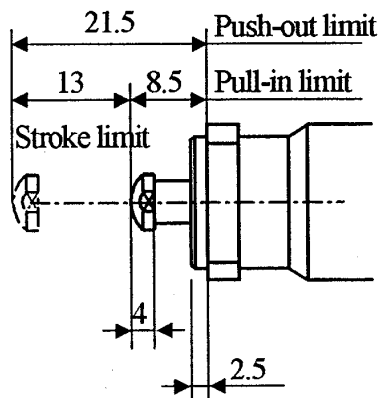


■ LA-30B-10-F

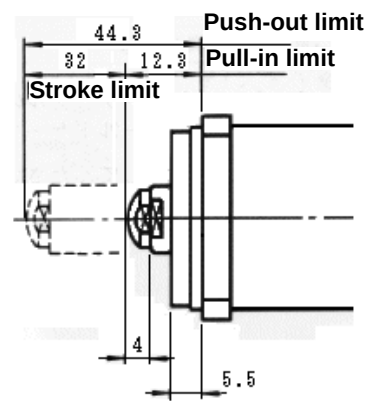


The linear actuators do not house a stroke-end limit switch or a sensor. If the rod moves beyond one of the end limit lines, the overrunning motion may cause poor positioning accuracy, shorter life or mechanical damage. Users should install stroke-end limit switches or sensors on the driven mechanism to stop motor rotation. The figure below shows the motion limits without any margine.

■ LA-30B-10-F



■ LA-32-30-F



Do not make the system of dead-end-stroke even in the permitted range of the rod, because it may cause poor positioning accuracy, shorter life or mechanical damage the actuator.

Chapter 3 Connections

3-1 Motor connection and moving direction

The rod moves toward pushing direction when power supply (+) to white motor lead, and (-) to black motor lead.

3-2 Color of encoder leads

Cable Color	Line Drive	Open Collector
Brown	PhaseA	PhaseA
Blue	Phase $\bar{A}$	—
Red	PhaseB	PhaseB
Green	Phase $\bar{B}$	—
Yellow	PhaseZ	PhaseZ
Orenge	Phase $\bar{Z}$	—
White	Power Supply	Power Supply
Black	Ground(COM)	Ground(COM)
Shield	Floating	Floating

Notice: Do not measure resistance of encoder circuitry. Measuring may cause encoder failure.

3-3 Treatment of encoder leads

Do not apply tensile force of more than 0.5kg to an encoder lead and a motor lead.

Slacken off encoder leads for their installation. Do not bend an encoder lead less than 40mm of curvature radius.

3-4 Motor lead extension

Use cable of 0.8mm² or thicker for extension.

To avoid noise influence to surrounding circuitry, use shielded cable.

3-5 Encoder lead extension

Twist shielded cable is recommended for extension encoder cable. When the extension cable length is shorter than 2m, shield cable is possible to use.

Total length of the extension cable should be less than 10m. The length is near to 10m, check the followings:

- ① Check the supplied voltage at the extension cable end of encoder side whether it is more than rated value.
- ② Check the signal pulse form at the extension cable end of encoder side whether the rise-form delays by the influence of stray capacitance of the long cable.

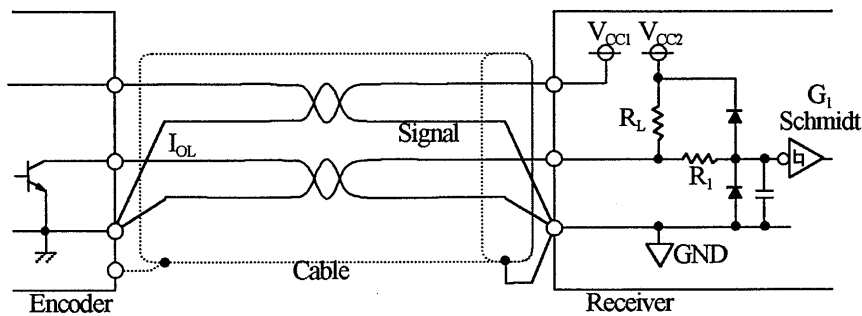
Contact us when the cable length exceeds 10m.

Do not use a single cable for motor power leads and encoder leads. Take care not to be affected by noise from signal lines for other equipment, if the lines use same extension cable for the encoder.

Take care that an interface circuit for the encoder is not affected by noise. The followings show typical interface circuit for long extension encoder cable.

■ Direct inputting to C-MOS gate

This is useful when the extension is relatively short (a few meter) and noise circumstance is good.



- (1) Set the pull-up resistance (R_L) with the following equation so that I_{OL} is 5~20mA.

$$I_{OL} = \frac{V_{CC2}}{R_L} \quad (A)$$

- (2) Set the filter constant (R_1, C_1) so that the cut-off frequency (f_c) is more than 2.8 times of the maximum signal pulse frequency.

$$f_c = \frac{1}{2\pi \times C_1 \times R_1} \quad (Hz)$$

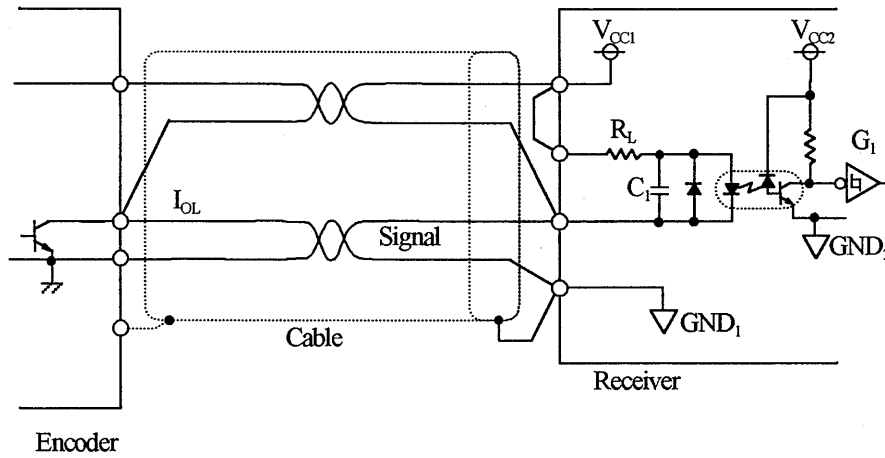
$$C_1 \leq 1000$$

- (3) Shield line should be connected to μF receiver ground (GND) or metal flange.

- (4) If noise circumstance is good, usual shield cable may be usable. However, twist shield cable is recommended.

■ Connection through opto-isolator

This is useful when the extension distance is less than 10m.



(1) Opto-Isolator: TLP550 (Maximum: around 50kHz) for an example

(2) Set the pull-up resistance (R_L) with the following equation so that I_{OL} is 10~20mA.

$$I_{OL} = \frac{V_{CC1} - V_F}{R_L} \quad (A)$$

V_F : Input forward voltage for photo isolator (approximately 1V to 1.6V)

(3) Set the filter constant (R_1 , C_1) so that the cut-off frequency (f_c) is more than 2.8 times of the maximum signal pulse frequency.

$$f_c = \frac{1}{2\pi \times C_1 \times R_L} \quad (Hz)$$

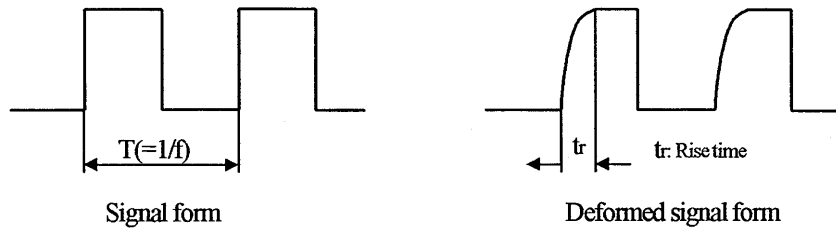
$$C_1 \leq 1000$$

(4) Shield line should be connected to pF receiver ground (GND₁) or metal frame.

(5) If noise circumstance is good, usual shield cable may be usable. However, twist shield cable is recommended.

■ Influence of cable stray capacitance to signal wave form

Cable stray capacitance deforms and delays signal wave form as shown in the figure below.



When “ t_r ” is longer than “ $T/8$ ” ($t_r \geq T/8$), signal transmission problem may occur. The limit length of the cable is obtained from the equation below.

$$n = \frac{1}{18.4 \times C_s \times R_L \times f} \quad (\text{m})$$

Where:

n : Limit cable length (m)

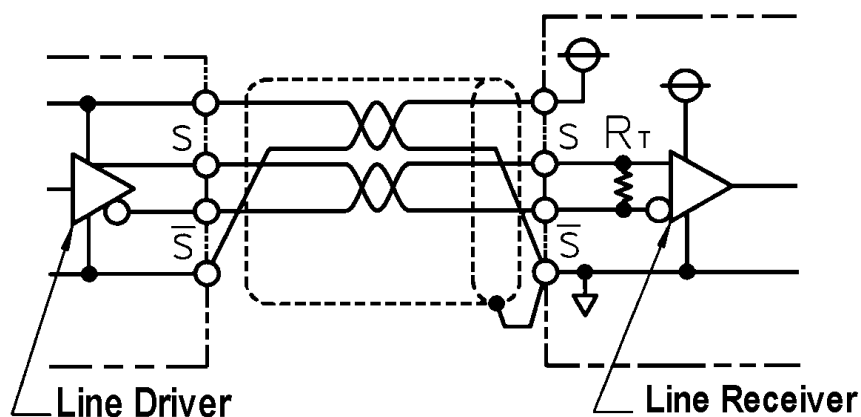
C_s : Stray capacitance of cable (F/m)

R_L : Load resistance (or pull-up resistance) (Ω)

f : Encoder frequency (pps)

For safety, half length of the value obtained from above equation is recommended for the limit. When the actual length for the cable is longer than the half, make C_s and R_L small, or use line driver/receiver system. (Contact us regarding the system.)

● Inputting to Line Driver



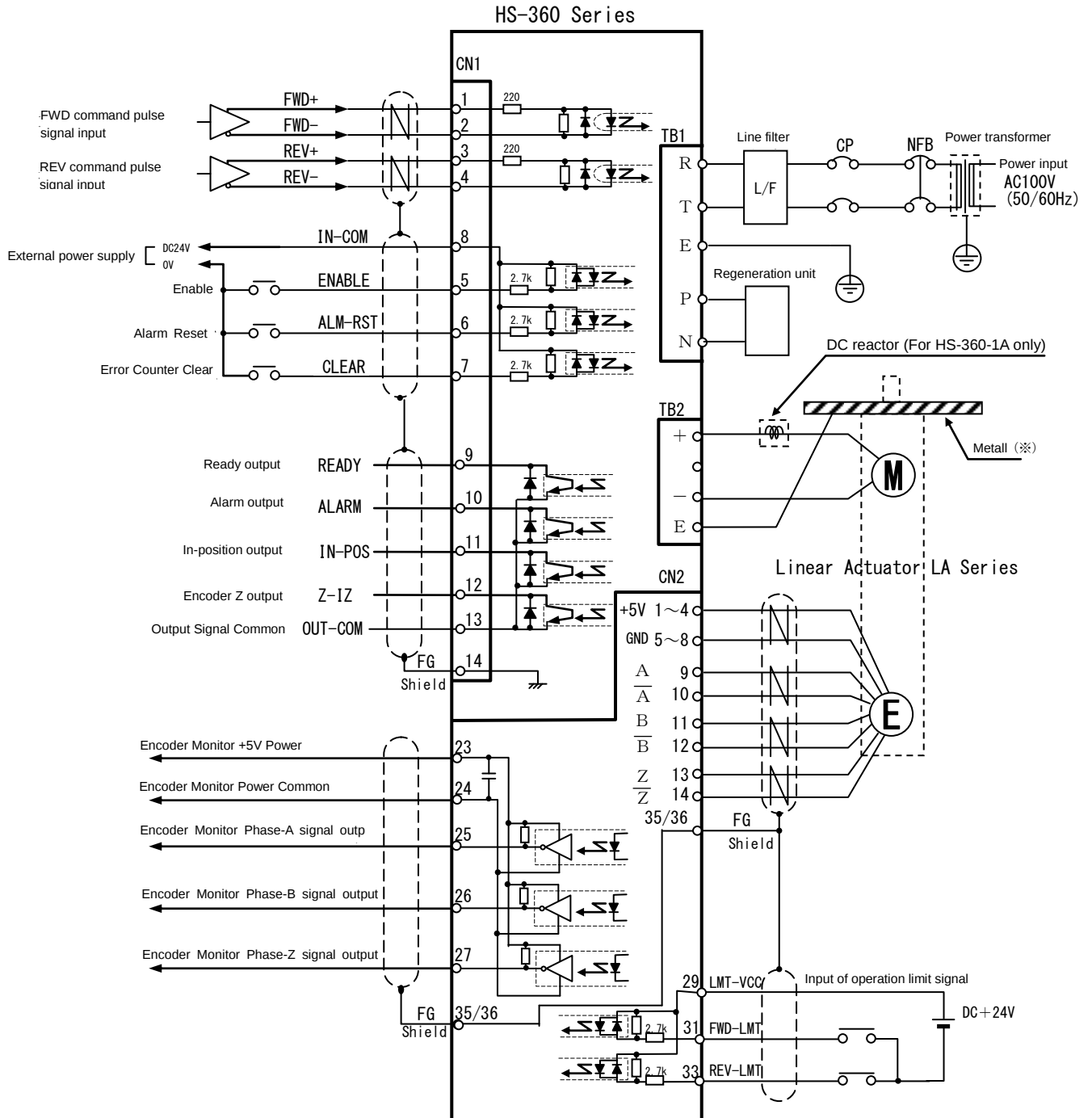
- Suitable where the transmission distance is long and noise environment is poor.
- Line driver: AM26LS31
- A terminating resistor of the R_T transmission line and 150 to 300 Ω is normally specified.
- Line receiver: Conforms to RS422

Note: The examples illustrated above are general examples. Circuit design and selection of constants matching

operating conditions are needed when equipment is designed. Contact HarmonicDrive if you have a question.

Chapter 4 Control unit

- ◆ The following is an external connection example where the pulse output configuration is a line driver.
- ◆ The command configuration is 2-pulse train.

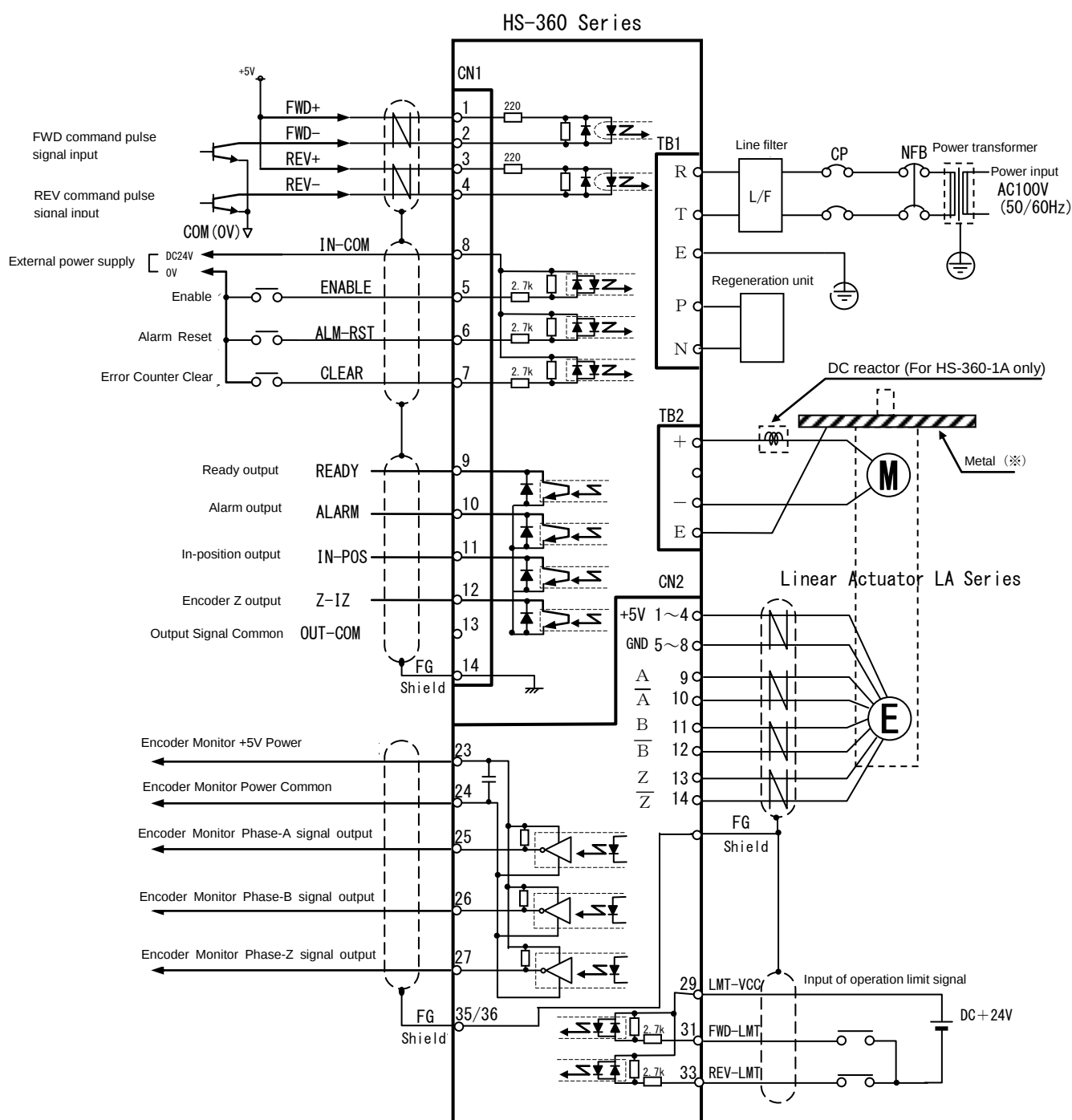


Note: GND (CASE) terminal is connected to inside of the frame.

※ : Be certain to connect the mounting part of the actuator and “E” of TB2 by wire. An encoder error (Alarm 02) may result if wire is not installed.

Request the technical document of the control unit to us.

- ◆ The following is an external connection example where the pulse output configuration is open collector.
- ◆ The command configuration is 2-pulse train.



Note: GND (CASE) terminal is connected to inside of the frame

※ : Be certain to connect the mounting part of the actuator and “E” of TB2 by wire.
An encoder error (Alarm 02) may result if wire is not installed.

Request the technical document of the control unit to us.

Chapter 5 Trial operation

Make trial operation, without load if possible, following to confirmations below.

■ Before trial operation

- (1) Check the actuator installation tightly.
- (2) Check the wiring for the motor, the encoder and limit switches correctly.
- (3) No obstacles interfering with the rod motion.

■ During trial operation

- (1) Check any abnormal vibrations.
- (2) Check any abnormal noises.
- (3) Is motor temperature rise normal?
- (4) Is rod movement smooth?

5-1 Relationship between input signal and actuator rod

■ The relationship between displacement and input signal pulse is given by the following equation.

$$\text{Rod Displacement (mm)} = \frac{\text{Input Signal Pulse (pulse)}}{57600}$$

Do not move the rod beyond a motion limit.

■ Rod speed is given by the following equation:

$$\text{Rod Speed (mm/sec)} = \frac{\text{Input Signal Pulse Speed (pps)}}{57600}$$

Do not exceed the rod speed more than 0.9 mm/sec

Chapter 6 Storing

6-1 Storing place

- No dust, no powder, no water or oil drop
- No corrosive gas, no liquid
- Ambient temperature: -20°C to +50°C
- Ambient humidity: 10%RH to 80%RH (No water condensation)

6-1 Anti-corrosion

- Move the output rod several times in the range of full-stroke supplying power in every three months, because of anti-corrosion for sliding portions and motor brushes.
- Seal up the actuator with a desiccant in a plastic bag

6-2 Storing posture

Store the actuator with horizontal portion or vertical portion of the rod being upside.

Warranty Period and Terms

The LA series are warranted as follows:

■ Warranty period

Under the condition that the actuator are handled, used and maintained properly followed each item of the documents and the manuals, all the LA series are warranted against defects in workmanship and materials for the shorter period of either one year after delivery or 2,000 hours of operation time.

■ Warranty terms

All the LA series are warranted against defects in workmanship and materials for the warranted period. This limited warranty does not apply to any product that has been subject to:

- (1) user's misapplication, improper installation, inadequate maintenance, or misuse.
- (2) disassembling, modification or repair by others than Harmonic Drive Systems, Inc.
- (3) imperfection caused by the other than the LA series.
- (4) disaster or others that does not belong to the responsibility of Harmonic Drive Systems, Inc.

Our liability shall be limited exclusively to repairing or replacing the product only found by Harmonic Drive Systems, Inc. to be defective. Harmonic Drive Systems, Inc. shall not be liable for consequential damages of other equipment caused by the defective products, and shall not be liable for the incidental and consequential expenses and the labor costs for detaching and installing to the driven equipment.



Registered Trademark in Japan

Certified to ISO14001/ISO9001 (TÜV Management Service GmbH)
 All specifications and dimensions in this manual subject to change without notice.
 This manual is correct as of July 2021.

<https://www.hds.co.jp/>

	Head Office :	Ichigo Omori Building, 6-25-3 Minami-Ohi, Shinagawa-ku, Tokyo, Japan
	〒140-0013	TEL+81(0)3-5471-7800 FAX+81(0)3-5471-7811
	Overseas Division :	5103-1 Hotakaariake Azumino-shi Nagano, Japan
	〒399-8301	TEL+81(0)263-81-5950 FAX+81(0) 263-50-5010
	HOTAKA Plant :	1856-1 Hotakamaki Azumino-shi Nagano, Japan
	〒399-8305	TEL+81(0)263-83-6800 FAX+81(0)263-83-6901
	Harmonic Drive SE :	Hoenbergstrasse 14 D-65555 Limburg a.d. Lahn, Germany
		TEL+49-6431-5008-0 FAX+49-6431-5008-119
	Harmonic Drive L.L.C. :	42 Dunham Ridge, Beverly, Massachusetts 01915, U.S.A.
		TEL+1- 978-532-1800 FAX+1- 978-532-9406