



# Linear Motor Actuator

## GLM20AP



For details, visit THK at [www.thk.com](http://www.thk.com)

\*Product information is updated regularly on the THK website.

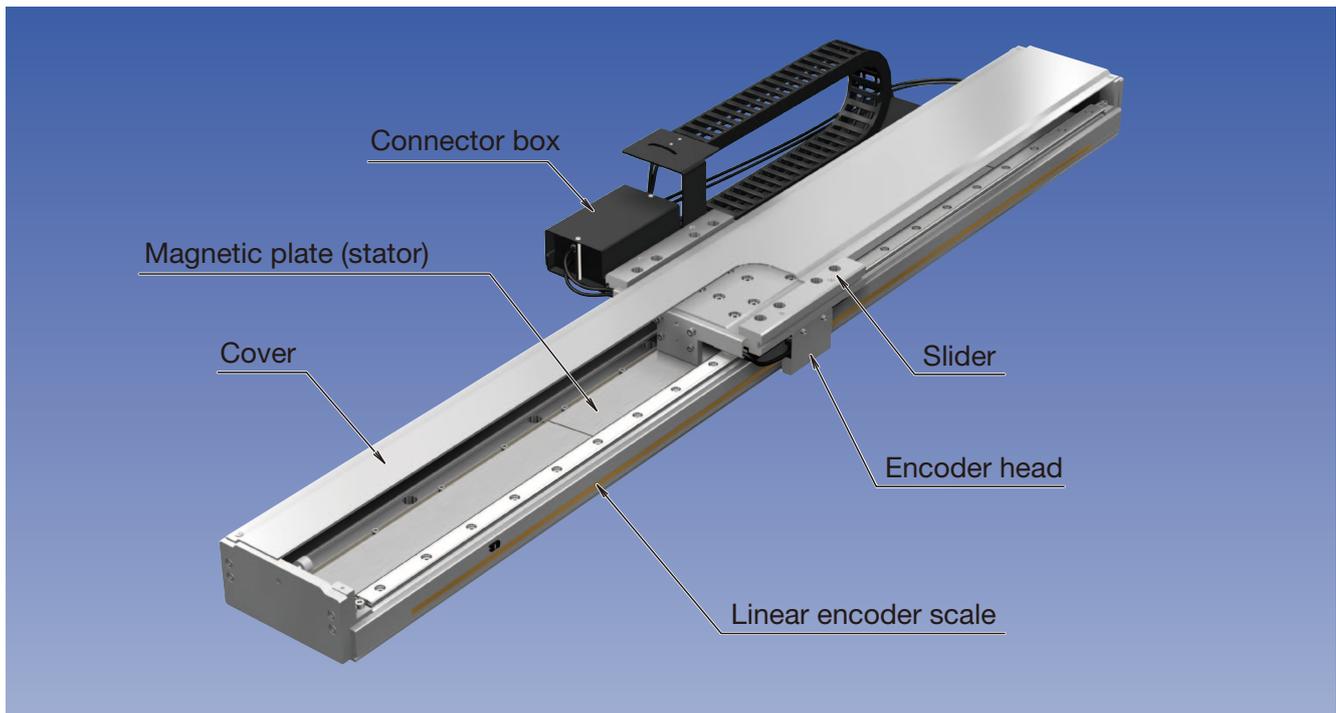
**THK CO., LTD.**  
TOKYO, JAPAN

CATALOG No.363-4E

## High Thrust Linear Motor

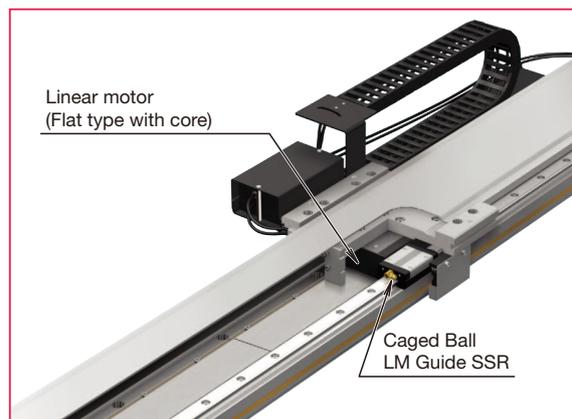
# GLM

Flat type with core

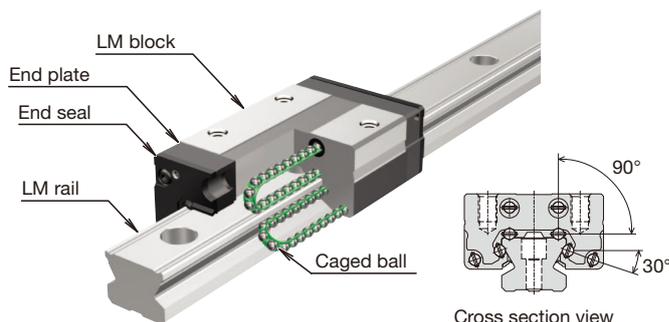


\* The connector box is available for GLM20AP only.

An AC linear server motor with core is used for the GLM. Coils are wound to the ferrite core, generating an extremely strong magnetic field so that characteristics such as high thrust and high acceleration/deceleration are exhibited even with a small volume.



### Caged Ball LM Guide SSR Structure Diagram



The Caged Ball LM Guide SSR eliminates wear of the ball caused by mutual friction when using the caged ball, and the LM guide achieves excellent high speed performance with low noise, good sound quality, and a long-term maintenance-free long life.

## Features

# 1 High speed & high acceleration/deceleration

Because linear motors can convert electromagnetic force directly to linear motion, high speed and high acceleration/deceleration are achieved even in the long stroke.

Maximum speed: 3m/s (4m/s for GLM10 only)

Acceleration/deceleration: 19.6m/s<sup>2</sup> (2G)

\* Vary depending on the specifications, conditions, etc.

# 2 High positioning accuracy

The actuator using the LM guide is controlled fully closed by the linear encoder, achieving high positioning repeatability.

# 3 Long stroke support

The linear motor actuator can support long strokes which cannot be realized with a ball screw drive. For GLM15AP/20AP/25, strokes of 4m or more are also supported by joint base configuration.

# 4 Multi-slider support

Setting multiple sliders on the base of one axis, it is possible to control each independently.

## Conformance to overseas standards

CE

UL\*

\* GLM20AP has standard support. Others have optional support.



## Adapted driver

Movable with the following drivers. Refer to P.17 regarding details for each driver.



### Driver TDP

A high functional driver for auto tuning support.



### Driver XD

A mini driver with integrated features.

\* Driver XD supports GLM10 only.

# GLM20AP

## Basic Specifications

Item		Motor type		S type						M type						L type											
Adapted driver	TDP	Capacity		450W						750W						1kW											
		Main circuit power voltage		200V AC single-/three-phase			100V AC			200V AC single-/three-phase			100V AC			200V AC three-phase											
		Control circuit power voltage		200V AC single-phase			100V AC			200V AC single-phase			100V AC			200V AC single-phase											
Maximum thrust *1 [N]				336			325			618			562			954											
Rated thrust *1 [N]				118			113			220			197			344											
Resolution [μm]		10.0	5.0	1.0	0.5	0.1	10.0	5.0	1.0	0.5	0.1	10.0	5.0	1.0	0.5	0.1	10.0	5.0	1.0	0.5	0.1	10.0	5.0	1.0	0.5	0.1	
Maximum speed *2 [m/s]		3.0		1.5		0.3		2.0		1.5		0.3		3.0		1.5		0.3		2.0		1.5		0.3			
Positioning repeatability [μm]		±10	±5	±1		±10	±5	±1		±10	±5	±1		±10	±5	±1		±10	±5	±1		±10	±5	±1			
Maximum transportable weight *3 [kg]		46.1						41.0						86.1						71.0						134.6	
Assumed transportable weight *4 [kg]		7.7						6.0						15.0						11.0						24.5	

\*1 When the average temperature of the armature winding is 90°C under an ambient temperature of 20°C.

\*2 The maximum speed varies depending on the resolution.

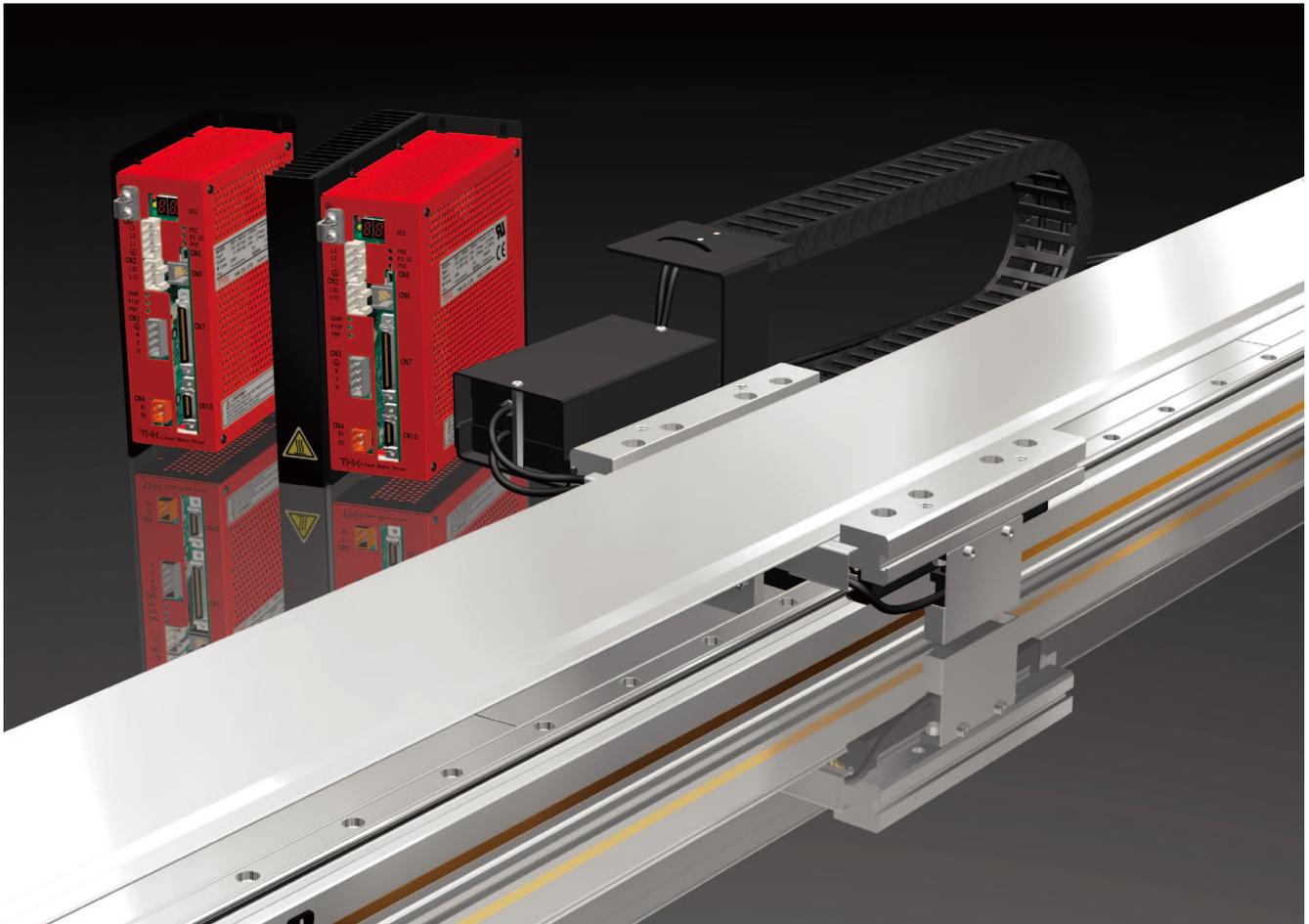
Example: The maximum speed is 0.3m/s when the motor type is S, the driver model number is TDP 200V AC, and the resolution is 0.1μm.

\*3 The specifications of the operating speed, acceleration/deceleration, etc. are limited by the load weight. See "GLM20AP Selection Method" on P.31.

The maximum transportable weight is a weight that can be driven at an approximate acceleration of 0.5G.

\*4 The assumed transportable weight is a weight that can be driven for a certain stroke at a duty ratio of 50% with an approximate acceleration of 2G and a maximum speed reached of 1.0m/s.

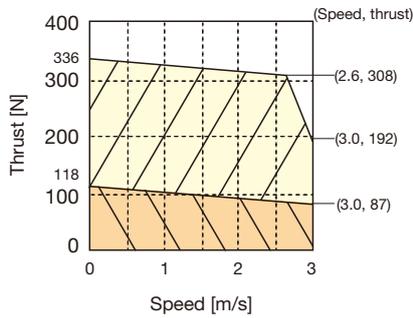
Depending on the operating conditions, the movable weight may change under the influence of the thrust and speed characteristics.



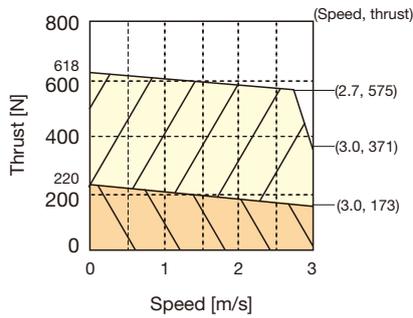
# Characteristics

[200V AC specifications]

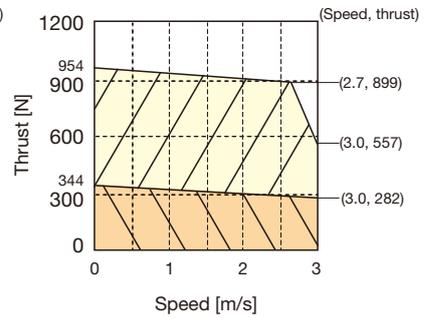
Motor type: S type  
Driver: TDP-045CU-200AC-GA20SU



Motor type: M type  
Driver: TDP-075CU-200AC-GA20MU



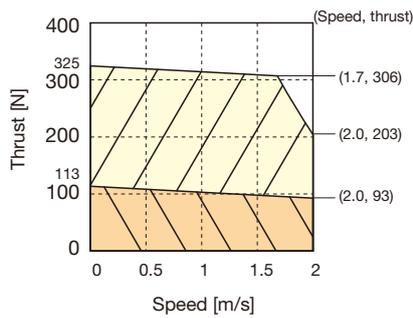
Motor type: L type  
Driver: TDP-100CU-200AC-GA20LU



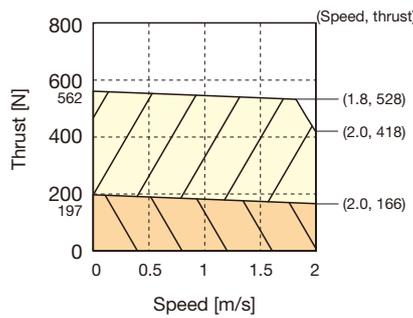
Maximum area  
 Continuous area

[100 VAC specifications]

Motor type: S type  
Driver: TDP-045CU-100AC-GA20SU

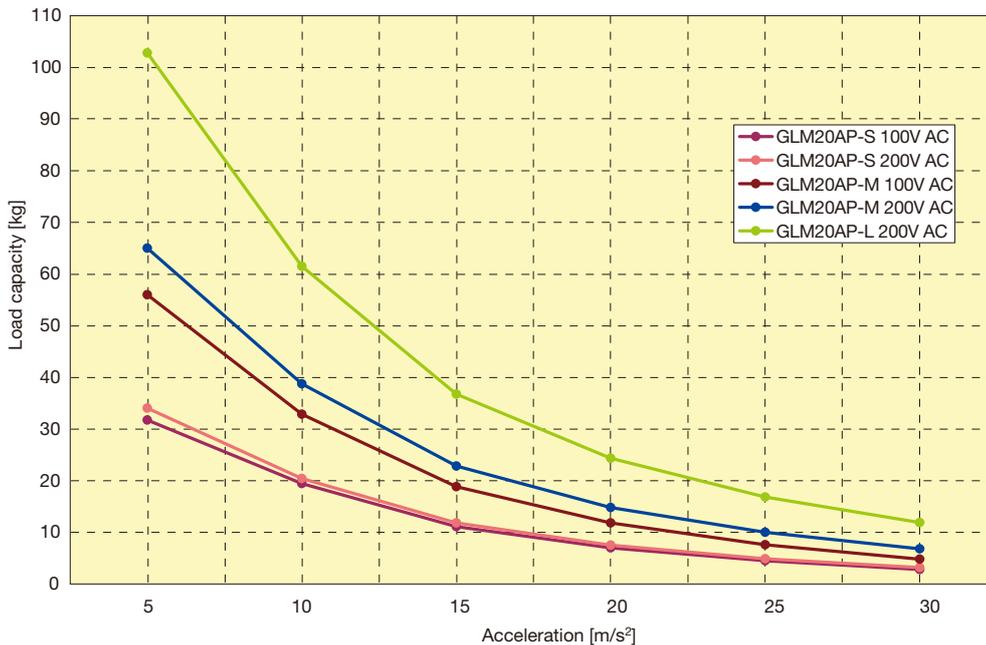


Motor type: M type  
Driver: TDP-075CU-100AC-GA20MU



Note) The thrust and speed characteristics shown above are values that take into consideration the sliding resistance component of the LM guide due to the slider attractive force and slider weight.

# Transportable Weight and Acceleration



Note) At a maximum speed reached of 1.0m/s, the unit can be driven for a certain stroke at a duty ratio of 50% at this weight. For details about selection, see "GLM20AP Selection Method" on P.31.

# GLM20AP



## Model Configuration

Model	Number of sliders/motor type	Stroke	Encoder/resolution	Magnetic pole sensor	Driver
GLM20AP	S	0490	T01K	J	TDP20
(1)	(2)	(3)	(4)	(5)	(6)

**GLM20AP**

**S:** S type

**M:** M type

**L:** L type

**2S:** S type × 2 (multi-slider)

**2M:** M type × 2 (multi-slider)

**2L:** L type × 2 (multi-slider)

**0130:** 130mm

to

**2650:** 2650mm

Refer to Table 1. Stroke List. \* Refer to the GLM20AP dimension diagram (→ P.9) for details.

**T01K:** 1.0μm

**R01K:** 1.0μm

**R500:** 0.5μm

**R100:** 0.1μm

**H01K:** 1.0μm

**G10K:** 10.0μm

**G05K:** 5.0μm

Encoders can be selected vary depending on the driver used. Refer to Table 2. Encoder List.  
Note) The maximum speed and positioning repeatability of the actuator vary depending on the encoder resolution.

**J:** With magnetic pole sensor

**N:** Without magnetic pole sensor

**TDP20:** Driver TDP 200V AC specification

**TDP10:** Driver TDP 100V AC specification

(6) Driver + input power voltage  
Example: **TDP20**  
TDP: Driver TDP  
20: 200V AC specification

(5) The specification without a magnetic pole sensor detects the magnetic pole by servo ON input. While detecting the magnetic pole, the rod fluctuates a few millimeters from side to side for about 10 seconds. The magnetic pole detection may fail if an excessive load is applied to the slider, the work loaded on the slider has a barycentric position that is overhung, or an external force or high resistance acts on the slider. In this case, the specification with a magnetic pole sensor is recommended.

(2) Number of sliders + Motor type  
Example: **2S**  
2: Slider × 2  
S: S type  
Note) If there is one slider, there is no symbol for the number of sliders. If there are two sliders or more, contact THK.

Table 1. List of strokes

Stroke signal	S type	0130	0310	0490	0670	0850	1030	1210	1390	1570	1750	1930	2110	2290	2470	2650
	M type	-	0160	0340	0520	0700	0880	1060	1240	1420	1600	1780	1960	2140	2320	2500
	L type	-	-	0200	0380	0560	0740	0920	1100	1280	1460	1640	1820	2000	2180	2360
Base length [mm]		400	580	760	940	1120	1300	1480	1660	1840	2020	2200	2380	2560	2740	2920
Total length of actuator [mm]		420	600	780	960	1140	1320	1500	1680	1860	2040	2220	2400	2580	2760	2940

Note 1) The stroke is different if a multi-slider is used. Contact THK for details.

Note 2) The standard base length is recommended because the design complies with the magnet length.

Note 3) Maximum length of the single base is 4400mm. For joint base configuration, select an encoder made by Magnescale Co., Ltd. or HEIDENHAIN Inc..

Table 2. List of encoders

Driver	(4) Encoder/resolution	Encoder manufacturer	Model	Positioning repeatability [μm]	Maximum speed [m/s]	
TDP	<b>T01K</b>	THK Co., Ltd.	MES-HM-1	±1	3.0	
	<b>R01K</b>		RGH22X			
	<b>R500</b>		RGH22Z			
	<b>R100</b>	0.5μm	RENISHAW	RGH22Y	±1	1.5
	<b>H01K</b>	1.0μm	HEIDENHAIN	LIDA277	±1	0.3
	<b>G10K</b>	10.0μm	Magnescale Co., Ltd.	PL25	±10	3.0
	<b>G05K</b>	5.0μm			±5	

Note 1) The maximum speed and positioning repeatability of the actuator vary depending on the encoder resolution.

Note 2) The resolution is the value after multiplying by 4.

Note 3) If a Magnescale made encoder is selected, the interpolator and magnetic switch are attached to the body.

Table 3. List of adapted drivers

(6) Driver	Motor type	Attached driver
<b>TDP20</b>	S type	TDP-045CU-200AC-GA20SU-(1)*1-(2)*2
	M type	TDP-075CU-200AC-GA20MU-(1)*1-(2)*2
	L type	TDP-100CU-200AC-GA20LU-(1)*1-(2)*2
<b>TDP10</b>	S type	TDP-045CU-100AC-GA20SU-(1)*1-(2)*2
	M type	TDP-075CU-100AC-GA20MU-(1)*1-(2)*2

\*1 (1) indicates the resolution set. The setting complies with the actuator resolution. For details, see the driver model number (→ P.19).

\*2 (2) indicates whether or not a magnetic pole sensor is set. The setting complies with the magnetic pole sensor of the actuator. For details, see the driver model number (→ P.19).

Cover	Sensors	Cable chain	Standard	Cable length
<b>C</b> (7)	<b>H</b> (8)	<b>C</b> (9)	<b>UL</b> (10)	<b>03</b> (11)
<b>C</b> : With cover <b>N</b> : Without cover	<b>H</b> : Proximity sensor [N.O. contact] × 3 <b>J</b> : Proximity sensor [N.O. contact] × 1 [N.C. contact] × 2 <b>Z</b> : Photo sensor × 3 [for both N.O. contact, N.C. contact] <b>N</b> : Without sensor	<b>C</b> : TKP18H14-30W40R50TC*1 <b>Q</b> : E6.29.040.055.0 <b>M</b> : Connector box only*2 <b>N</b> : Cable chain/without connector box	<b>UL</b> : UL standard certified product <b>CU</b> : CE marked product/UL certified product  (10) GLM20AP is normally a UL certified product. To make it a CE marked product, select a model with a cable chain or a connector box only.	<b>03</b> <b>05</b> <b>10</b> <b>15</b>
(8)H: GX-F12A × 3 (Panasonic Industrial Devices SUNX Co., Ltd.) J: GX-F12A × 1 GX-F12B × 2 (Panasonic Industrial Devices SUNX Co., Ltd.) Z: EE-SX671 × 3 (Omron Corp.) Connector (model: EE-1001) comes included.		(9)*1: "C" is for strokes less than those shown below. S type: 1570mm or less M type: 1600mm or less L type: 1640mm or less *2: The cable chain should be provided by customer if "M" is selected. Note: If a model with a cable chain (C or Q) is selected, a connector box is always supplied with it. Cable chains than other the standard setting can be supported. Contact THK for details.		(11) Cable length Example: <b>03</b> 3m Note: Different cables are attached depending on the selection of (4) encoder and (5) magnetic pole sensor. For details, refer to "Table 4. List of accessory cables".

## Model configuration coding

# GLM20AP – S – 0490 – R01K – N – TDP20 – C – N – C – UL – 03

GLM20AP-S

- Stroke: 490mm
- With cover
- Encoder resolution: 1µm



Cable

- Length: 3m



Cable image



Driver

- Driver TDP

Note: The above model numbers configurations are for sets of actuators + drivers + cables.

If only the actuator is required, contact THK.

The motion controller and a cable connect the controller and the driver should be provided by customer.

Table 4. List of accessory cables

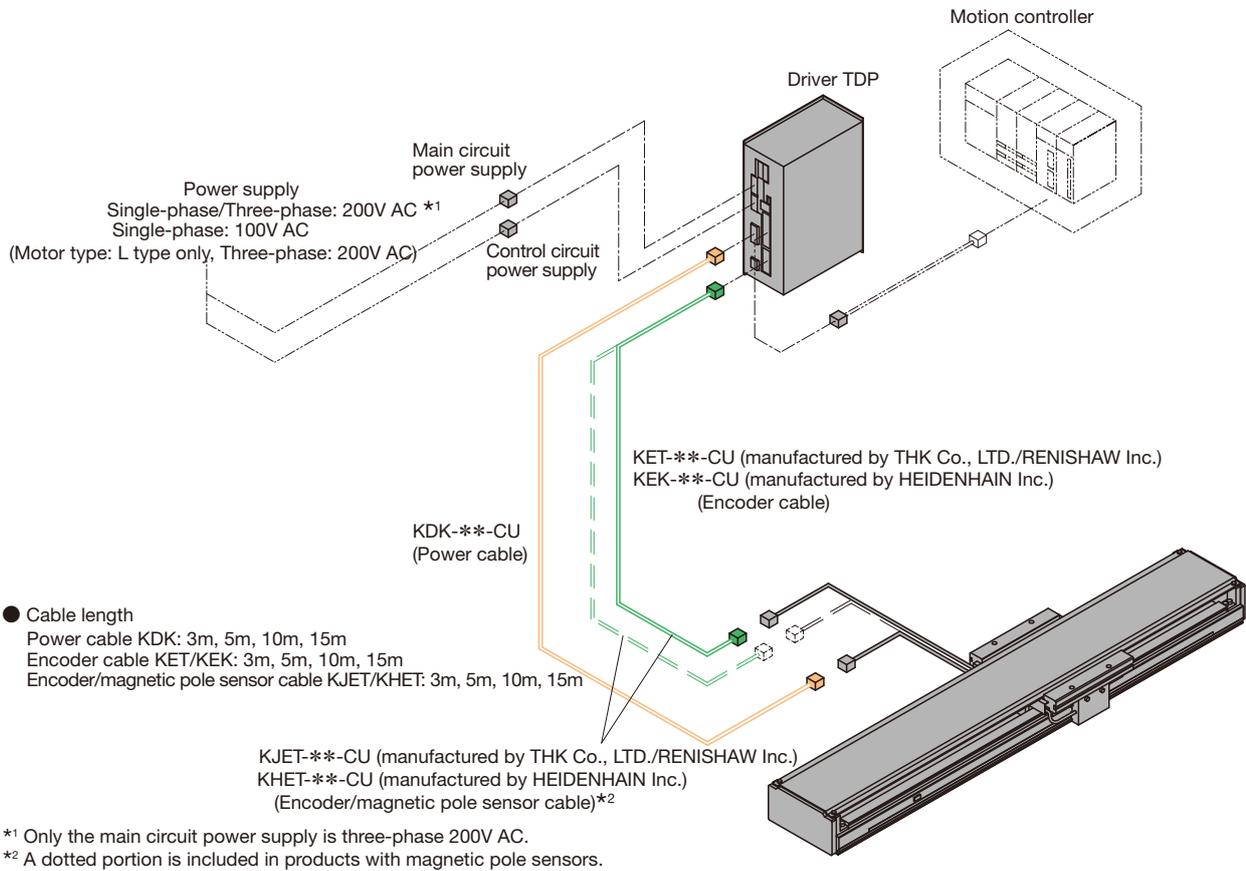
(6) Driver	(4) Encoder/resolution	(5) Magnetic pole sensor	Power cable	Encoder/Magnetic pole sensor cable	For origin detector cable	Interpolator/cable between interpolator and driver	Cable between interpolator and driver
TDP	T01K/R01K/R500/R100	J: With magnetic pole sensor	KDK-**-CU	KJET-**-CU	-	-	-
		N: Without magnetic pole sensor		KET-**-CU	-	-	-
	H01K	J: With magnetic pole sensor		KHET-**-CU	-	-	-
		N: Without magnetic pole sensor		KEK-**-CU	-	-	-
G10K/G05K	J: With magnetic pole sensor	CK-**-	CE09-**-	KSJT-**-CU	-	-	KSET-01-CU
	N: Without magnetic pole sensor						

## Pages for detailed description

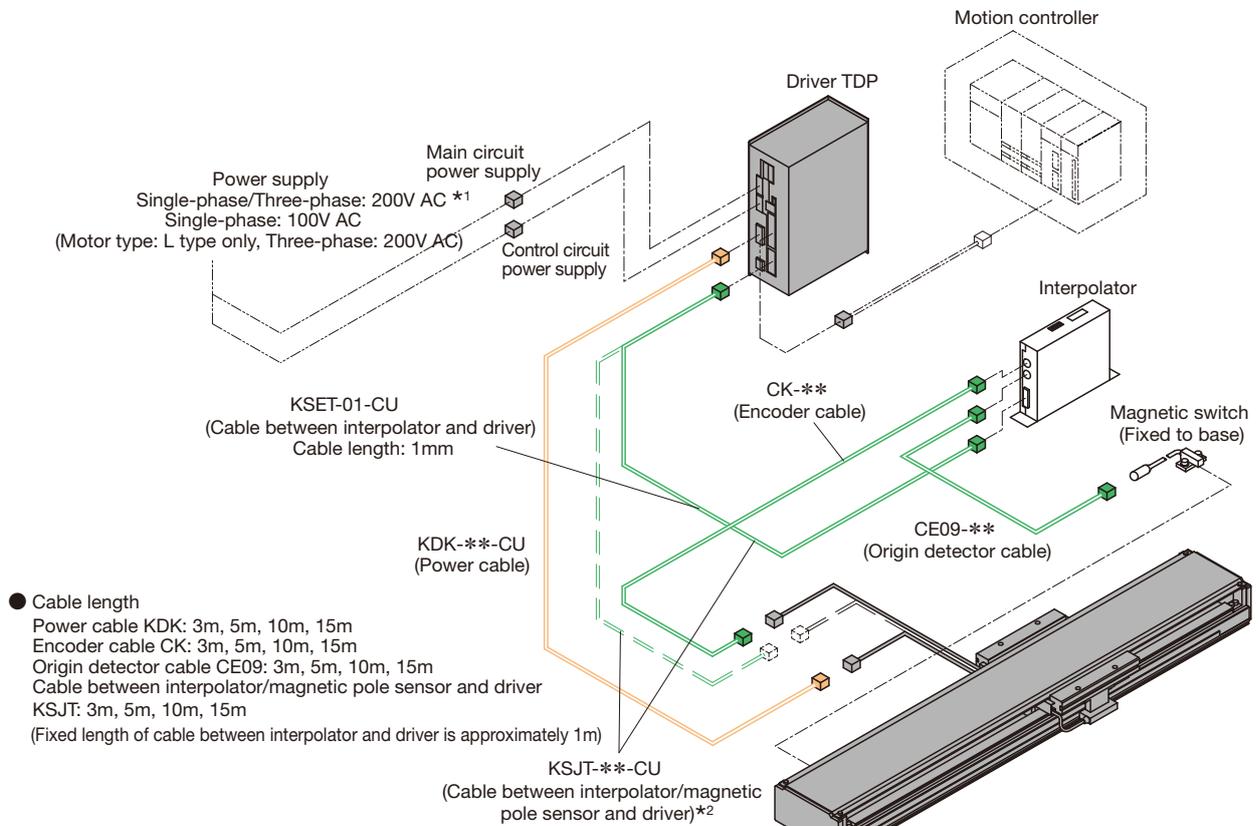
(2) Motor type	P3	Basic specifications, characteristics
(3) Stroke	P9	Dimension diagram
(4) Encoder/resolution	P5	Basic Specifications
(6) Driver	P23	Model configuration, specification
(8) Sensors	P15	Dimensions at Sensor Installation
(9) Cable chain	P16	Dimensions at Cable Chain Installation
(10) Standard	P38	Explanation of terms
(11) Cable length	P7	System Configuration

## System Configuration

- Driver TDP specification  
 (magnetic linear recorder manufactured by THK Co., LTD.)  
 (optical linear encoder manufactured by RENISHAW Inc./HEIDENHAIN Inc.)  
 Motor type: S, M, L type



● Driver TDP specifications (magnetic linear encoder manufactured by Magnescale Co., LTD.)  
 Motor type: S, M, L type



\*1 Only the main circuit power supply is three-phase 200V AC.  
 \*2 A dotted portion is included in products with magnetic pole sensors.

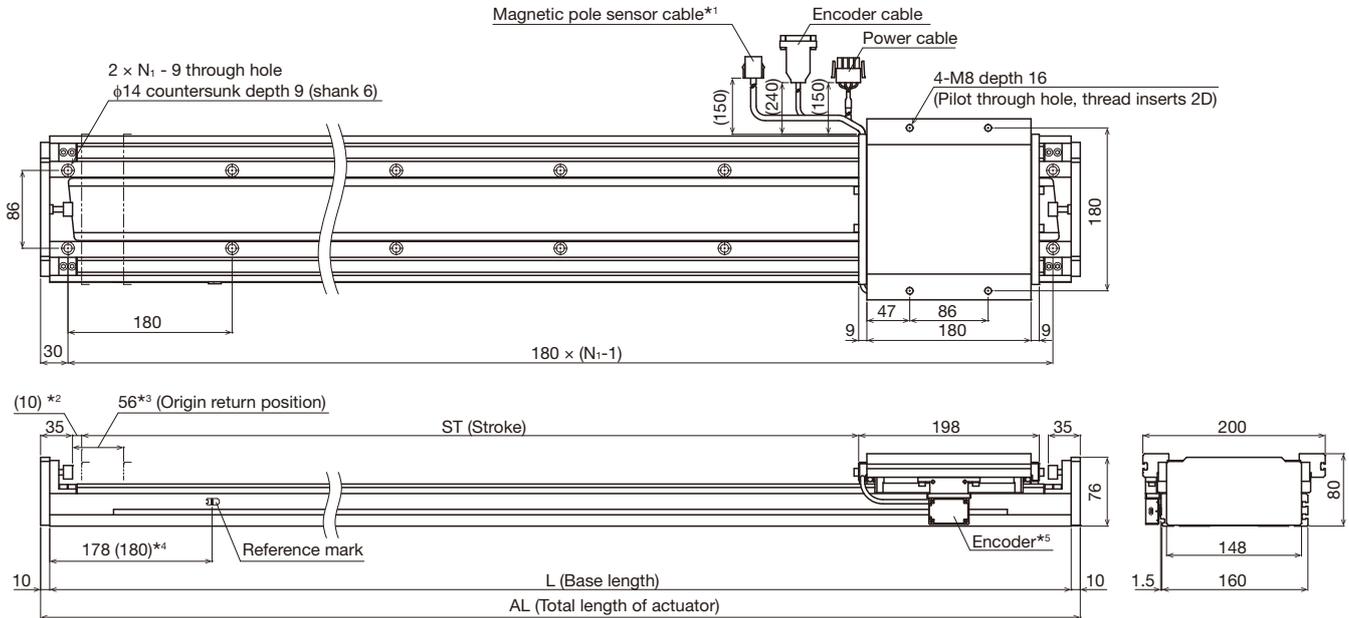
# GLM20AP

S type: Flat type with core  
 Height: 80mm, Stroke: 130 - 2650mm



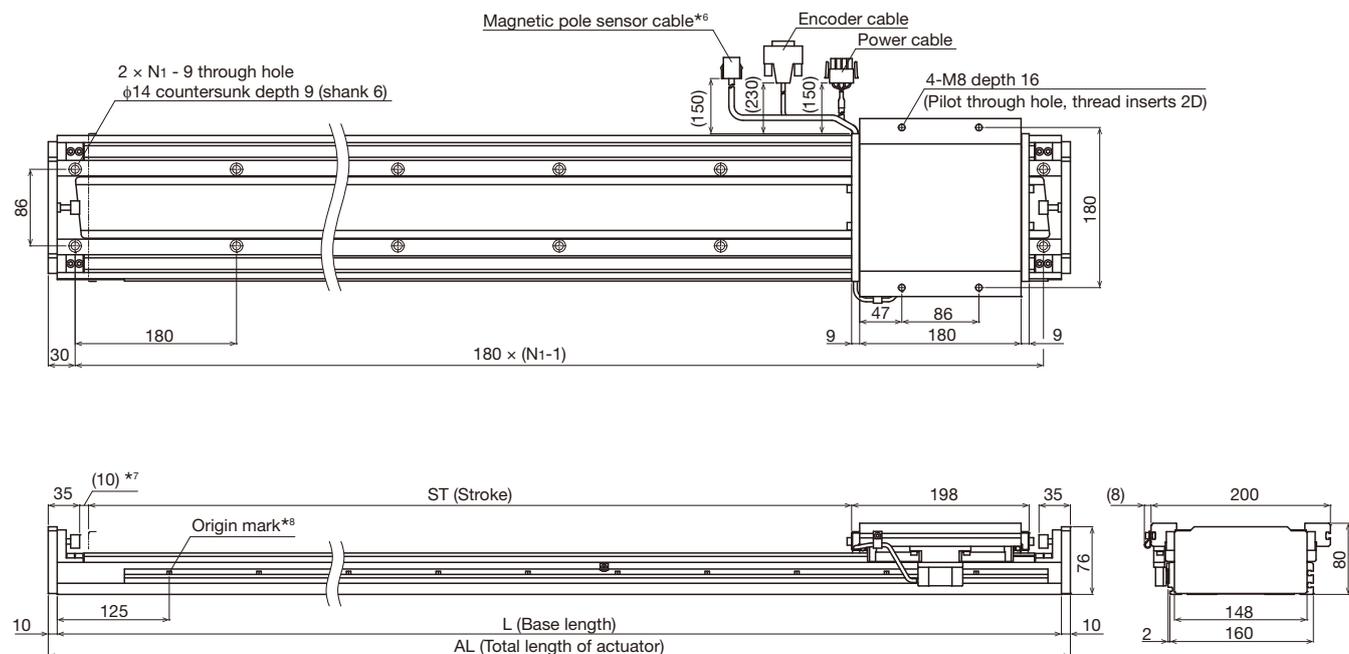
## Dimension Diagram

- Specifications of magnetic linear encoder (THK Co., LTD.)
- Specifications of optical linear encoder (RENISHAW Inc.)



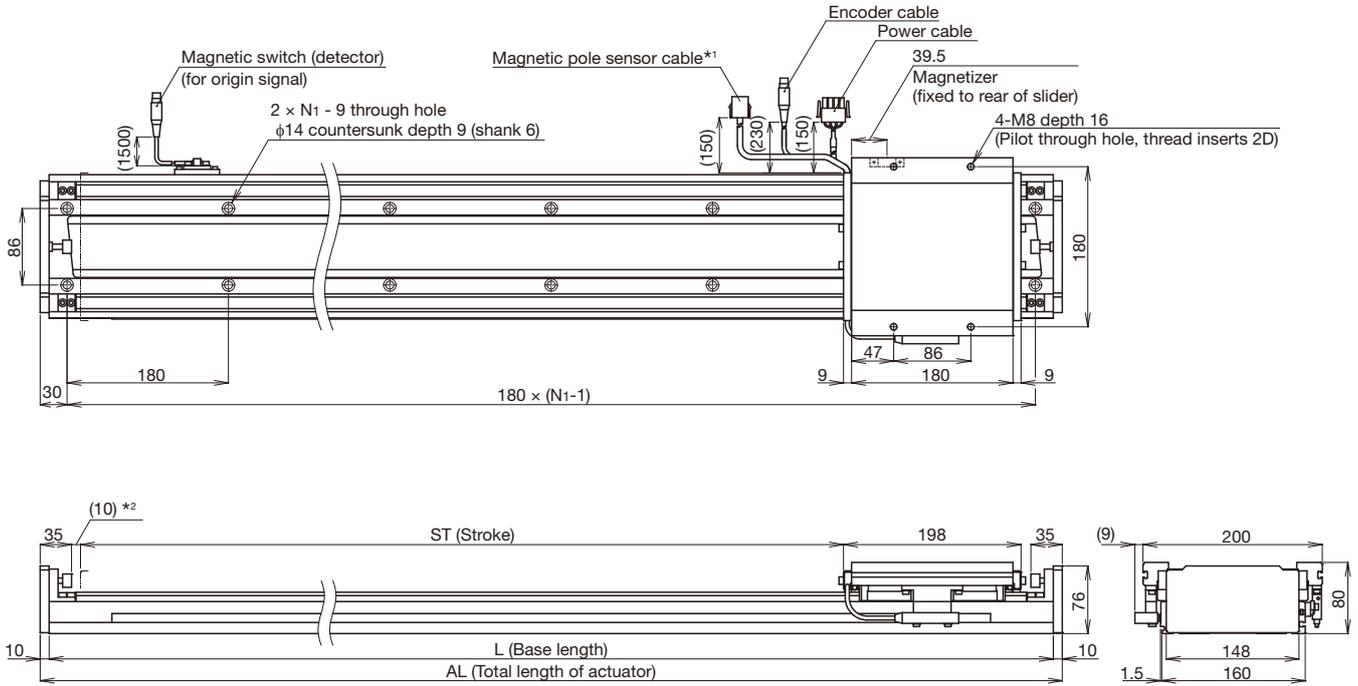
\*<sup>1</sup> Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.  
 \*<sup>2</sup> Distance from the mechanical stopper to the set stroke. Select the margin up to the mechanical stopper for the stroke actually used taking the ability to stop safely into consideration.  
 \*<sup>3</sup> The origin return position if the reference mark is used.  
 \*<sup>4</sup> Dimensions for an optical linear encoder manufactured by RENISHAW Inc..  
 \*<sup>5</sup> A cover is attached to the encoder head for an optical linear encoder manufactured by RENISHAW Inc..

## ● Specifications of optical linear encoder (HEIDENHAIN Inc.)



\*<sup>6</sup> Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.  
 \*<sup>7</sup> Distance from the mechanical stopper to the set stroke. Select the margin up to the mechanical stopper for the stroke actually used taking the ability to stop safely into consideration.  
 \*<sup>8</sup> An origin is output every 100mm. Select an origin position to be actually used using an external sensor. Refer to the instruction manual for details.

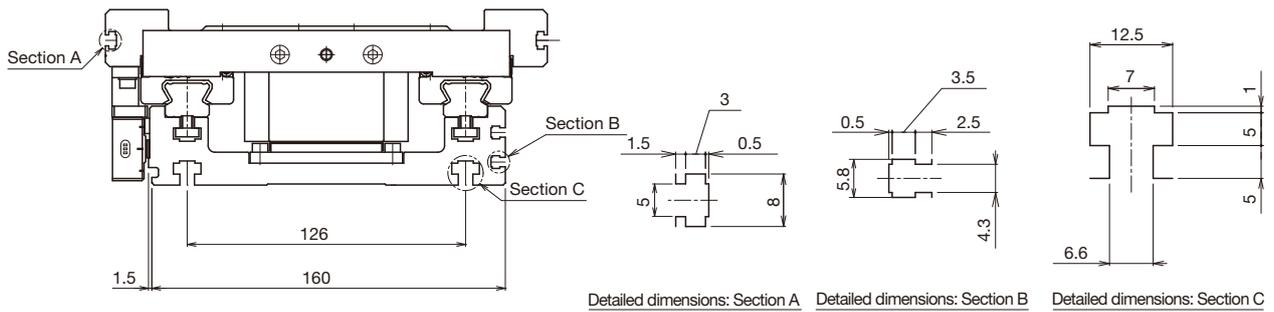
## ● Specifications of magnetic linear encoder (Magrescale Co., Ltd.)



\*1 Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.

\*2 Distance from the mechanical stopper to the set stroke. Select the margin up to the mechanical stopper for the stroke actually used taking the ability to stop safely into consideration.

## T Slot Dimensions



## Detailed Dimensions

GLM20AP-S-		0130* <sup>3</sup>	0310	0490	0670	0850	1030	1210	1390	1570	1750	1930	2110	2290	2470	2650
Stroke [mm]	ST	130	310	490	670	850	1030	1210	1390	1570	1750	1930	2110	2290	2470	2650
(Stroke between mechanical stoppers) [mm]		(152)	(332)	(512)	(692)	(872)	(1052)	(1232)	(1412)	(1592)	(1772)	(1952)	(2132)	(2312)	(2492)	(2672)
Base length [mm]	L	400	580	760	940	1120	1300	1480	1660	1840	2020	2200	2380	2560	2740	2920
Total length of actuator [mm]	AL	420	600	780	960	1140	1320	1500	1680	1860	2040	2220	2400	2580	2760	2940
Number of installation holes per column	N <sub>1</sub>	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Slider weight * <sup>4</sup> [kg]		5.3														
Base weight [kg]		6.3	8.9	11.6	14.3	16.9	19.6	22.2	24.9	27.6	30.2	32.9	35.6	38.2	40.9	43.5
Main unit weight: * <sup>5</sup> [kg]		11.9	14.7	17.5	20.3	23.1	25.9	28.7	31.5	34.3	37.1	39.9	42.7	45.5	48.3	51.1

\*<sup>3</sup> Because the stroke is short, there are items which cannot use the center base installation holes.

In such cases, use a base installation nut (P15), and secure with a T slot.

\*<sup>4</sup> The slider weight is the value with a magnetic pole sensor. In the case of no magnetic pole sensor, the weight is -0.2kg.

\*<sup>5</sup> The main unit weight is the value with a magnetic pole sensor and cover.

# GLM20AP

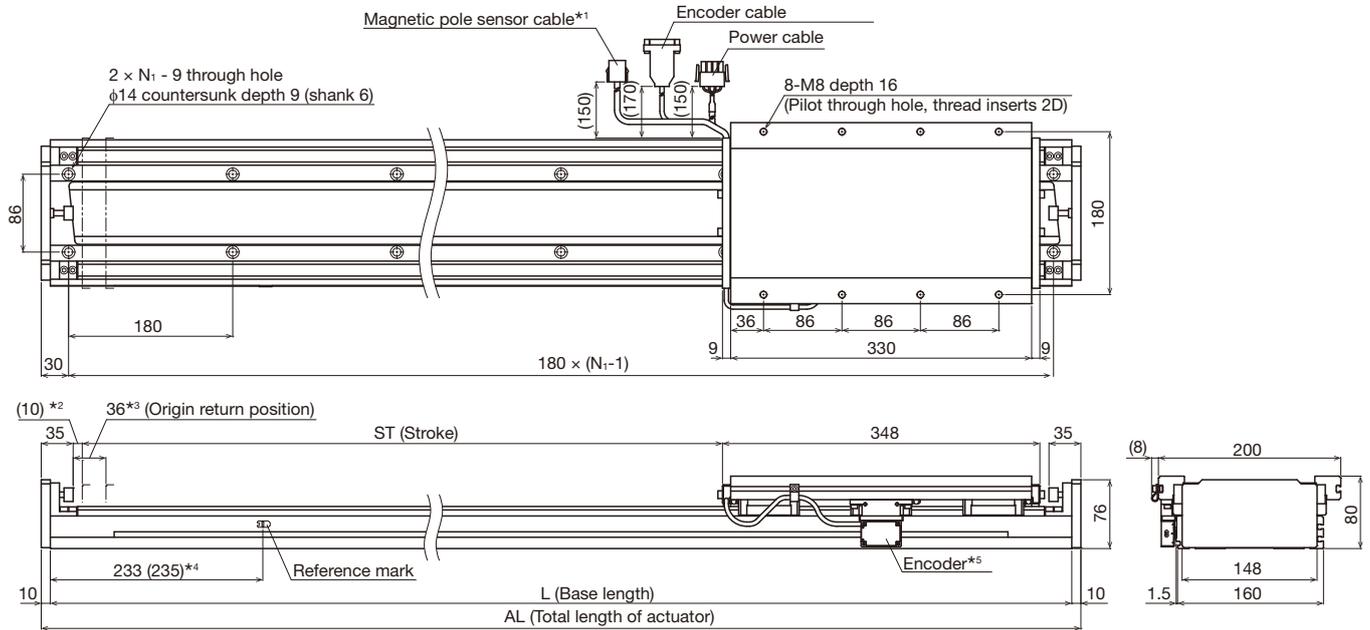
M type: Flat type with core

Height: 80mm, Stroke: 160 to 2500mm



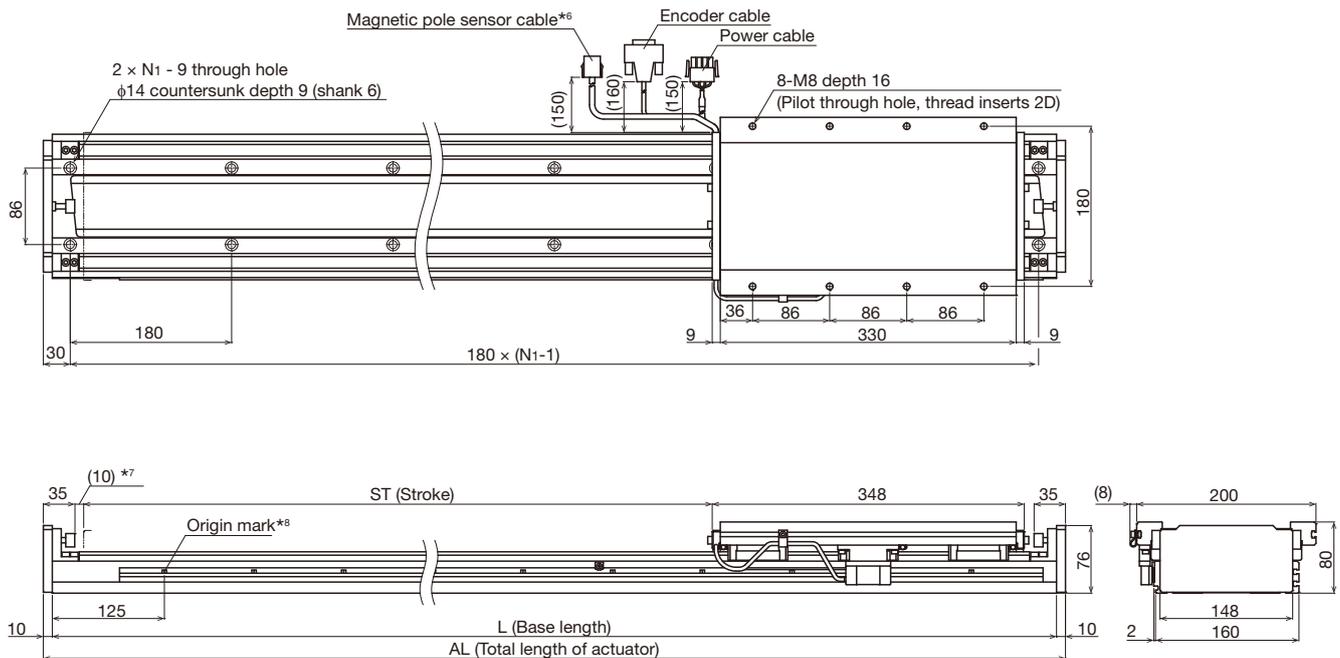
## Dimension Diagram

- Specifications of magnetic linear encoder (THK Co., LTD.)
- Specifications of optical linear encoder (RENISHAW Inc.)



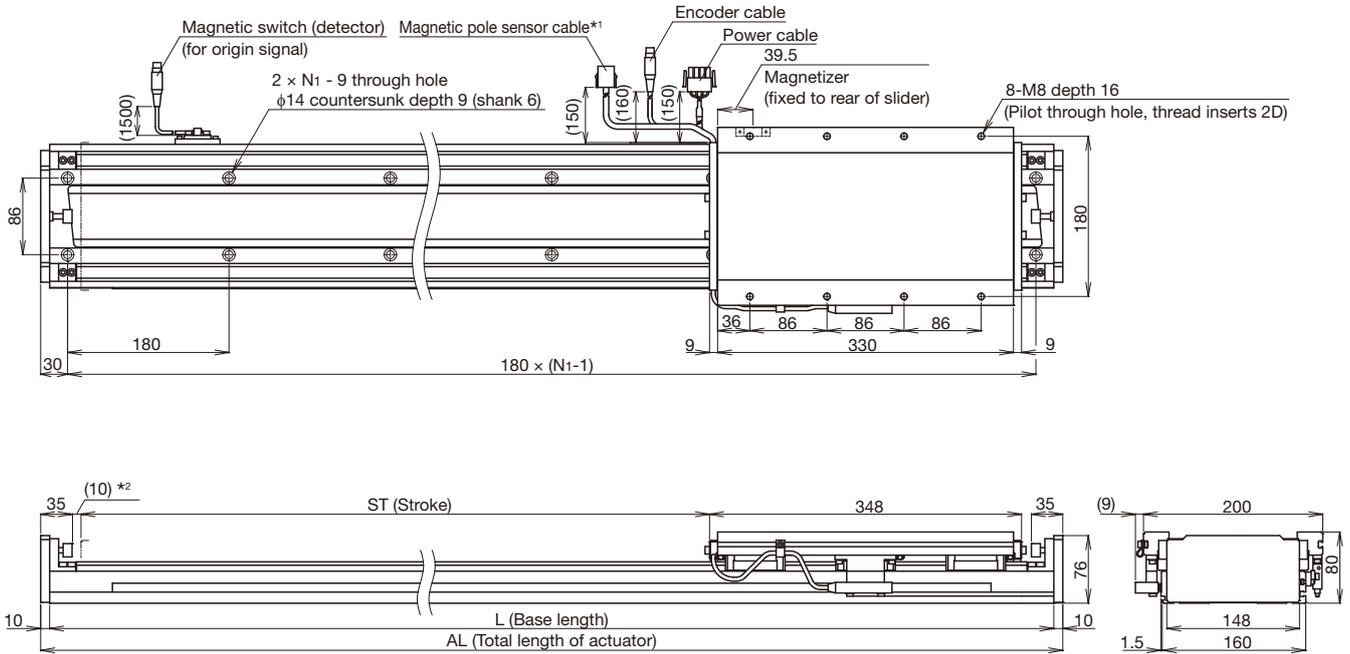
- \*1 Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.
- \*2 Distance from the mechanical stopper to the set stroke. Select the margin up to the mechanical stopper for the stroke actually used taking the ability to stop safely into consideration.
- \*3 The origin return position if the reference mark is used.
- \*4 Dimensions for an optical linear encoder manufactured by RENISHAW Inc..
- \*5 A cover is attached to the encoder head for an optical linear encoder manufactured by RENISHAW Inc..

## ● Specifications of optical linear encoder (HEIDENHAIN Inc.)



- \*6 Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.
- \*7 Distance from the mechanical stopper to the set stroke. Select the margin up to the mechanical stopper for the stroke actually used taking the ability to stop safely into consideration.
- \*8 An origin is output every 100mm. Select an origin position to be actually used using an external sensor. Refer to the instruction manual for details.

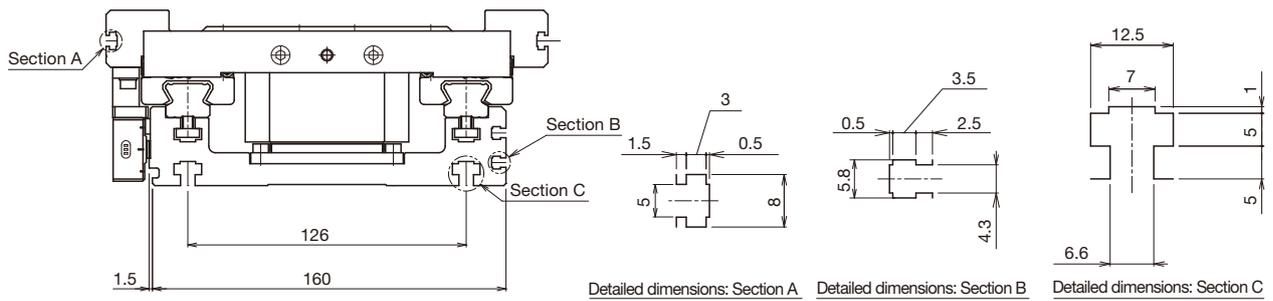
## ● Specifications of magnetic linear encoder (Magscale Co., Ltd.)



\*1 Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.

\*2 Distance from the mechanical stopper to the set stroke. Select the margin up to the mechanical stopper for the stroke actually used taking the ability to stop safely into consideration.

## T Slot Dimensions



## Detailed Dimensions

GLM20AP-M-		0160	0340	0520	0700	0880	1060	1240	1420	1600	1780	1960	2140	2320	2500
Stroke [mm]	ST	160	340	520	700	880	1060	1240	1420	1600	1780	1960	2140	2320	2500
(Stroke between mechanical stoppers) [mm]		(182)	(362)	(542)	(722)	(902)	(1082)	(1262)	(1442)	(1622)	(1802)	(1982)	(2162)	(2342)	(2522)
Base length [mm]	L	580	760	940	1120	1300	1480	1660	1840	2020	2200	2380	2560	2740	2920
Total length of actuator [mm]	AL	600	780	960	1140	1320	1500	1680	1860	2040	2220	2400	2580	2760	2940
Number of installation holes per column	N <sub>1</sub>	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Slider weight <sup>*3</sup> [kg]		9.1													
Base weight [kg]		8.9	11.6	14.3	16.9	19.6	22.2	24.9	27.6	30.2	32.9	35.6	38.2	40.9	43.5
Main unit weight: <sup>*4</sup> [kg]		18.5	21.3	24.1	26.9	29.7	32.5	35.3	38.1	40.9	43.7	46.5	49.3	52.1	54.9

<sup>\*3</sup> The slider weight is the value with a magnetic pole sensor. In the case of no magnetic pole sensor, the weight is -0.2kg.

<sup>\*4</sup> The main unit weight is the value with a magnetic pole sensor and cover.

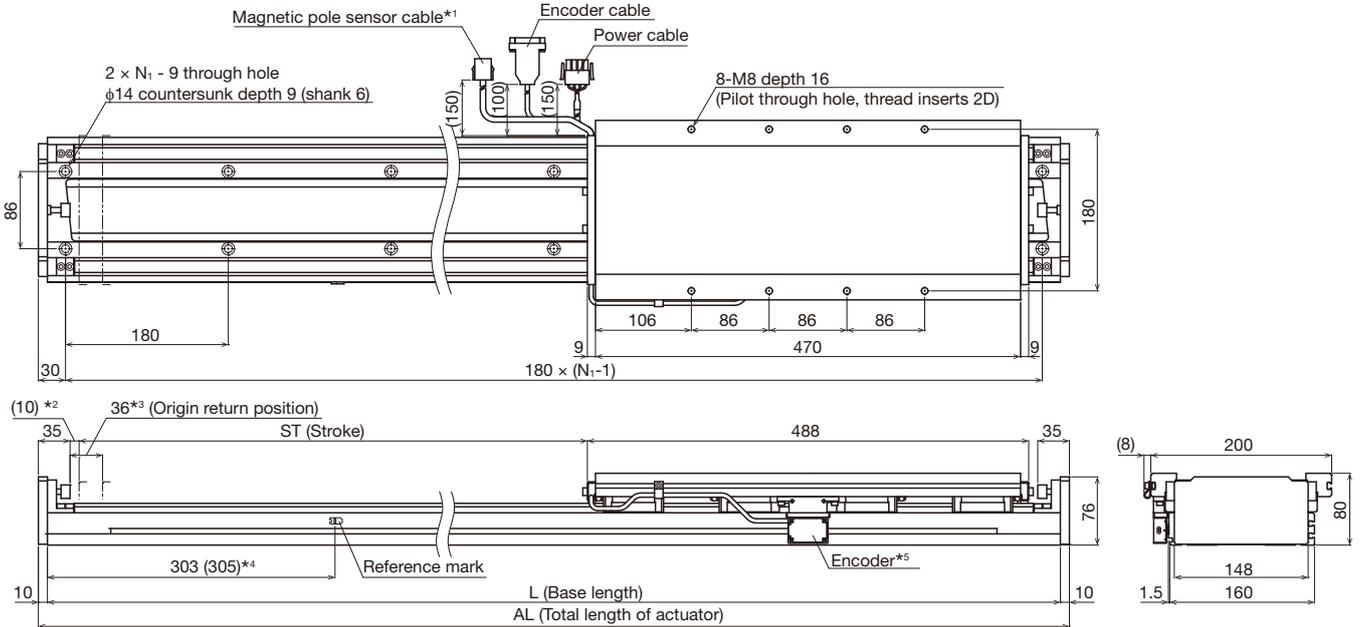
# GLM20AP

L type: Flat type with core  
 Height: 80mm, Stroke: 200 to 2360mm



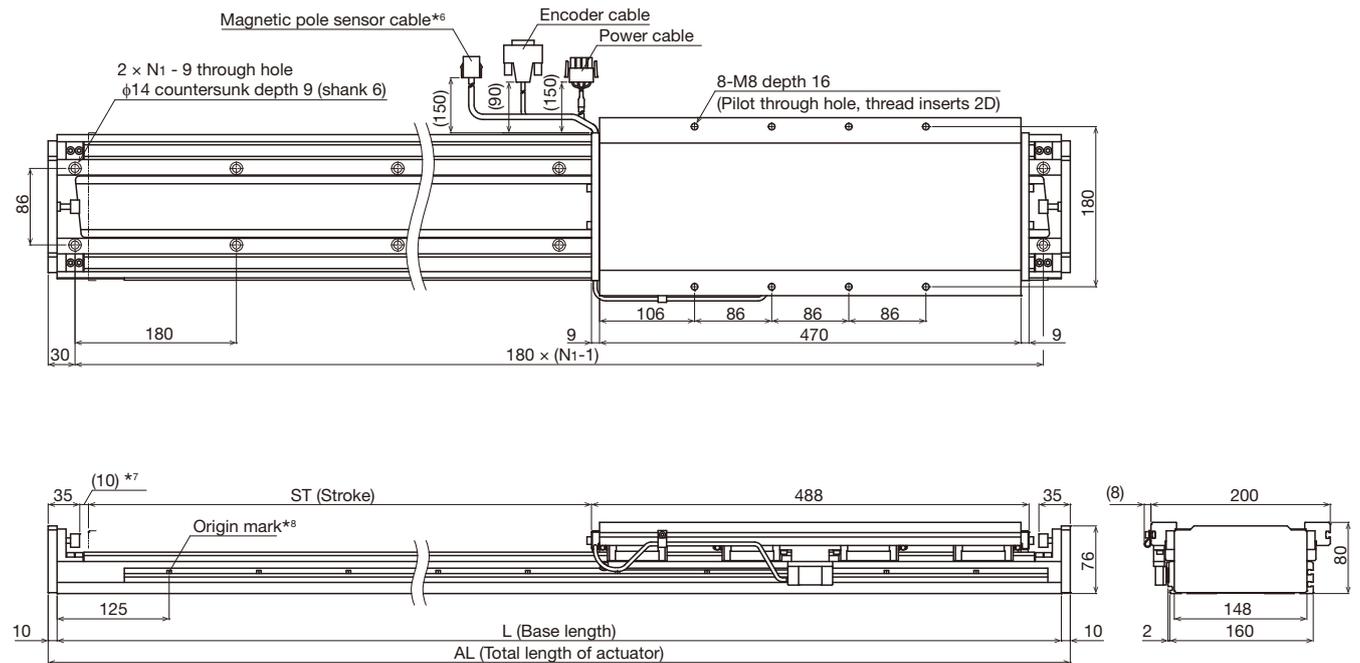
## Dimension Diagram

- Specifications of magnetic linear encoder (THK Co., LTD.)
- Specifications of optical linear encoder (RENISHAW Inc.)



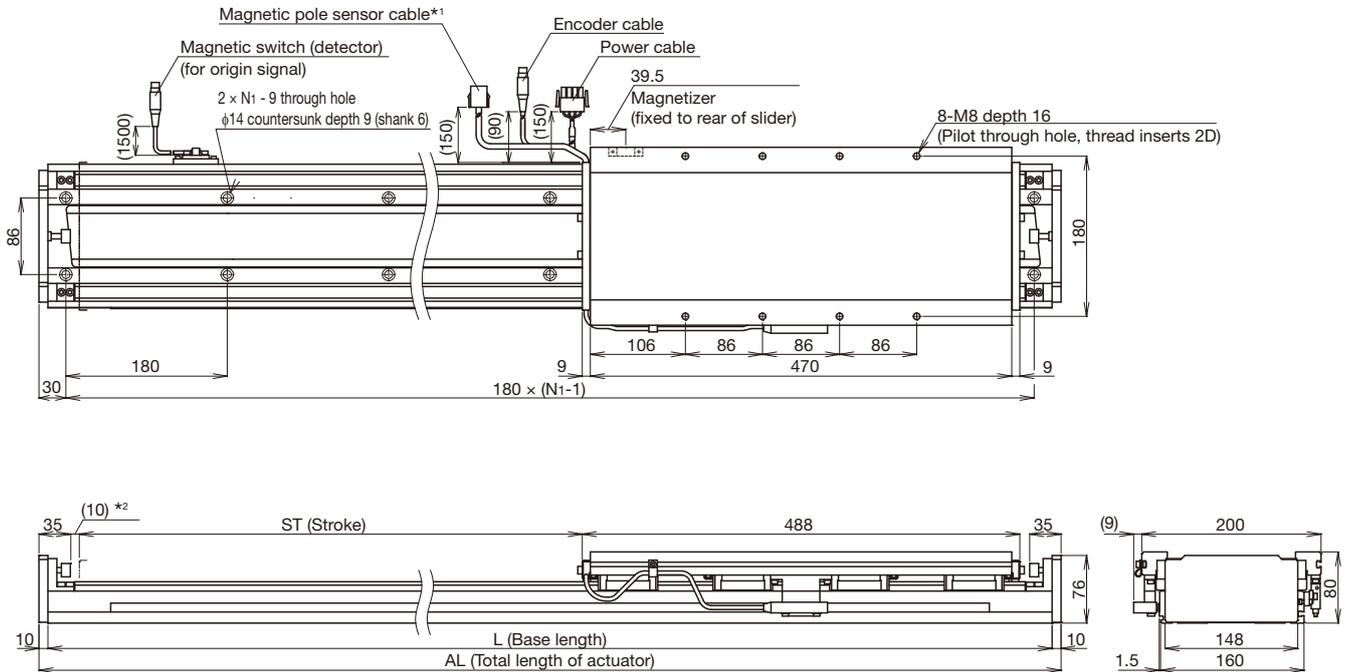
\*1 Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.  
 \*2 Distance from the mechanical stopper to the set stroke. Select the margin up to the mechanical stopper for the stroke actually used taking the ability to stop safely into consideration.  
 \*3 The origin return position if the reference mark is used.  
 \*4 Dimensions for an optical linear encoder manufactured by RENISHAW Inc..  
 \*5 A cover is attached to the encoder head for an optical linear encoder manufactured by RENISHAW Inc..

## ● Specifications of optical linear encoder (HEIDENHAIN Inc.)



\*6 Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.  
 \*7 Distance from the mechanical stopper to the set stroke. Select the margin up to the mechanical stopper for the stroke actually used taking the ability to stop safely into consideration.  
 \*8 An origin is output every 100mm. Select an origin position to be actually used using an external sensor. Refer to the instruction manual for details.

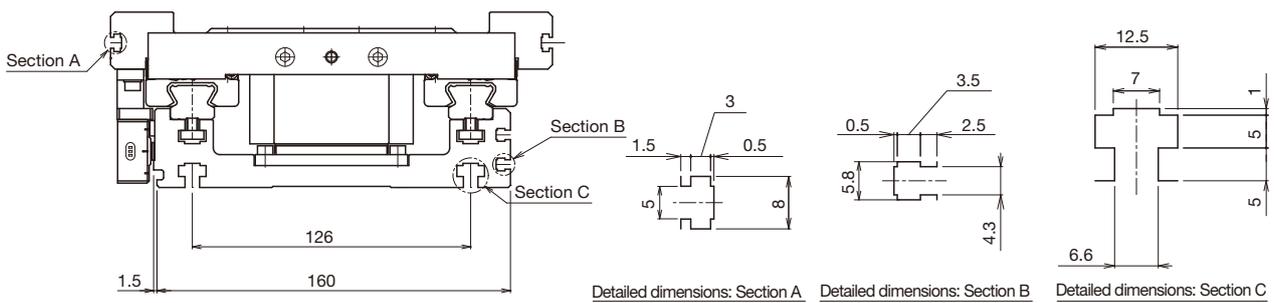
## ● Specifications of magnetic linear encoder (Magnescale Co., Ltd.)



\*1 Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.

\*2 Distance from the mechanical stopper to the set stroke. Select the margin up to the mechanical stopper for the stroke actually used taking the ability to stop safely into consideration.

## T Slot Dimensions



## Detailed Dimensions

GLM20AP-L-		0200 <sup>*3</sup>	0380	0560	0740	0920	1100	1280	1460	1640	1820	2000	2180	2360
Stroke [mm]	ST	200	380	560	740	920	1100	1280	1460	1640	1820	2000	2180	2360
(Stroke between mechanical stoppers) [mm]		(222)	(402)	(582)	(762)	(942)	(1122)	(1302)	(1482)	(1662)	(1842)	(2022)	(2202)	(2382)
Base length [mm]	L	760	940	1120	1300	1480	1660	1840	2020	2200	2380	2560	2740	2920
Total length of actuator [mm]	AL	780	960	1140	1320	1500	1680	1860	2040	2220	2400	2580	2760	2940
Number of installation holes per column	N <sub>1</sub>	5	6	7	8	9	10	11	12	13	14	15	16	17
Slider weight <sup>*4</sup> [kg]		12.9												
Base weight [kg]		11.6	14.3	16.9	19.6	22.2	24.9	27.6	30.2	32.9	35.6	38.2	40.9	43.5
Main unit weight: <sup>*5</sup> [kg]		25.1	27.9	30.7	33.5	36.3	39.1	41.9	44.7	47.5	50.3	53.1	55.9	58.7

\*3 Because the stroke is short, there are items which cannot use the center base installation holes.

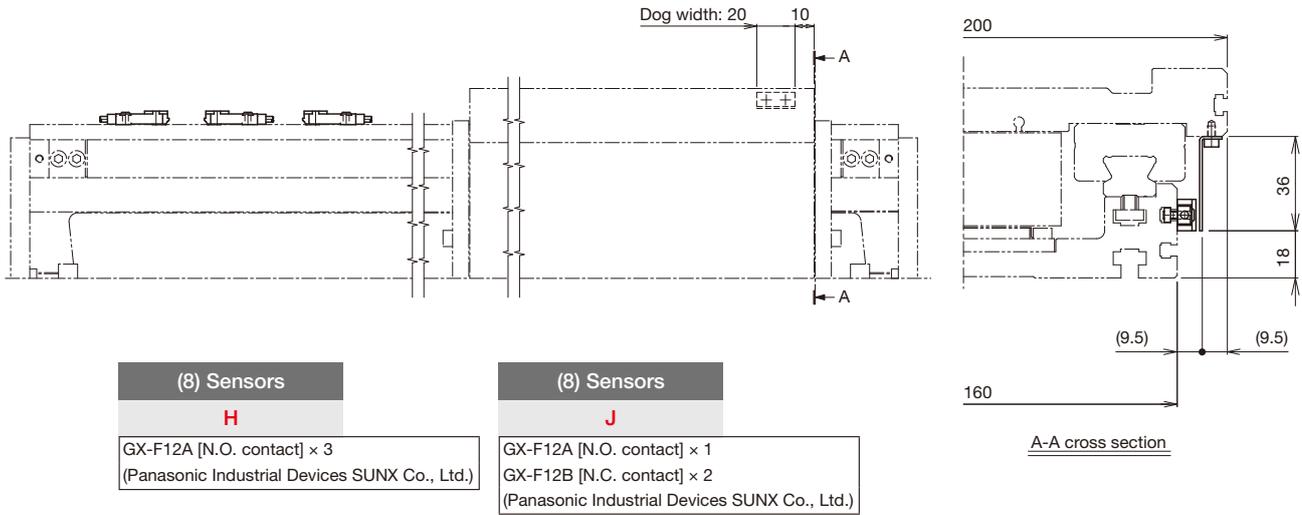
In such cases, use a base installation nut (P15), and secure with a T slot.

\*4 The slider weight is the value with a magnetic pole sensor. In the case of no magnetic pole sensor, the weight is -0.2kg.

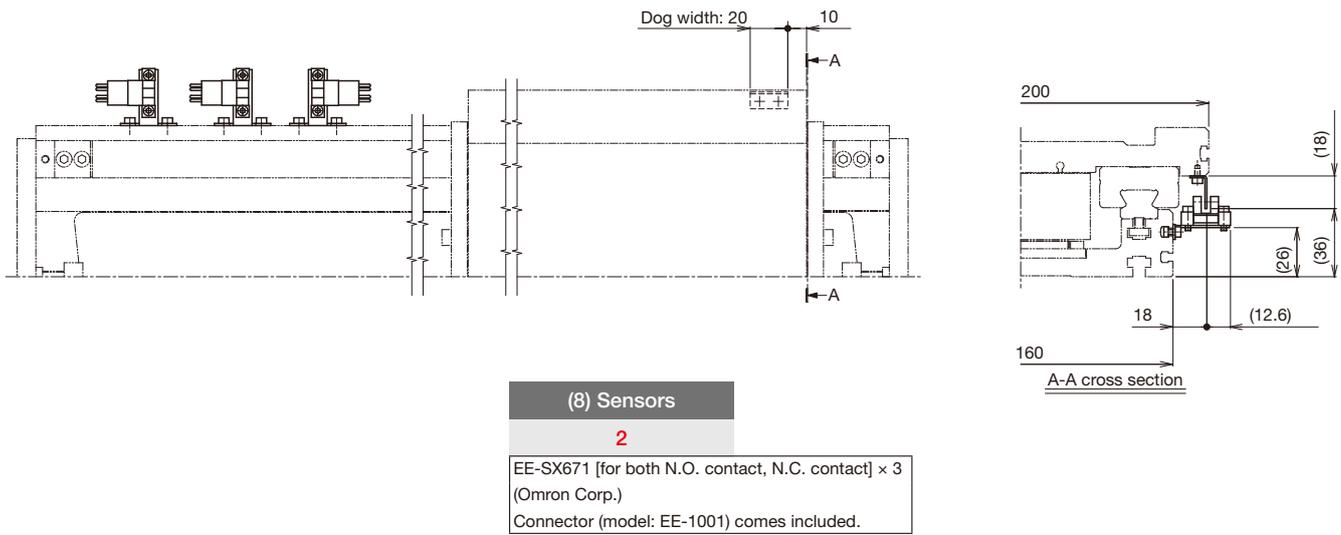
\*5 The main unit weight is the value with a magnetic pole sensor and cover.

## Dimensions at Sensor Installation

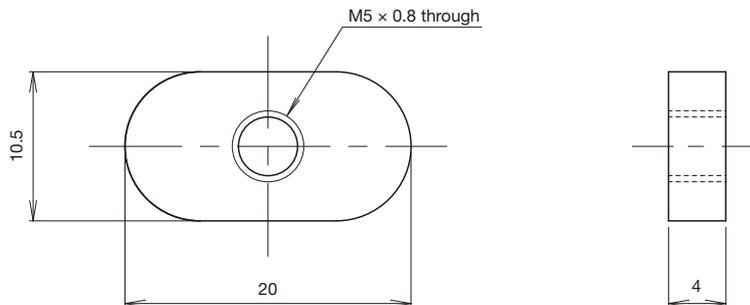
### Proximity sensor [H], [J]



### Photo sensor [2]



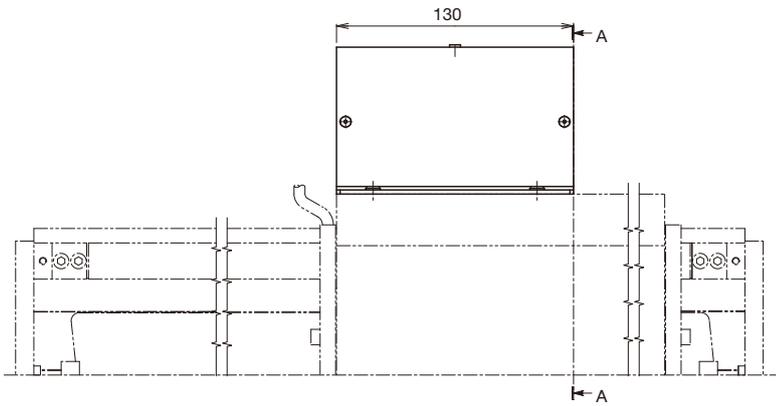
## Outer Dimensions of Base Installation Nuts



Contact THK for base installation nuts.

# Dimensions at Cable Chain Installation

## Connector box [M]

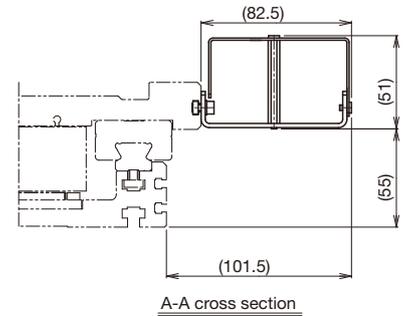


### (9) Cable chain

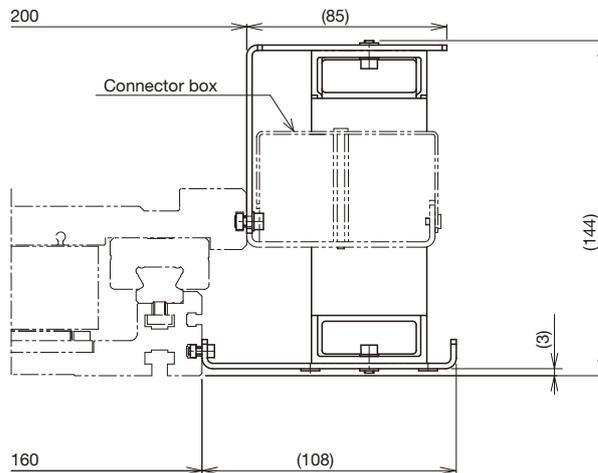
**M**

Connector box only

\* The cable chain should be provided by the customer.



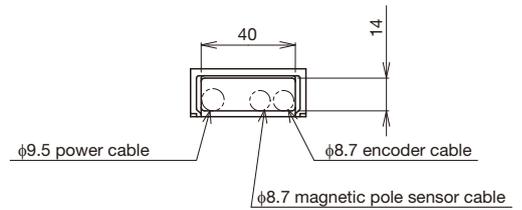
## Cable chain [C]



### (9) Cable chain

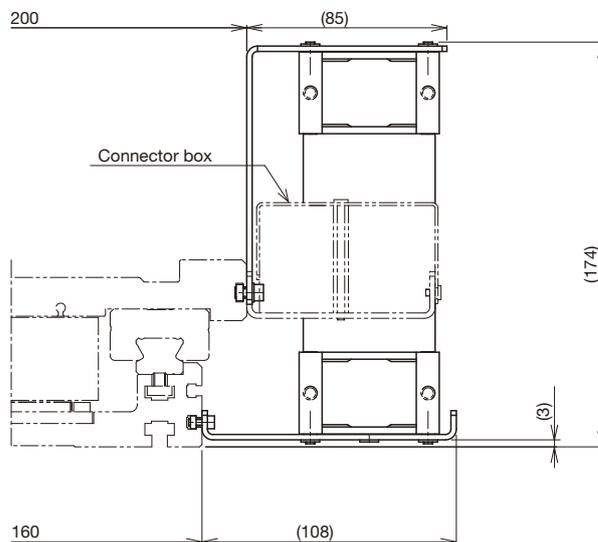
**C**

TKP18H14-30W40R50TC  
(Tsubakimoto Chain CO.)



Note) If a model with a cable chain is selected, a connector box is always supplied with it.

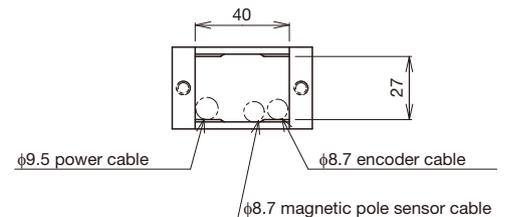
## Cable chain [Q]



### (9) Cable chain

**Q**

E6.29.040.055.0  
(igus K.K.)



Note) If a model with a cable chain is selected, a connector box is always supplied with it.

# Medium and large capacity driver for single axis

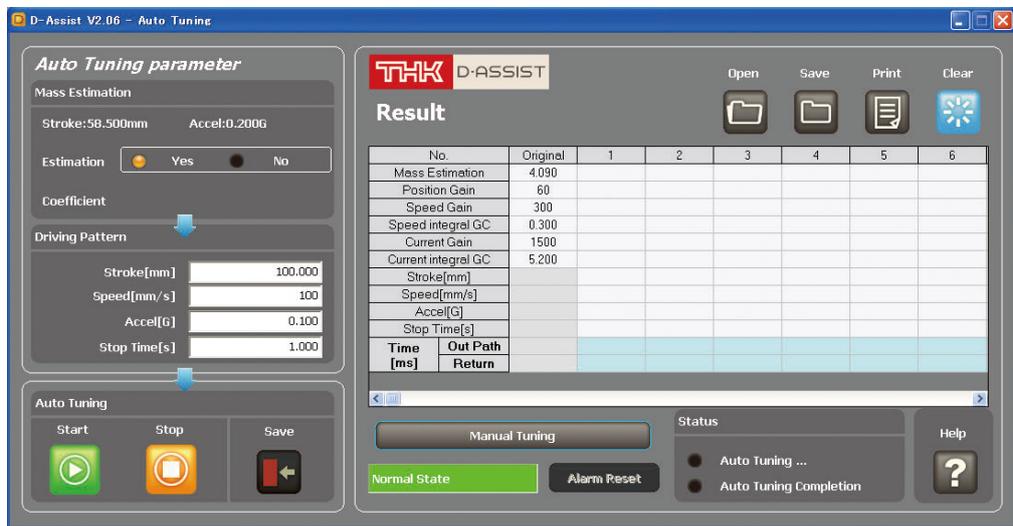
# TDP



## Features

### 1 Auto-tuning

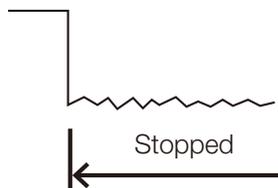
Auto-tuning functionality built-in. Helps realize reductions in adjustment work.



### 2 Vibration suppression function during stop

When the linear motor is stopped, unique vibrations (hunting) from the servo motor are generated. The vibration suppression function during stop makes it possible to suppress these vibrations.

Without vibration suppression function during stop



With vibration suppression function during stop



### 3 East-to-use setup tool

With the PC software D-Assist Ver. 2, it is easy to set parameters, etc.

### 4 USB communication function

By using a USB 2.0 to communicate with a PC, high speed communication is possible.

# Setup tool

The PC software D-Assist Ver. 2 is required when changing the parameters for driver TDP.

## PC software D-Assist Ver. 2



### Features

Easy setting on PC

Parameter settings can be performed on your PC.

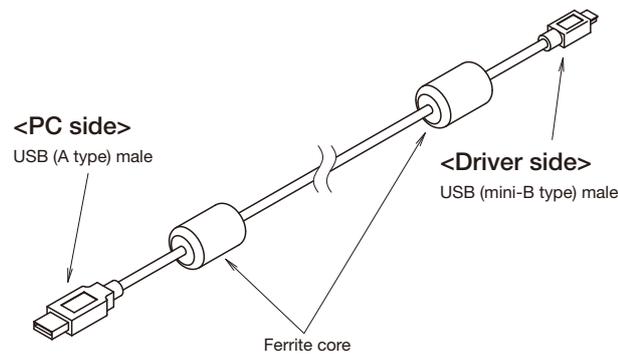
### Functions

- Auto-tuning function setting
- Parameter checking / changing / writing / saving
- Monitoring (I/O, position, alarm, effective load factor)
- Logging (Position / speed / current waveform display)
- Jogging/inching movement
- Communication speed settings
- Supported OS: Windows 7, XP, Vista

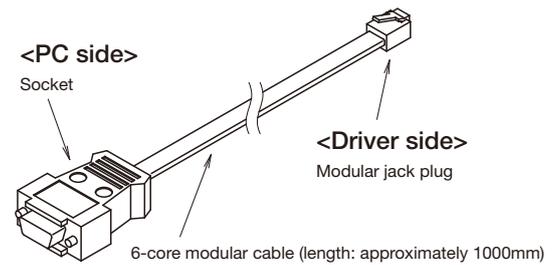


Note) When using D-Assist, the PC communication cable K232-01 (sold separately) or a USB cable are required.

### USB cable (commercially available)\*



### Computer communication cable K232-01



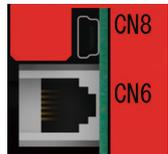
\* For the USB cable, use a commercially available product with a ferrite core.

# TDP Medium and large capacity driver for single axis



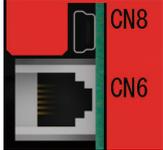
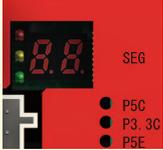
## Specification (main circuit voltage 100V AC)

Model	Model number		TDP				
	Capacity		100W	200W	450W	750W	
Model	Appearance						
Input power supply	Main circuit		100V AC single phase, 50/60Hz (Allowable voltage: 90 to 120V)				
	Control circuit		100V AC single phase, 50/60Hz (Allowable voltage: 90 to 120V)				
	Power supply capacity		0.2kVA	0.3kVA	0.7kVA	0.9kVA	
Control	Number of control axes		1 shaft				
	Control method		PWM control, sine wave drive method				
	Auto-tuning		Settling time emphasis type				
	Position detection	Detection method		Incremental			
		Input signal		Phase A + phase B (pulse)			
	Position control	Command method		Pulse train (sign + pulse train/CW + CCW pulse train/two-phase pulse train with 90° phase difference)			
		Input signal		Differential line driver (5V DC)			
Frequency		Max 5 MHz					
Input/output	Positional signal output		Phase A, Phase B, Phase Z				
	Dedicated input/output	Input point	7 points (servo on, forward/reverse run prohibited, alarm reset, reference pulse inhibit, DB input, location deviation clear)				
		Output point	6 points (servo alarm, alarm code (3 bits), positioning completion, servo ready)				
Communication	Serial communication 1 (CN8)	Connected device	Computer software D-Assist				
		Communication method	USB2.0 (Full Speed)				
		Port count	USB Mini B × 1				
	Serial communication 2 (CN6)	Connected device	Computer software D-Assist				
		Communication method	RS-232C				
		Port count	RJ-11 (6-pole/6-core) × 1				
Functions	Display function		seven segment LED (two digits), charge LED, internally powered LED × 5, display LED × 3				
	Protective function		Motor overcurrent, main circuit overvoltage, motor overload, abnormal motion error detection, electrical thermal, etc.				
Peripherals	Accessories		I/O connector (With case)				
	Options (sold separately)	Built-in	-				
External		PC communications cable K232 (RJ-11 ↔ RS-232C) PC communications cable (Mini USB ↔ USB)*					
Environment	Operating/storage temperature		0 to 50°C (No freezing)/-20 to 85°C (No freezing)				
	Operating/storage humidity		90% RH or below (No condensation)				
	Ambient condition		Interior (avoid direct sunlight), free from corrosive gas, inflammable gas, oil mist, and dust. No exposure to water, oil, or chemicals.				
Compliance standards	CE Marking		Low voltage directive: EN61800-5-1 EMC directive: EN61800-3				
	UL standard		UL508C				
Structure	Protection level		IP20				
	Weight		1.0kg		1.3kg		



\* USB cable should be provided by the customer.

## Specification (main circuit voltage 200V AC)

Model	Model number		TDP						
	Capacity		100W	200W	450W	750W	1kW	1.5kW	3kW
Model	Appearance								
Input power supply	Main circuit		200V AC single-phase/three-phase, 50/60Hz (Allowable voltage: 170 to 250V)			200V AC three-phase, 50/60Hz (Allowable voltage: 170 to 250V)			
	Control circuit		200V AC single-phase, 50/60Hz (Allowable voltage: 170 to 250V)						
	Power supply capacity		0.4kVA	0.75kVA	1.4kVA	1.9kVA	2.3kVA	3.2kVA	6.4kVA (3.2kVA × 2)
Control	Number of control axes		1 shaft						
	Control method		PWM control, sine wave drive method						
	Auto-tuning		Settling time emphasis type						
	Position detection	Detection method	Incremental						
		Input signal	Phase A + phase B (pulse)						
	Position control	Command method	Pulse train (sign + pulse train/CW + CCW pulse train/two-phase pulse train with 90° phase difference)						
Input signal		Differential line driver (5V DC)							
Input/output	Frequency		Max 5 MHz						
	Positional signal output		Phase A, Phase B, Phase Z						
	Dedicated input/output	Input point	7 points (servo on, forward/reverse run prohibited, alarm reset, reference pulse inhibit, DB input, location deviation clear)						
Output point		6 points (servo alarm, alarm code (3 bits), positioning completion, servo ready)							
Communication	Serial communication 1 (CN8)	Connected device	Computer software D-Assist						
		Communication method	USB2.0 (Full Speed)						
		Number of ports	USB Mini B × 1						
	Serial communication 2 (CN6)	Connected device	Computer software D-Assist						
		Communication method	RS-232C						
		Number of pots	RJ-11 (6-pole/6-core) × 1						
Functions	Display function		Seven segment LED (two digits), charge LED, internally powered LED × 5, display LED × 3						
	Protective function		Motor overcurrent, main circuit overvoltage, motor overload, abnormal motion error detection, electrical thermal, bus voltage unbalanced*1, current unbalanced*1, etc.						
Peripherals	Accessories		I/O connector (With case)						
	Options (sold separately)	Built-in	-						
External		PC communications cable K232 (RJ-11 ↔ RS-232C) PC communications cable (Mini USB ↔ USB)*2							
Environment	Operating/storage temperature		0 to 50°C (No freezing)/-20 to 85°C (No freezing)						
	Operating/storage humidity		90% RH or below (No condensation)						
	Ambient condition		Indoor (Free from direct sunlight, corrosive gas, flammable gas, oil mist) No exposure to water, oil, or chemicals.						
Compliance standards	CE Marking		Low voltage directive: EN61800-5-1 EMC directive: EN61800-3						
	UL standard		UL508C						
Structure	Protection level		IP20						
	Weight		1.0kg		1.3kg	2.0kg	2.1kg	3.9kg	

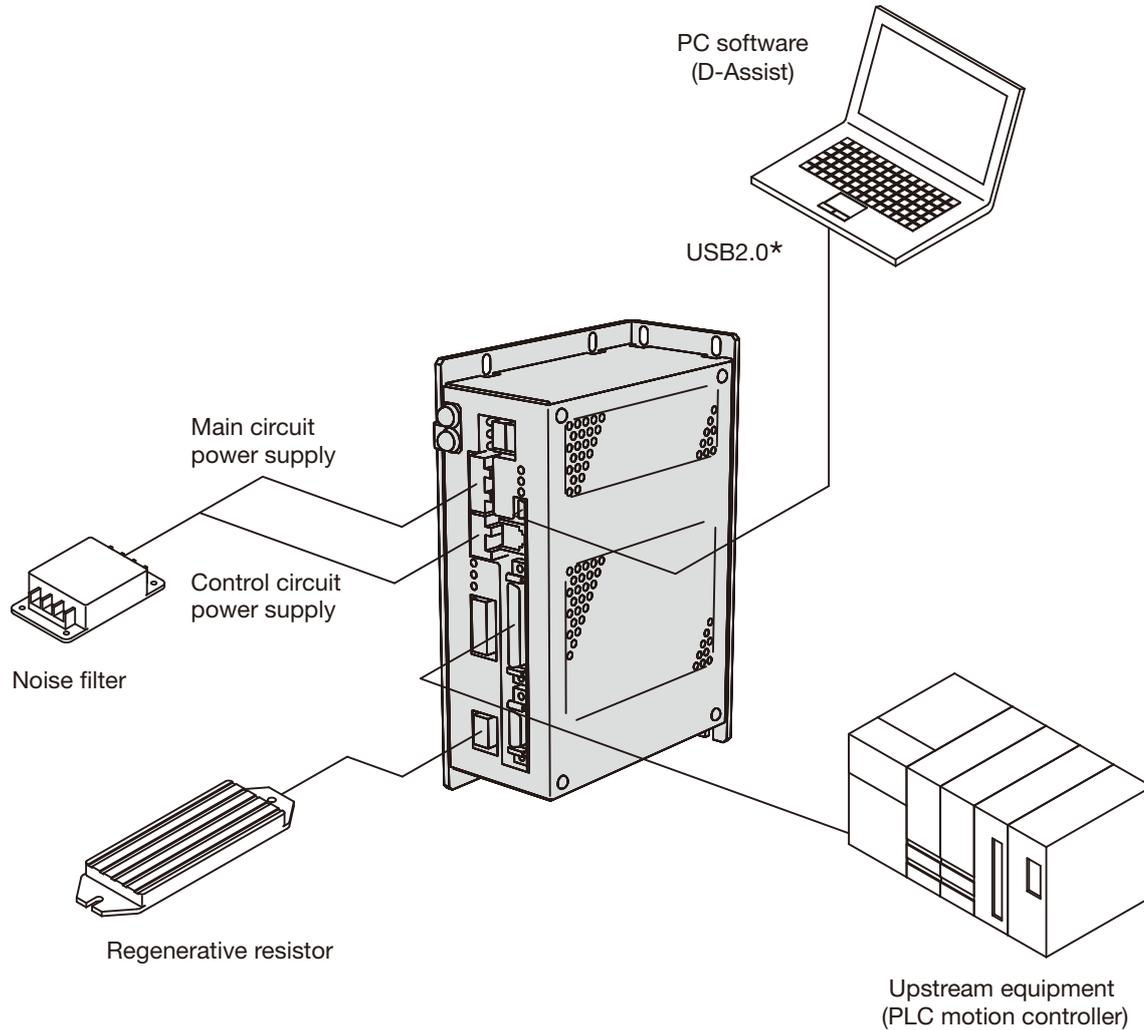
\*1 Only TDP-300CU-200AC is supported.

\*2 USB cable to be provided by the customer.

# TDP Medium and large capacity driver for single axis



## Peripheral Device Configuration



\*When connecting to a personal computer, use USB2.0 or RS-232C.

## I/O List

I/O	CN7 Pin number	Signal name	Description of functions
Input	3	GND	I/O external power supply (24V DC)
	4	+24V	
	5	SG	Signal ground (for positional directive, analog monitor)
	7	PULSE	Sign + pulse train, positional directive (pulse train input)
	8	/PULSE	By setting parameters, it is possible to select between CW+CCW mode and phase difference 2-phase pulse train mode.
	9	DIR	Sign + pulse train method, positional directive (sign input)
	10	/DIR	By setting parameters, it is possible to select between CW+CCW mode and phase difference 2-phase pulse train mode.
	11	S-ON	Servo on
	12	GND	
	13	P-OT	Forward run prohibited
	14	GND	Reverse run prohibited
	15	N-OT	
	16	GND	Auxiliary input By setting parameters, it is possible to allocate location deviation clear functions.
	17	UI1	
	18	GND	Positional reference pulse inhibit
	19	INH	
	20	GND	Dynamic brake function cancellation
	21	DBK	
	22	GND	Alarm reset
	23	ALM-RST	
24	GND	Cannot be used	
25	-		
26	-		
Output	27	S-RDY	Servo ready
	28	GND	Positioning completed
	29	INPOS	
	30	GND	Alarm code (3-bit output)
	31	ALO0	
	32	GND	
	33	ALO1	
	34	GND	
	35	ALO2	Alarm
	36	GND	
	37	ALM	Cannot be used
	38	GND	
	39	-	
	40	-	
41	-	Positional signal (phase A)	
42	-		
43	PAO	Positional signal (phase B)	
44	/PAO		
45	PBO	Positional signal (phase Z)	
46	/PBO		
47	PZO	Analog monitor (CN0)	
48	/PZO		
49	AN0-MON	Analog monitor (CN1)	
50	AN1-MON		

# TDP Medium and large capacity driver for single axis



## Model Configuration

Model	Capacity	Input power supply	Actuator	Resolution	Magnetic pole sensor
TDP	- 075CU	- 200AC	- GA20MU	- 1U	- N
(1)	(2)	(3)	(4)	(5)	(6)
Driver elements			Actuator elements		

(1) Model number	TDP				
(2) Capacity	010CU: 100W 020CU: 200W 045CU: 450W 075CU: 750W		100CU: 1kW 150CU: 1.5kW 300CU: 3kW		
(3) Input power supply	100AC: 100V AC single-phase 200AC: 200V AC single-/three-phase * For 1kW, 1.5kW and 3kW capacity specifications, only a 200V AC three-phase input power supply is supported.				

(4) Actuator	E.g.) G10M : GLM10 M type GA20MU : GLM20AP M type GA20LU : GLM20AP L type * Refer to the "Model number list" on page 5 for details.				
			GA15S : GLM15AP S type K46S : KLM46 S type		

(5) Resolution	10U : 10.0μm 5U : 5.0μm 1U : 1.0μm 500N : 0.5μm 100N : 0.1μm																																													
	<table border="1"> <thead> <tr> <th rowspan="2">Actuator</th> <th colspan="5">Resolution</th> </tr> <tr> <th>10U (10.0μm)</th> <th>5U (5.0μm)</th> <th>1U (1.0μm)</th> <th>500N (0.5μm)</th> <th>100N (0.1μm)</th> </tr> </thead> <tbody> <tr> <td>GLM10</td> <td></td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> </tr> <tr> <td>GLM15AP</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> </tr> <tr> <td>GLM20AP</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> </tr> <tr> <td>GLM25</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> </tr> <tr> <td>KLM46</td> <td></td> <td></td> <td>●</td> <td>●</td> <td>●</td> </tr> </tbody> </table>					Actuator	Resolution					10U (10.0μm)	5U (5.0μm)	1U (1.0μm)	500N (0.5μm)	100N (0.1μm)	GLM10		●	●	●	●	GLM15AP	●	●	●	●	●	GLM20AP	●	●	●	●	●	GLM25	●	●	●	●	●	KLM46			●	●	●
Actuator	Resolution																																													
	10U (10.0μm)	5U (5.0μm)	1U (1.0μm)	500N (0.5μm)	100N (0.1μm)																																									
GLM10		●	●	●	●																																									
GLM15AP	●	●	●	●	●																																									
GLM20AP	●	●	●	●	●																																									
GLM25	●	●	●	●	●																																									
KLM46			●	●	●																																									

(6) Magnetic pole sensor	J : With magnetic pole sensor N : Without magnetic pole sensor *Only N (without magnetic pole sensor) is used for KLM46.				
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## Model Number List

(5): Resolution  
(6): Magnetic pole sensor

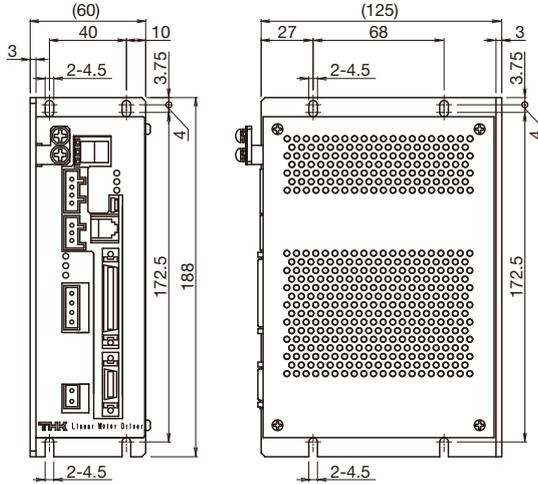
Capacity	Input power supply	Actuator	Driver model
100W	Single-phase 100V AC	GLM10 S type	TDP-010CU-100AC-G10S-(5)-(6)
		GLM10 M type	TDP-010CU-100AC-G10M-(5)-(6)
	200V AC single-/three-phase	GLM10 S type	TDP-010CU-200AC-G10S-(5)-(6)
		GLM10 M type	TDP-010CU-200AC-G10M-(5)-(6)
		KLM46 S type	TDP-010CU-200AC-K46S-(5)-(6)
200W	Single-phase 100V AC	GLM15AP S type	TDP-020CU-100AC-GA15S-(5)-(6)
	200V AC single-/three-phase	GLM15AP S type	TDP-020CU-200AC-GA15S-(5)-(6)
		KLM46 M type	TDP-020CU-200AC-K46M-(5)-(6)
450W	Single-phase 100V AC	GLM15AP M type	TDP-045CU-100AC-GA15M-(5)-(6)
		GLM20AP S type	TDP-045CU-100AC-GA20SU-(5)-(6)
	200V AC single-/three-phase	GLM15AP M type	TDP-045CU-200AC-GA15M-(5)-(6)
		GLM20AP S type	TDP-045CU-200AC-GA20SU-(5)-(6)
750W	Single-phase 100V AC	GLM20AP M type	TDP-075CU-100AC-GA20MU-(5)-(6)
	200V AC single-/three-phase	GLM20AP M type	TDP-075CU-200AC-GA20MU-(5)-(6)
1kW	200V AC three-phase	GLM20AP L type	TDP-100CU-200AC-GA20LU-(5)-(6)
1.5kW	200V AC three-phase	GLM25 S type	TDP-150CU-200AC-G25S-(5)-(6)
3kW	200V AC three-phase	GLM25 M type	TDP-300CU-200AC-G25M-(5)-(6)

# TDP Medium and large capacity driver for single axis

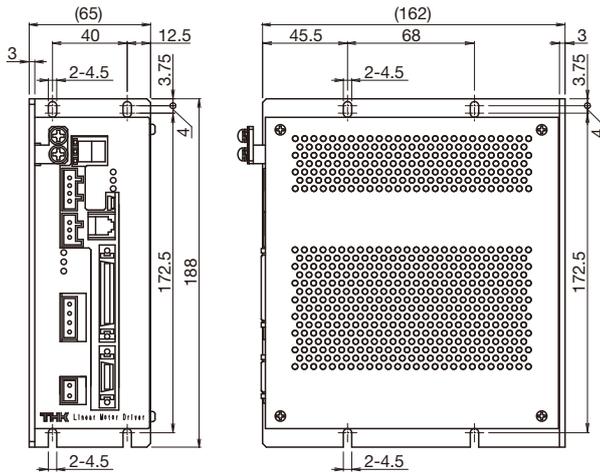


## Dimension Diagram

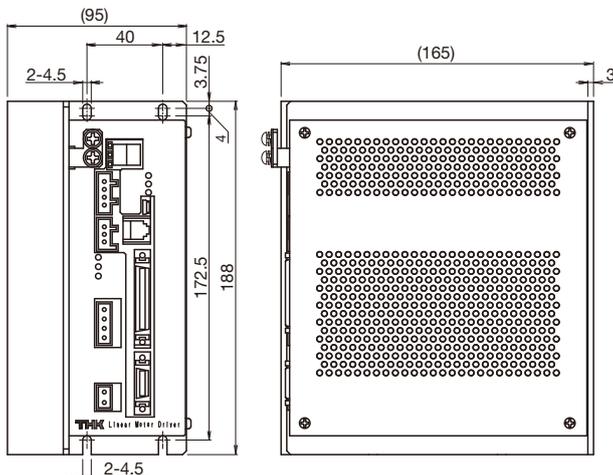
TDP-010CU, TDP-020CU, TDP-045CU



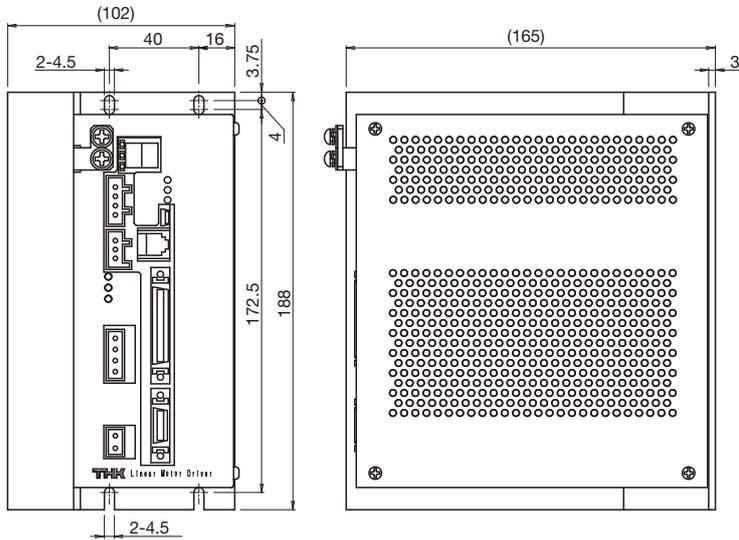
TDP-075CU



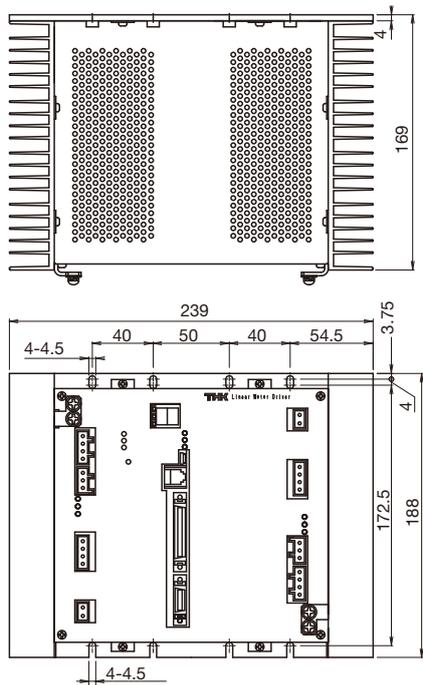
TDP-100CU



## TDP-150CU



## TDP-300CU



## Details of Setup Tools

# D-Assist Ver.2

## Support for realizing optimal motion

The D-Assist is a user support tool.

Provides support for setting of driver functions or linear motor adjustments.

\*D-Assist can be downloaded free of charge (<https://tech.thk.com/>).



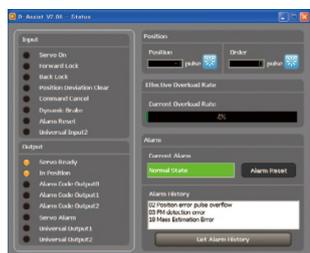
## Functions



Parameter settings



Logging



Monitor display

### Parameter settings

Confirmation/alteration/saving of each parameter can be performed.

### Motion confirmation

Jogging and inching movement, as well as auto tuning can be performed.

### Monitor display

I/O and positional directive/current position can be displayed.

### Logging

Waveforms for current speed and location deviation, etc., can be obtained.

### Support for multiple languages

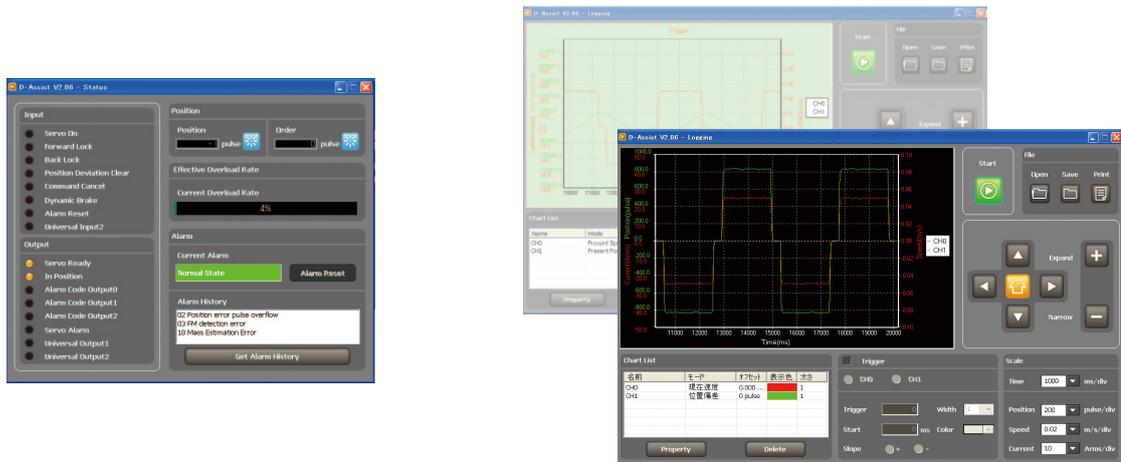
Three display languages are available.  
Japanese / English / Chinese (simplified)

### Help function

An explanation of parameters, as well as causes and remedial procedures for alarm displays can be confirmed.

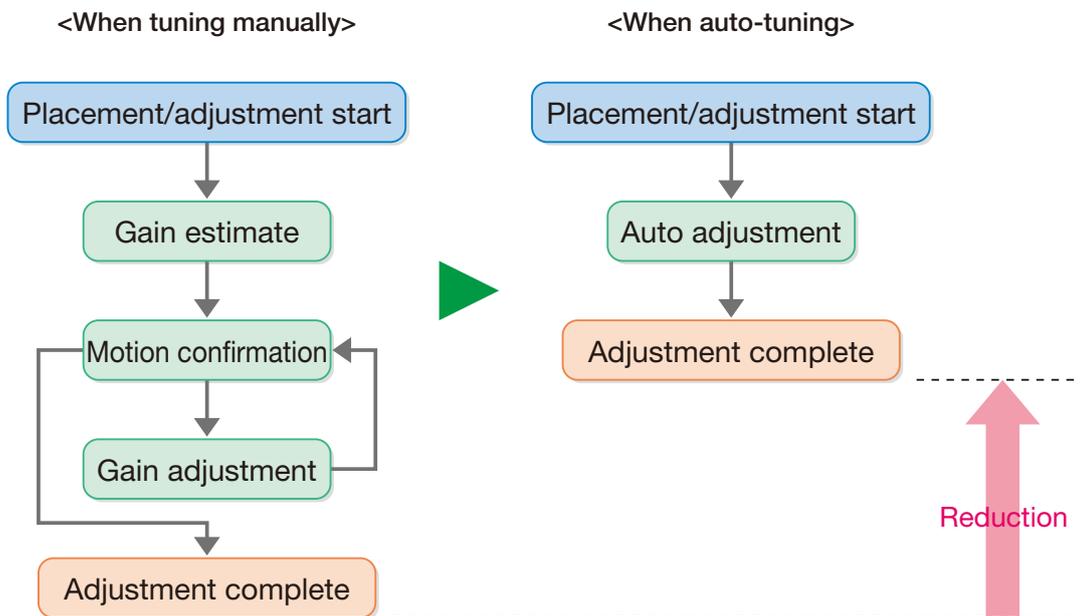
## User-friendly Interface

The monitor and icon designs have been updated. Intuitive operation has been made possible, making this tool easier to use.



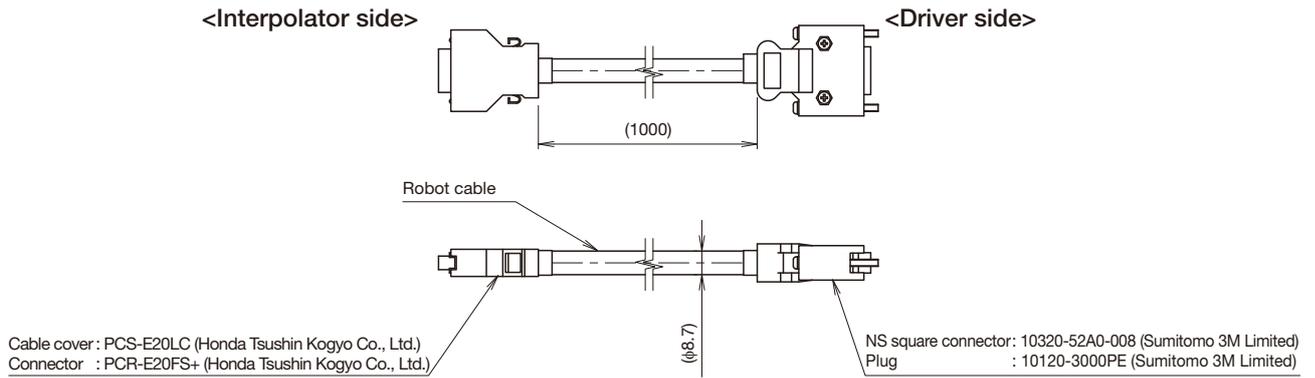
## Supports Servo Adjustments

Auto-tuning functionality built-in. Helps realize reductions in adjustment work.

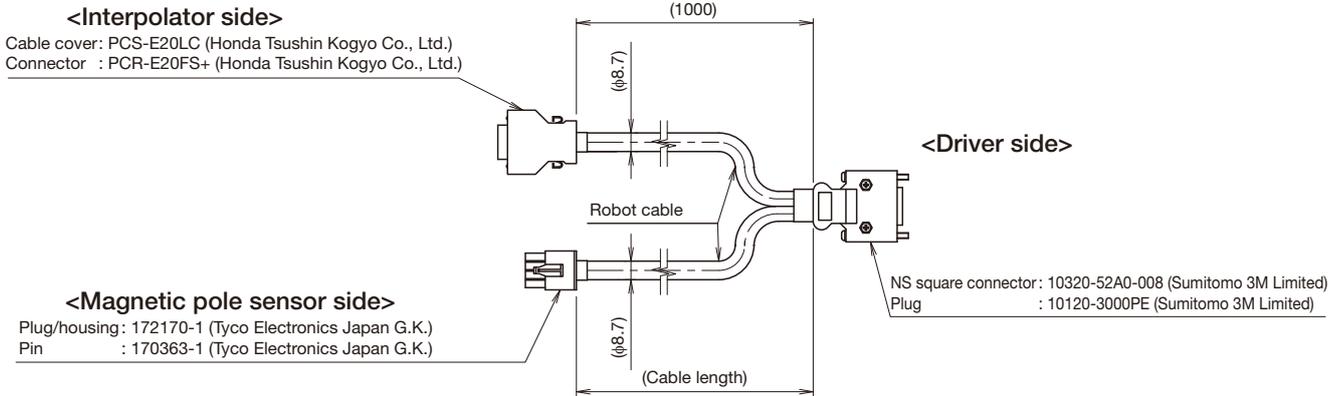




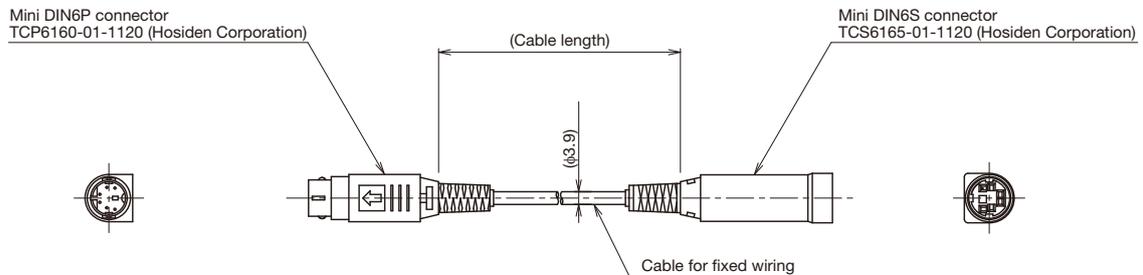
## KSET-01-CU: Connection cable between interpolator and driver (for GLM15AP/20AP/25)



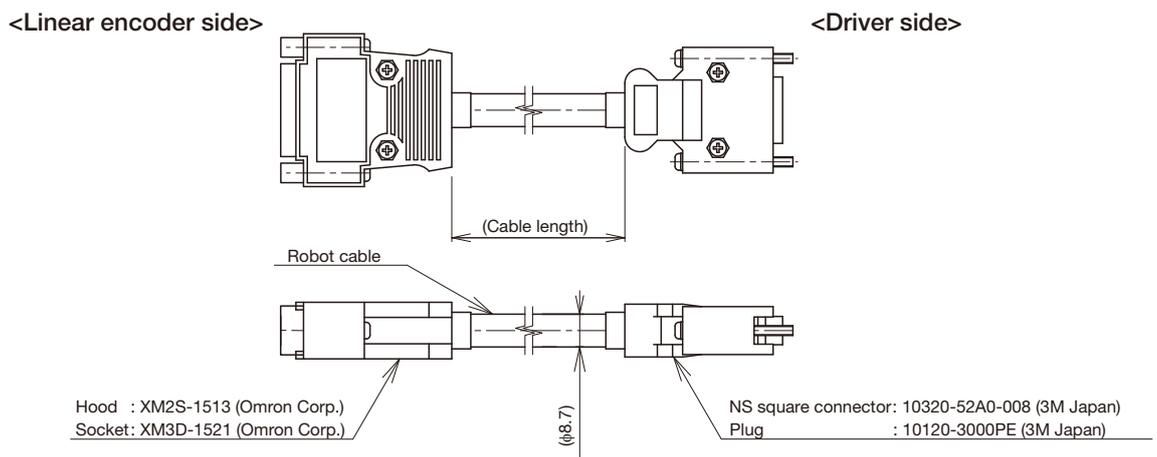
## KSJT-\*\*-CU: Connection cable between interpolator and magnetic pole sensor (for GLM15AP/20AP/25)



## CE09-\*\*- Origin detector cable (for GLM15AP/20AP/25)



## KEK-\*\*-CU: Optical linear encoder cable (for GLM15AP/20AP, KLM46)



## GLM20AP Selection Method

Select the linear motor following the procedure below.

\* If you provide the usage conditions, THK can select a recommended model number.  
Please contact THK.

### 1. Evaluate the maximum thrust ratio

---

Make sure that the maximum thrust of the motor exceeds the required thrust for operations.  
It is recommended to use with **80% or less** of the maximum thrust by load fluctuations into account.

### 2. Evaluate the RMS thrust ratio

---

Make sure that the rated continuous thrust of the motor exceeds the required RMS thrust.  
It is recommended to use with **70% or less** of the rated continuous thrust by taking load fluctuations into account.

\* It is recommended to use with 60% or less of the the rated continuous thrust when using the actuator in a ceiling mount.  
Please contact THK for details.

### 3. Confirm the specifications of the selected model number

---

Check the detailed specifications of the model number selected using the above process, to ensure that external dimensions, stroke, maximum speed, resolution and positioning repeatability all satisfy the requirement.

### 4. Selection of regenerative resistor

---

A regenerative resistor may be required depending on the operating conditions.  
Check the "GLM20AP Instruction Manual" and Evaluation of regenerative resistor (→ P.36) for the selection method.

## Calculation conditions

$m_1$	Payload	[kg]
$m_2$	Slider mass	[kg]
V	Motion speed	[m/s]
g	Gravitational acceleration (9.807m/s <sup>2</sup> )	
$\mu$	Friction coefficient	
$\alpha$	Acceleration	[m/s <sup>2</sup> ]
L	Stroke	[m]
P	Motor attraction force	[N]
f	Sliding resistance of LM block	[N]
n	No. of LM blocks being used	
T	1 cycle time	[s]
t <sub>1</sub>	Acceleration time	[s]
t <sub>2</sub>	Constant speed time	[s]
t <sub>3</sub>	Deceleration time	[s]
t <sub>4</sub>	Stop time	[s]

## Data for selection

Motor type	S type	M type	L type
Slider mass: $m_2$ [kg]	5.3 (5.1)	9.1 (8.9)	12.9 (12.7)
Motor attraction force: P [N]	1232	2547	3728
No. of LM blocks being used: n [pcs]	4	6	8
Sliding resistance of LM block: f [N]	3.7		
Friction coefficient: $\mu$	0.01		
Maximum load capacity [kg] * <sup>1</sup>	46.1	86.1	134.6
Estimated load capacity [kg] * <sup>2</sup>	7.7	15.0	24.5

Note: The values in ( ) are for the specifications without the magnetic pole sensor.

\*<sup>1</sup> Speed or acceleration/deceleration may be reduced by the payload mass. See "GLM20AP Selection Method" on Pages 31 to 35.

The maximum load capacity is the mass that can be driven with the acceleration of approx. 0.5G.

\*<sup>2</sup> The estimated load capacity is the mass that can be driven with the acceleration of approx. 2G, with the maximum speed of 1.0m/s, and at a duty factor of 50% of a constant stroke.

However, operable mass may vary as it may be affected by thrust-speed characteristics depending on speed.

Table 1. Permissible driver regenerative energy

Driver model no.	Permissible regenerative energy $E_2$ [J]	Minimum permissible resistance [Ω]	Regenerative power [W]			
			RH120 100Ω	RH150 100Ω	RH220 100Ω	RH300C 100Ω
				RF180 100Ω	RF240 100Ω	
TDP-045CU-100AC-GA20SU	3.6	50	70	90	120	200
TDP-045CU-200AC-GA20SU	4.5	100	70	90	120	200
TDP-075CU-100AC-GA20MU	8.7	50	70	90	120	200
TDP-075CU-200AC-GA20MU	13.1	100	70	90	120	200
TDP-100CU-200AC-GA20LU	19.7	100	70	90	120	200

Table 2. External regenerative resistor and reference model for reference

Name	Type	Specifications	Manufacturer
Regenerative resistor	RH*** 50/100Ω *	Without thermostat	Iwaki Musen Kenkyusho
	RH*** 50/100Ω * - *** B	With thermostat (external)	
	RF*** 50/100Ω * - *** B	With thermostat (internal)	
Female plug: 2-pole Pin pitch: 5.08mm	231-302/026-000		WAGO

Note: \* under the Type column of the regenerative resistor indicates, from the left toward the right, the power, permissible resistance, and thermostat temperature, respectively. For details, refer to the manufacturer's catalog.

### Evaluating the maximum thrust ratio

The required maximum thrust  $F_{\max}$  is the largest value out of the values calculated by the following three formulas:

Load force: $F$ [N]	$F = \mu \times m_1 \times g$
Thrust during acceleration: $F_a$ [N]	$F_a = (m_1 + m_2) \times \alpha + F$
Thrust during deceleration: $F_{d1}$ [N]	$F_{d1} = (m_1 + m_2) \times \alpha - F$

Required maximum thrust  $F_{\max}$ : Maximum value of  $F$ ,  $F_a$  and  $F_{d1}$  above

Find the maximum thrust  $F_{\text{peak}}$  of the actuator at the motion speed from the thrust-speed characteristics chart in product specifications (→ P.5).

Maximum thrust ratio (%):  $\frac{F_{\max}}{F_{\text{peak}}} \times 100$  80% or less is recommended.

### Evaluating the RMS thrust ratio

Calculate the RMS (root-mean-square) thrust from the load force, thrust during acceleration, and thrust during deceleration with respect to each duration.

RMS thrust: $F_{\text{rms}}$ [N]	$F_{\text{rms}} = \sqrt{\frac{F_a^2 \times t_1 + F^2 \times (t_2 + t_4) + F_{d1}^2 \times t_3}{T}}$
----------------------------------	---

Also, from the motion profile, average speed:  $V_{\text{ave}}$  is calculated.

Average speed: $V_{\text{ave}}$ [m/s]	$V_{\text{ave}} = \frac{L}{T \text{ (1 cycle time)}}$
---------------------------------------	---

Find the rated continuous thrust  $F_{\text{cont}}$  of the motor from the thrust-speed characteristics chart in product specifications (→ P.5).

RMS thrust ratio (%):  $\frac{F_{\text{rms}}}{F_{\text{cont}}} \times 100$  70% or less is recommended.

### Evaluating the regenerative resistor

Use the following formula to calculate the thrust during deceleration.

Thrust during deceleration: $F_{d2}$ [N]	$F_{d2} = (m_1 + m_2) \times \alpha - [(m_1 + m_2) \times g + P] \times \mu + f \times n$
Regeneration energy: $E_1$ [J]	$E_1 = F_{d2} \times t_3 \times \frac{V}{2}$

Check the permissible regenerative energy  $E_2$  of the driver to be used. (→ P.32 Table 1)

If  $E_2 < E_1$ , regeneration resistor is required.

Required capacity of regenerative resistor: $W_K$ [W]	$W_K = \frac{(E_1 - E_2)}{0.2 \times T}$
---	--

## Example of Selection

The examination below shows that if GLM20AP-S type can drive a payload of 10kg along the following motion profile:

Selection model	: GLM20AP-S type 200V AC specifications without magnetic pole sensor
Payload	: $m_1 = 10$ [kg]
Slider mass	: $m_2 = 5.1$ [kg]
Motion speed	: $V = 1.0$ [m/s]
Acceleration	: $\alpha = 10$ [m/s <sup>2</sup> ]
Stroke	: $L = 1.0$ [m]
Friction coefficient	: $\mu = 0.01$
Gravitational acceleration	: $g = 9.807$ [m/s <sup>2</sup> ]

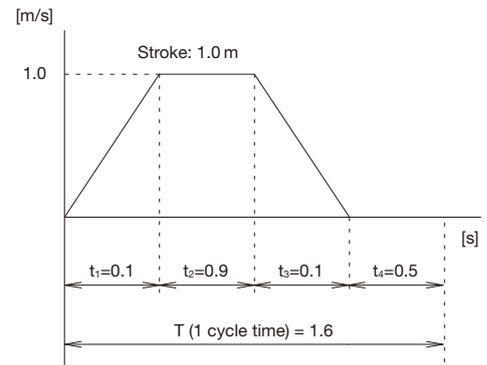


Figure: Motion profile

### (1) Evaluating the required maximum thrust ratio

The required maximum thrust is the largest value out of the values calculated by the following three formulas.

$$\begin{aligned} \text{Load force} \quad : F &= \mu \times m_1 \times g \\ &= 0.01 \times 10 \times 9.807 \\ &= 1.0 \text{ [N]} \end{aligned}$$

$$\begin{aligned} \text{Thrust during acceleration} : F_a &= (m_1 + m_2) \times \alpha + F \\ &= (5.1 + 10) \times 10 + 1.0 \\ &= 152.0 \text{ [N]} \end{aligned}$$

$$\begin{aligned} \text{Thrust during deceleration} : F_{d1} &= (m_1 + m_2) \times \alpha - F \\ &= (5.1 + 10) \times 10 - 1.0 \\ &= 150.0 \text{ [N]} \end{aligned}$$

From the above calculation results:

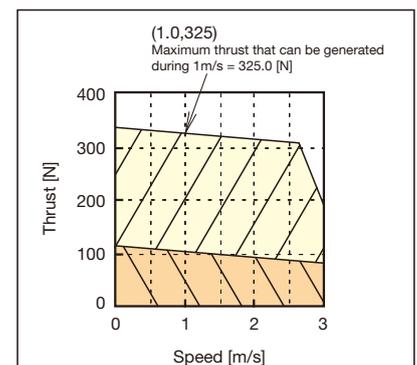
$$\text{Required maximum thrust: } F_{\max} = F_a = 152.0 \text{ [N]}$$

Thrust-speed characteristics chart (Figure) for GLM20AP-S type shows that the thrust of the motor's maximum thrust:

$$F_{\text{peak}} \text{ (at speed = 1.0m/s)} = 325 \text{ [N]}$$

Therefore, the ratio of the required maximum thrust to the motor's maximum thrust is:

$$\frac{F_{\max}}{F_{\text{peak}}} \times 100 = \frac{152}{325} \times 100 = \underline{\underline{47\%}} (\leq 80\%)$$



Motor type : S type  
Driver : TDP-045CU-200AC-GA20SU

Figure: Thrust-speed characteristics chart

(2) Evaluating the RMS thrust ratio

Calculate the RMS (root-mean-square) thrust from the load force, thrust during acceleration, and thrust during deceleration with respect to each duration.

RMS thrust:

$$F_{rms} = \sqrt{\frac{F_a^2 \times t_1 + F^2 \times (t_2 + t_4) + F_d^2 \times t_3}{T}}$$

$$= \sqrt{\frac{152.0^2 \times 0.1 + 1.0^2 \times (0.9 + 0.5) + 150.0^2 \times 0.1}{1.6}}$$

$$= 53.4 [N]$$

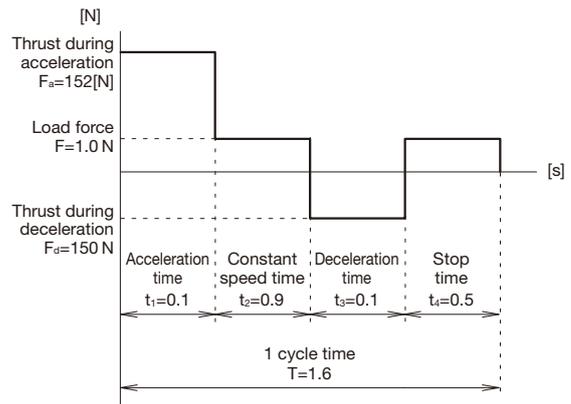


Figure: Thrust and time

Also, from the motion profile, average speed :  $V_{ave}$  is calculated:

$$V_{ave} = \frac{L}{T} = \frac{1.0}{1.6} = 0.625 [m/s]$$

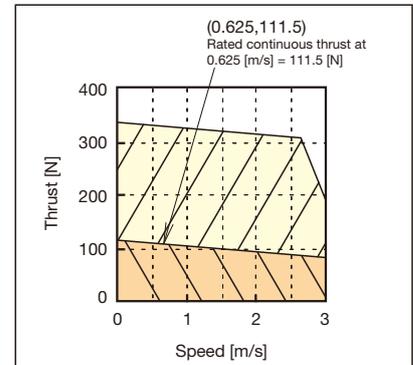
Thrust-speed characteristics chart for GLM20AP-S type shows that the thrust of the motor's rated continuous thrust:

$$F_{cont} \text{ (at the time of average speed } 0.625m/s) = 111.5 [N]$$

Therefore, the RMS thrust ratio for the rated continuous thrust is:

$$\frac{F_{rms}}{F_{cont}} \times 100 = \frac{53.4}{111.5} \times 100 = 48[\%] (\leq 70\%)$$

As the result above, of the maximum thrust ratio and RMS thrust ratio, this application shall be concluded operative.



Motor type : S type  
Driver : TDP-045CU-200AC-GA20SU

Figure: Thrust-speed characteristics chart

### (3) Evaluating the regenerative resistor

Determine whether or not a regenerative resistor is required, by comparing the value calculated from the thrust during deceleration, deceleration time and motion speed with the permissible regenerative energy of the driver.

Use the following formula to calculate the thrust during deceleration.

$$\text{Thrust during deceleration} : F_{d2} = (m_1 + m_2) \times \alpha - \{[(m_1 + m_2) \times g + P] \times \mu + f \times n\} = 122.4 \text{ [N]}$$

$$\text{Motor attraction force} : P = 1232 \text{ [N]}$$

$$\text{Sliding resistance of LM block} : f = 3.7 \text{ [N]}$$

$$\text{No. of LM blocks} : n = 4 \text{ (for GLM20AP-S)}$$

$$\text{Deceleration time} : t_3 = 0.1 \text{ [s]}$$

$$\text{Cycle time} : T = 1.6 \text{ [s]}$$

$$\text{Motion speed} : V = 1.0 \text{ [m/s]}$$

$$\text{Regenerative energy in the above case: } E_1 = F_{d2} \times t_3 \times \frac{V}{2} = 6.12 \text{ [J]}$$

From Table 1 on P.31, the permissible regeneration of the driver being used (TD-045CU-200AC-GA20SU) is:

$$E_2 = 4.5 \text{ [J]}$$

Because  $E_2 < E_1$ , an external regenerative resistance is required.

$$\text{The required capacity of the external regenerative resistor is: } W_k = \frac{(E_1 - E_2)}{0.2 \times T} = \underline{\underline{5.06 \text{ [W]}}}$$

The 0.2 term in the above formula is the value where the load factor for the external regenerative resistor is 20%.

Because the required capacity of the external regenerative resistor is 5.06W, select a recommended regenerative resistor model number with the capacity of 5.06W or more.

\* Minimum permissible resistance of TDP-045CU-200AC-GA20SU = 100 [ $\Omega$ ]

Therefore, select the RH120 100 $\Omega$  (70W) [Iwaki Musen Kenkyusho].

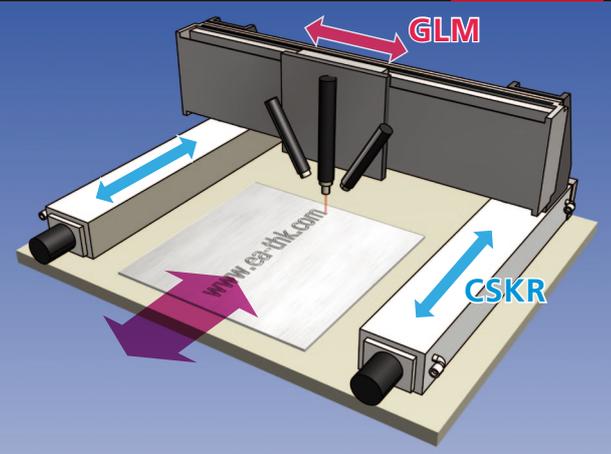
Note 1: Check with the manufacturer for detailed specifications of the external regenerative resistor, including load characteristics and thermostat specifications.

Note 2: If an external regenerative resistor is required, the customer is to provide the connector ( $\rightarrow$  P.32 Table 2).

# Product Usage Example

## Laser marking

Processing / Assembly

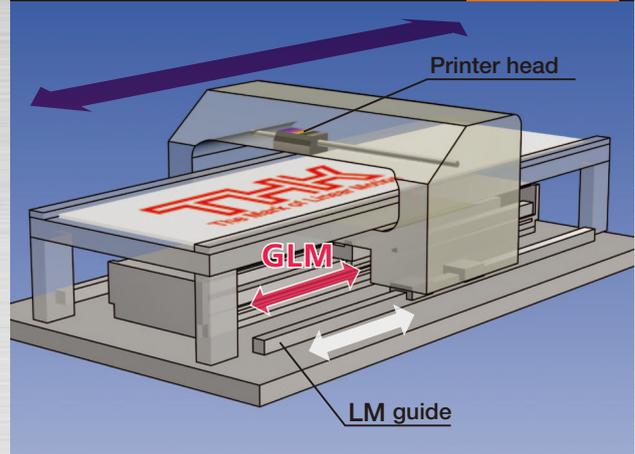


**Model Number Used** CSKR and GLM are used for the laser moving section. By using a clean series CSKR and GLM which generates little dust with non-contact drive, use corresponding to a clean room is possible.

**CSKR GLM**

## Printer

Other

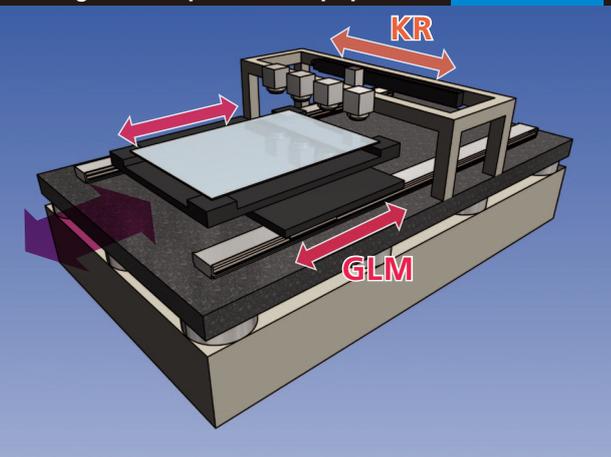


**Model Number Used** GLM is used for the head moving section. High resolution printing is possible using a high accuracy, high resolution GLM.

**GLM LM guide**

## LCD glass inspection equipment

Inspection

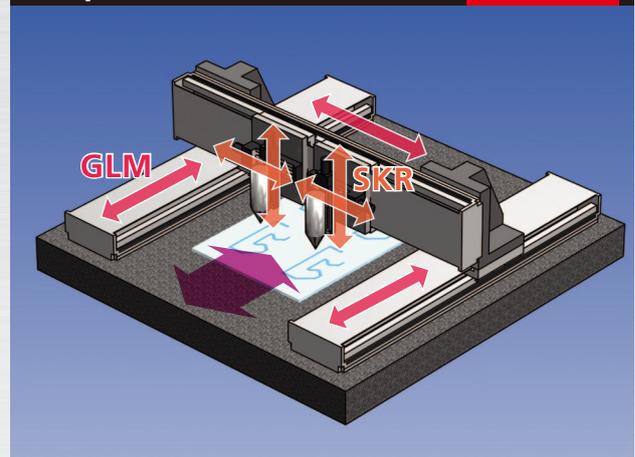


**Model Number Used** Using a GLM that supports long strokes and high speed, larger works with an improved takt time have been achieved.

**KR GLM**

## Dispenser

Processing / Assembly

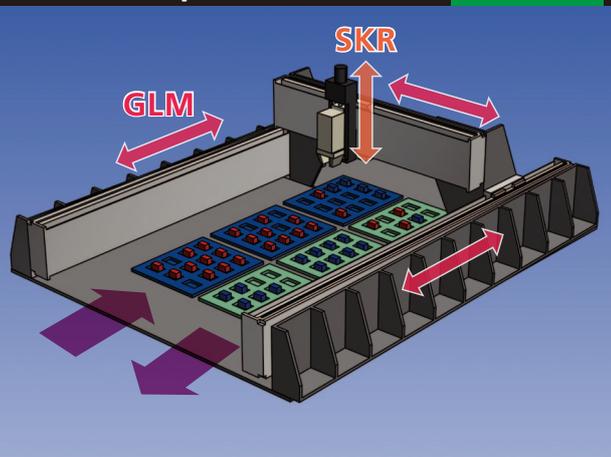


**Model Number Used** SKR and GLM are used for the dispenser. Painting in smooth motions with no irregularities is possible.

**SKR GLM**

## Pick and press

Transport

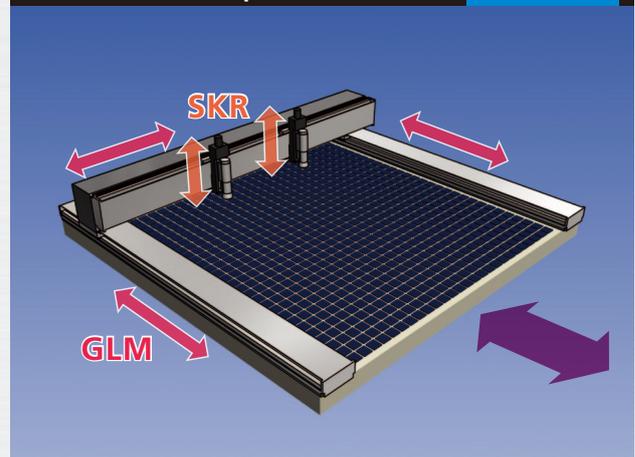


**Model Number Used** GLM is used for the gantry moving section, and SKR is used for the vertical axis. Long stroke motions at high speeds and with high acceleration/deceleration are made possible by utilizing the properties of the linear motor series, helping realize reductions in takt time.

**GLM SKR**

## Glass board inspection device

Inspection



**Model Number Used** GLM and SKR are used for the camera moving section of the inspection equipment. The gantry structure can also support large scale work.

**GLM SKR**

## Glossary

### | Maximum thrust |

Indicates the largest value of the force that the slider can generate instantaneously.

### | Magnetic pole sensor |

The sensor that identifies N and S poles of the magnet. This is used to detect the relative position between the coil and polarity of the permanent magnet.

### | Optical linear encoder |

A position detector that detects the position of the slider by using light (laser light). This is used for applications that require high precision and high resolution.

### | Magnetic linear encoder |

A position detector that detects the position of the slider by using magnetism. This possesses superb environmental resistance compared to the optical type.

### | CE compliance |



Statutory safety logo for the products sold in the EU region. For the unit products such as drivers, etc., obtaining the CE compliance approval became fully compulsory from January 1996 by the EMC directive and low voltage directive.

(1) EMC Directive

- Immunity test: Capacity to withstand noise from outside
- Emission test: Capacity to reduce the release of noise to outside

(2) Low Voltage Directive

- Requirement of electric safety for the electric products that are operated by the power source of 50 to 1000V AC and 75 to 1500V DC.

### | RoHS Directive |

This is a hazardous substances control act enforced by EU on July 1, 2006, prohibiting electric and electronic equipment to contain the specified hazardous substances. If the products contain the hazardous substances that are controlled by this directive, they cannot be sold within the EU region.

### | UL Standard |



UL stands for Underwriters Laboratories Inc., a nonprofit organization in the United States. The UL standard created by UL has garnered public trust as the highest authority for safety standards, and UL Marking is used by many state and local governments in the US.

UL has been approved as the certification and testing agency in Canada by the Canadian Standards Association, and is recognized throughout all states in Canada.

If the products are evaluated in accordance with the safety standards of both America and Canada, and prove that they conform to the standards, they can bear UL Marking, c-UL Marking, or a combination of these.

### | Rated continuous thrust |

Indicates the force that the slider can continuously generate.

### | Maximum load capacity |

Indicates the maximum mass that can be transferred by loading onto the actuator.

\* THK defines the maximum load capacity as the mass that can be transferred with approx. 0.5G acceleration. For actual selection, see Selection Method (P.27 to 33) in this catalog and please contact THK.

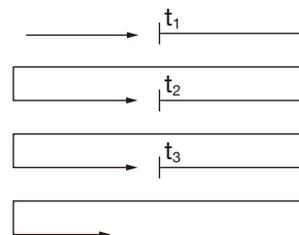
### | Resolution |

Minimum travel distance that can be set.

Note: This does not guarantee the positioning accuracy.

### | Positioning repeatability |

Position to a given point from the same direction seven times, measure the stopping points and then calculate the value of half the maximum difference of the reading. Perform this measurement at the center and at both ends of the travel distance; the largest value becomes the measurement value, and the positioning repeatability is expressed by placing the symbol "±" next to the value of half the maximum difference.



= 1/2 of the maximum difference between  $t_1$ ,  $t_2$ ... $t_7$

### | THK green procurement |

THK Group, through the development of its business activities as well as the social life of each employee, acknowledges that we are deeply related to the global environment, and thus would like to effectively tackle reducing environmental impact. When procuring raw materials and parts used in the production of the products, or those indirect materials and tools used in the production processes, THK Group implements the measures to consider reducing their impact on the environment.



## Precautions on Use

### ● Environment

The wrong environment can cause failure for the actuator and driver. The best places to use the device are as follows:

- For actuators, an environment with a room and ambient temperature from 0 to 40 °C and humidity of no more than 80% RH that will not expose the product to freezing or condensation.
- For drivers, an environment with a room and ambient temperature from 0 to 50 °C and humidity of no more than 90% RH that will not expose the product to freezing or condensation.
- A place free from corrosive gas or flammable gas.
- Places where none of the following are flying around: iron particles, or any other conductive particles, dust, oil mist, cutting fluid, water, salt, organic solvents.
- Places that are not exposed to direct sunlight or radiant heat.
- Places where no strong electric fields or strong magnetic fields occur.
- Places where vibration or impact are not transmitted to the unit.
- Places that are easy to inspect and clean.

### ● Safety Precautions

- This product consists mostly of heavy items (20 kg or more). When moving heavy items, use 2 or more people or moving equipment. Otherwise, injury or damage may occur.
- When transporting and installing this unit, mount the supplied eye nut to the base and attach the slider fixing screw. Always remove the eye nut and slider fixing screw when operating the actuator.
- Do not drop or knock this product. Doing so may cause injury or damage the unit.
- Unnecessarily disassembling this product may allow foreign objects to enter and reduce functionality. Also, there is a risk of electric shock from the driver.
- The PL seal is attached to the magnetic plate, the end plate, the slider and the connector box of the actuator unit.
- The magnetic plate (stator) is a very powerful magnet. Keep magnetic bodies (particularly metals) away from the magnet plate. There is a risk of getting the finger(s) jammed between the metal body and the magnet due to the attractive force of the magnet. Also, persons using cardiac pacemakers should absolutely stay away from the magnet.
- Never touch the moving section of the actuator when it is energized. Also, when the product is in motion, or in a state of readiness for motion, do not enter the movement zone of the actuator.
- When carrying out installation, adjustment, inspection or maintenance of the actuator unit, driver or connected associated devices, always remove all plugs from the power sockets, and use locking or safety plugs etc. so that no one but an operator can turn on the power again. Also, display a notice explaining what work is in progress in a position that is readily seen.
- If two or more people are involved in the operation, confirm the procedures such as sequences, signs, and abnormalities in advance, and appoint another person for monitoring the operation.
- Read the manual carefully, understanding the content properly, and be sure to observe all safety precautions.

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