THK

Linear Motor Actuator

GLM20AP

For details, visit THK at **www.thk.com**
*Product information is updated regularly on the THK website.
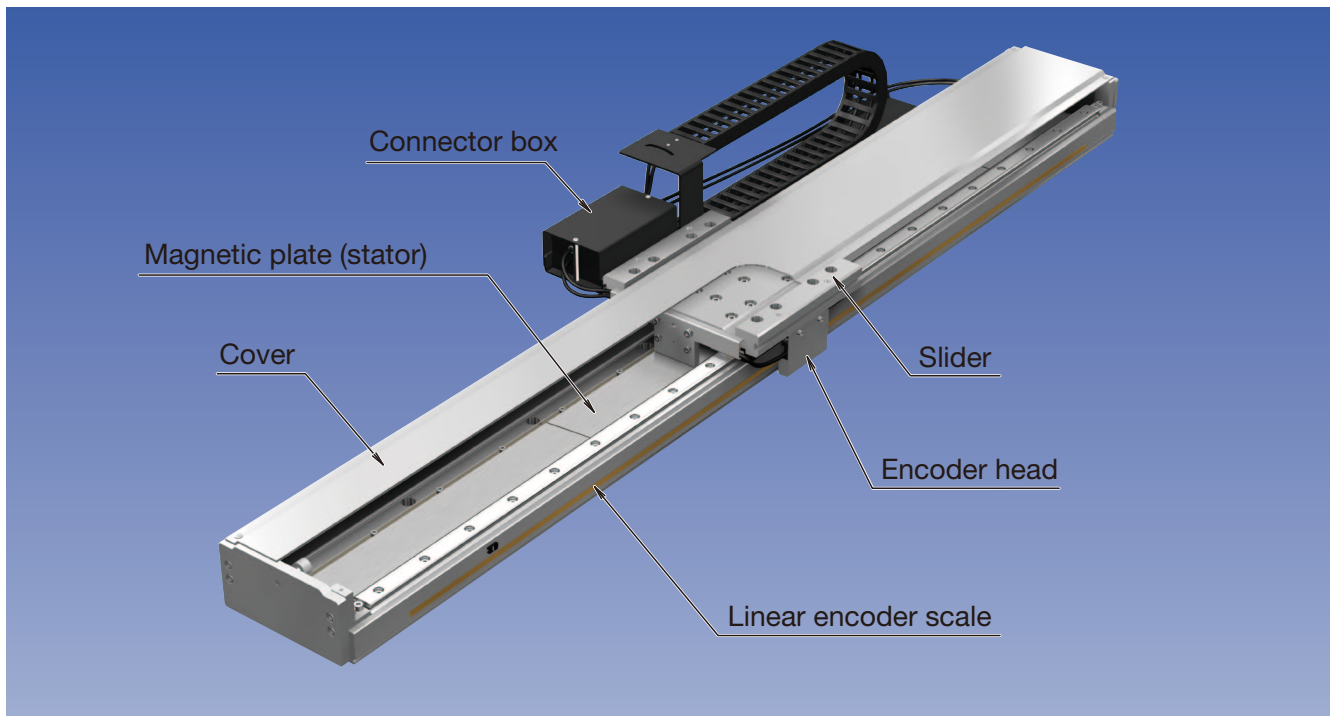
THK CO., LTD.

TOKYO. JAPAN

High Thrust Linear Motor

GLM

Flat type with core

Connector box

Magnetic plate (stator)

Cover

Slider

Encoder head

Linear encoder scale
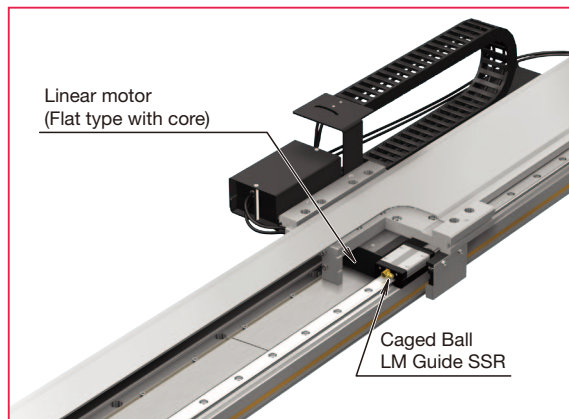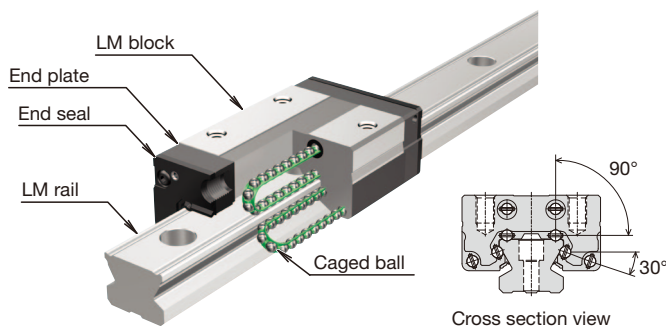
* The connector box is available for GLM20AP only.

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.

Linear motor
(Flat type with core)

Caged Ball
LM Guide SSR

Caged Ball LM Guide SSR Structure Diagram

LM block

End plate

End seal

LM rail

Caged ball

90°

30°

Cross section view

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^2 (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.

CE $_c$**UL**$_{US}$ **UL**

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	3.0			1.5	0.3
Positioning repeatability [µm]			±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.
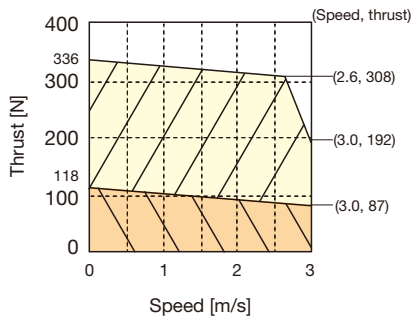   Depending on the operating conditions, the movable weight may change under the influence of the thrust and speed characteristics.
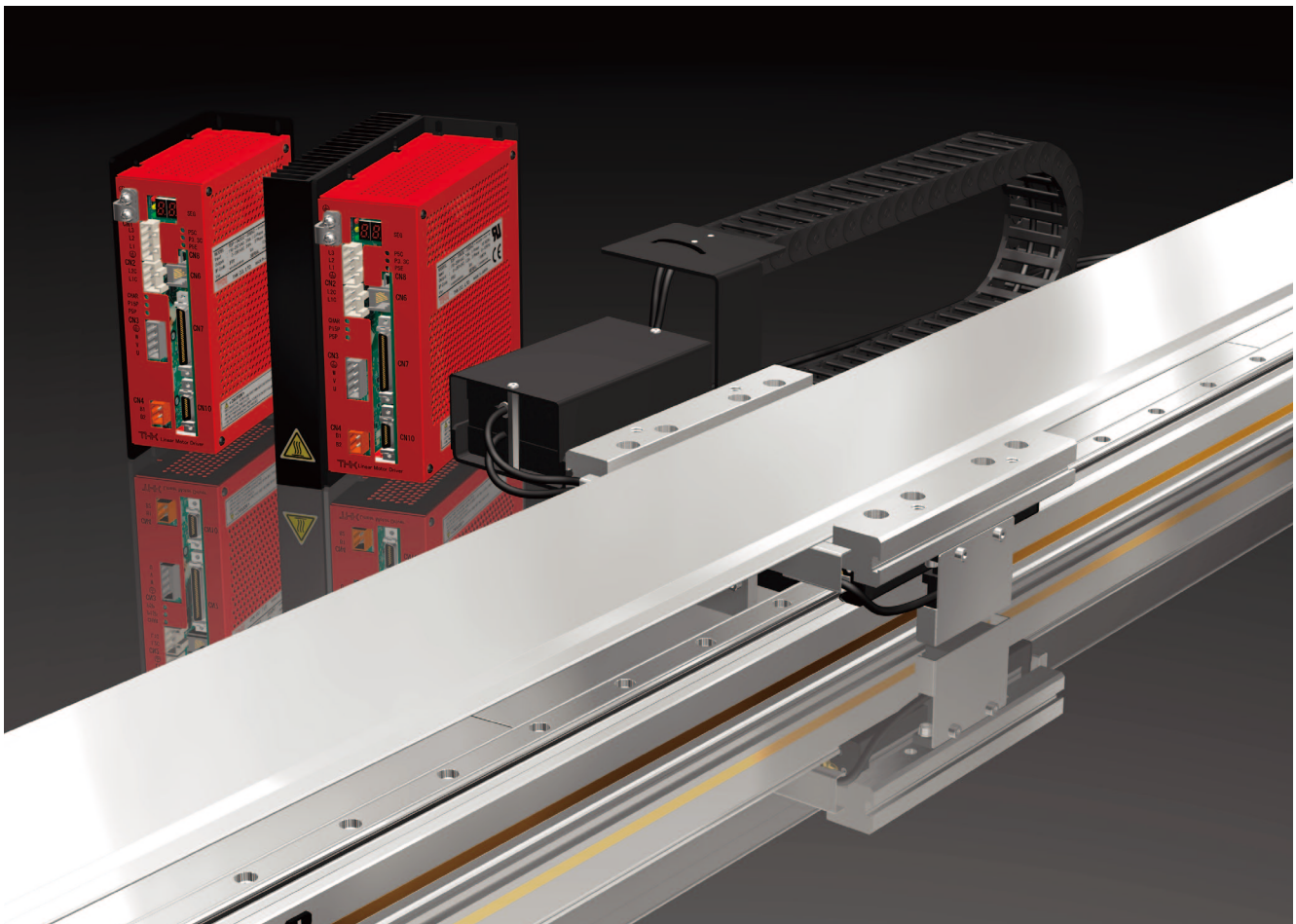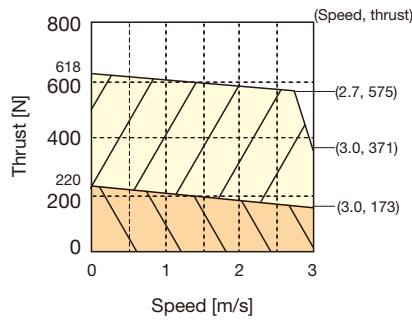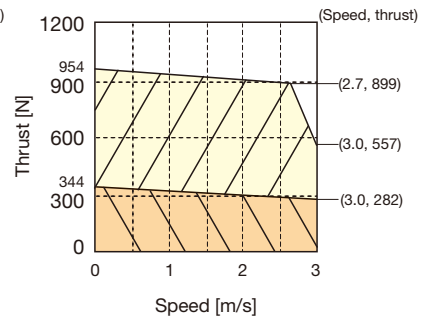
Characteristics

[200V AC specifications]

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

Motor type: M type
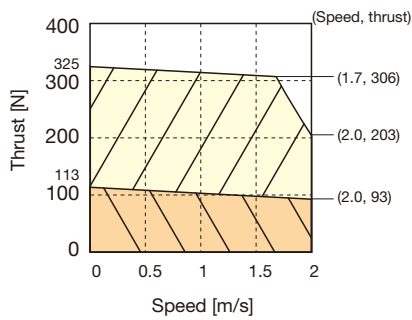Driver: TDP-075CU-200AC-GA20MU
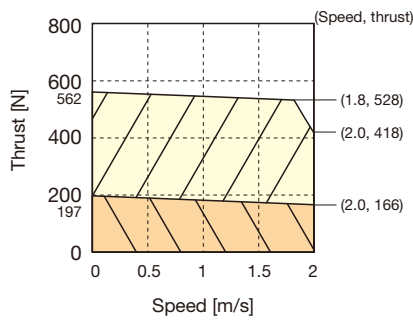
Motor type: L type
Driver: TDP-100CU-200AC-GA20LU

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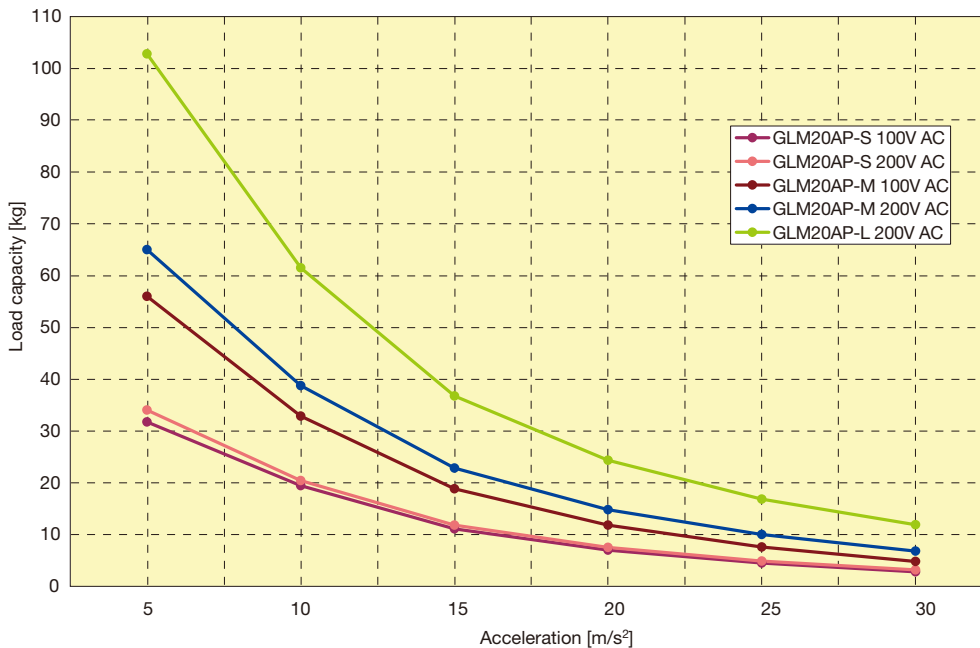
Note) At a maximum speed reached of 1.0m/s, the unit can be driven for a certain stroke at a duty ratio of 50% at this weight. For details about selection, see "GLM20AP Selection Method" on P.31.

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)

(1) GLM20AP
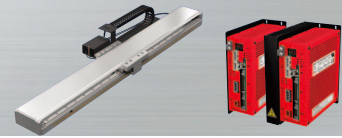
(2)
- S: S type
- M: M type
- L: L type
- 2S: S type × 2 (multi-slider)
- 2M: M type × 2 (multi-slider)
- 2L: L type × 2 (multi-slider)

(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.

(3)
- 0130: 130mm
- to
- 2650: 2650mm

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

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.

(4)
- T01K: 1.0μm
- R01K: 1.0μm
- R500: 0.5μm
- R100: 0.1μm
- H01K: 1.0μm
- G10K: 10.0μm
- G05K: 5.0μm

(5)
- J: With magnetic pole sensor
- N: Without magnetic pole sensor

(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.

(6)
- 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

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	T01K	1.0μm	THK Co., Ltd.	MES-HM-1	±1	3.0
	R01K		RENISHAW	RGH22X		
	R500	0.5μm		RGH22Z		1.5
	R100	0.1μm		RGH22Y		0.3
	H01K	1.0μm	HEIDENHAIN	LIDA277	±1	3.0
	G10K	10.0μm	Magnescale Co., Ltd.	PL25	±10	
	G05K	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 multilpying 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
TDP20	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]
TDP10	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).

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	Cover	Sensors	Cable chain	Standard	Cable length
-	C	- H	- C	- UL	- 03
	(7)	(8)	(9)	(10)	(11)

(7) Cover
- **C**: With cover
- **N**: Without cover

(8) Sensors
- **H**: Proximity sensor [N.O. contact] × 3
- **J**: Proximity sensor [N.O. contact] × 1 [N.C. contact] × 2
- **2**: Photo sensor × 3 [for both N.O. contact, N.C. contact]
- **N**: Without sensor

(8)**H**: GX-F12A × 3(Panasonic Industrial Devices SUNX Co., Ltd.)
J: GX-F12A × 1
GX-F12B × 2 (Panasonic Industrial Devices SUNX Co., Ltd.)
2: EE-SX671 × 3 (Omron Corp.)
Connector (model: EE-1001) comes included.

(9) Cable chain
- **C**: TKP18H14-30W40R50TC*¹
- **Q**: E6.29.040.055.0
- **M**: Connector box only*²
- **N**: Cable chain/ without connector box

(10) Standard
- **UL**: UL standard certified product
- **CU**: 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.

(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
- 03
- 05
- 10
- 15

(11) Cable length
Example: **03** 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.
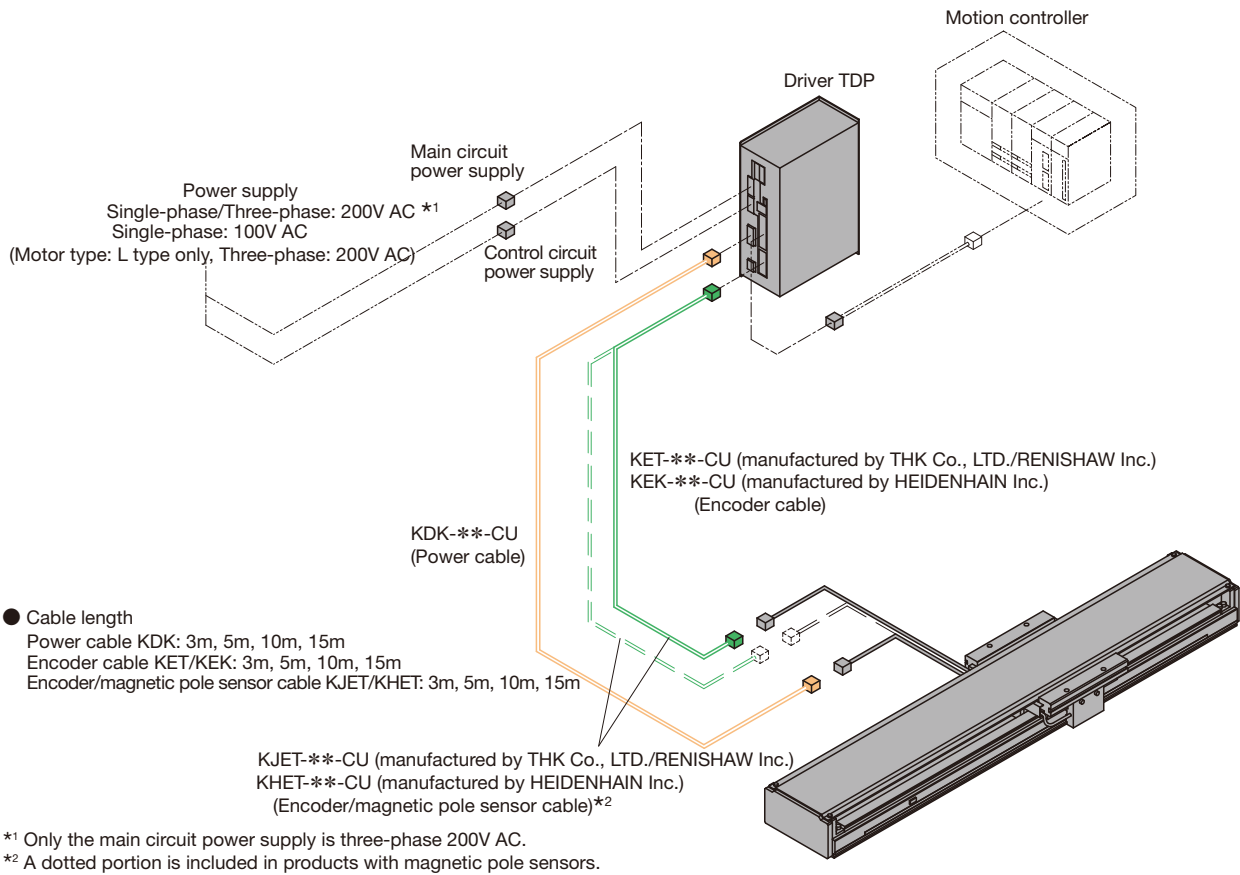
Table 4. List of accessory cables

(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	-
		N: Without magnetic pole sensor				-	KSET-01-CU

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

Motion controller

Driver TDP

Main circuit
power supply

Power supply
Single-phase/Three-phase: 200V AC *1
Single-phase: 100V AC
(Motor type: L type only, Three-phase: 200V AC)

Control circuit
power supply

KET-✱✱-CU (manufactured by THK Co., LTD./RENISHAW Inc.)
KEK-✱✱-CU (manufactured by HEIDENHAIN Inc.)
(Encoder cable)

KDK-✱✱-CU
(Power cable)

● Cable length
Power cable KDK: 3m, 5m, 10m, 15m
Encoder cable KET/KEK: 3m, 5m, 10m, 15m
Encoder/magnetic pole sensor cable KJET/KHET: 3m, 5m, 10m, 15m

KJET-✱✱-CU (manufactured by THK Co., LTD./RENISHAW Inc.)
KHET-✱✱-CU (manufactured by HEIDENHAIN Inc.)
(Encoder/magnetic pole sensor cable)*2

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

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

Motion controller

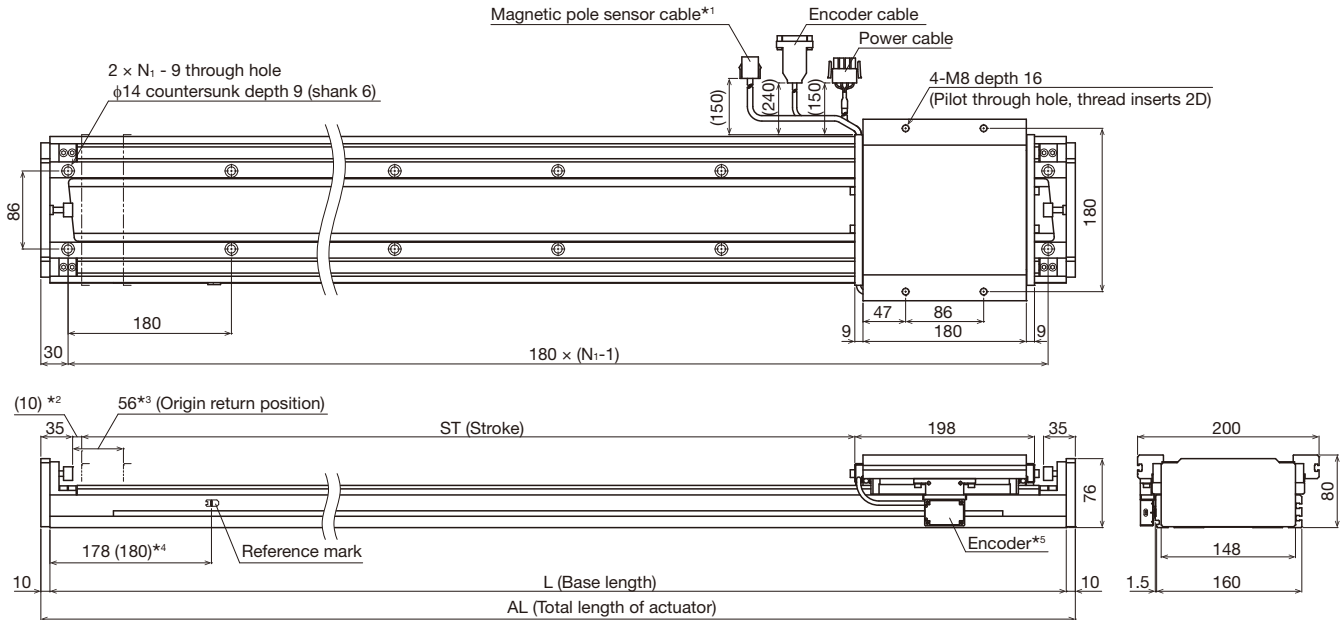Driver TDP

Main circuit
power supply

Power supply
Single-phase/Three-phase: 200V AC *[1]
Single-phase: 100V AC
(Motor type: L type only, Three-phase: 200V AC)

Control circuit
power supply

Interpolator

KSET-01-CU
(Cable between interpolator and driver)
Cable length: 1mm

CK-**
(Encoder cable)

Magnetic switch
(Fixed to base)

KDK-**-CU
(Power cable)

CE09-**
(Origin detector cable)

● Cable length
Power cable KDK: 3m, 5m, 10m, 15m
Encoder cable CK: 3m, 5m, 10m, 15m
Origin detector cable CE09: 3m, 5m, 10m, 15m
Cable between interpolator/magnetic pole sensor and driver
KSJT: 3m, 5m, 10m, 15m
(Fixed length of cable between interpolator and driver is approximately 1m)

KSJT-**-CU
(Cable between interpolator/magnetic
pole sensor and driver)*[2]

*[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.)**
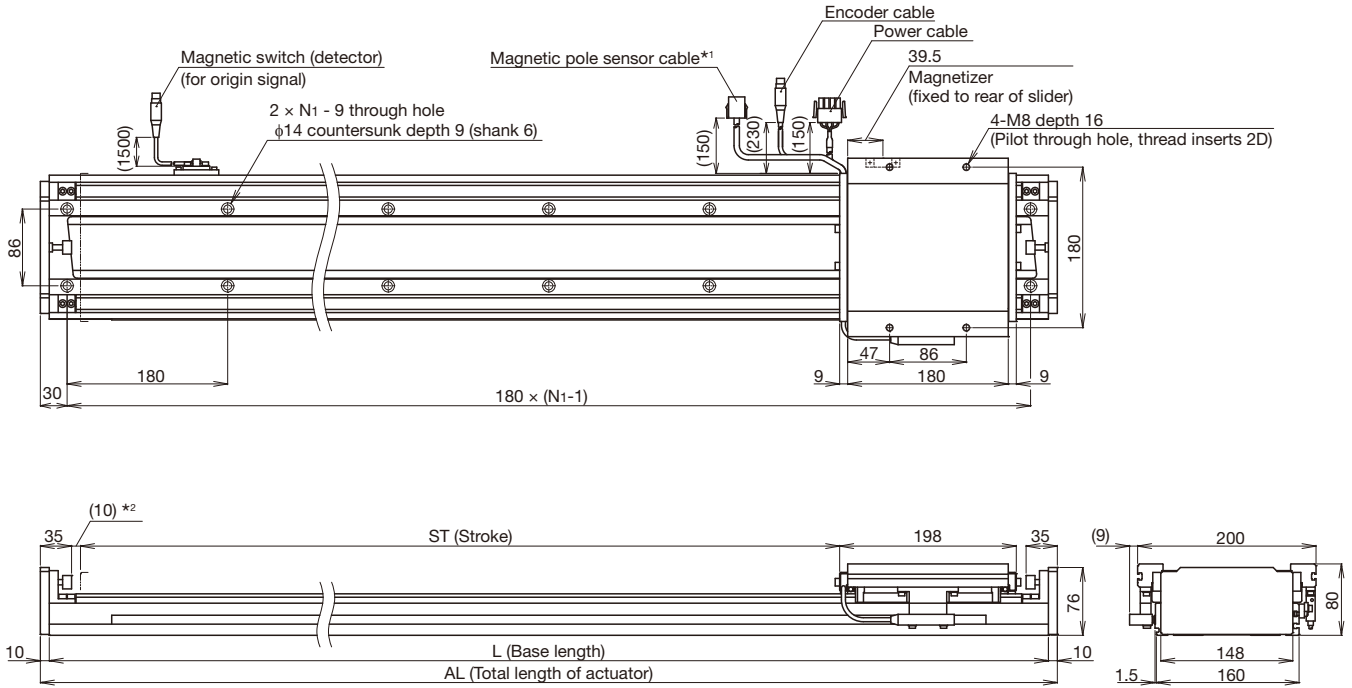● **Specifications of optical linear encoder (RENISHAW Inc.)**

*[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.
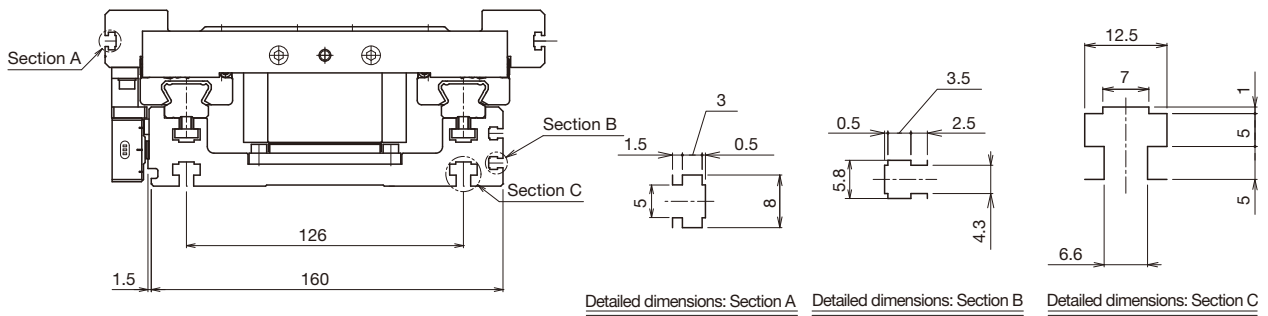
THK

● 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: Section A   Detailed dimensions: Section B   Detailed dimensions: Section C

Detailed Dimensions

GLM20AP-S-		0130*3	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_1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Slider weight *4 [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: *5 [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

*3 Because the stroke is short, there are items which cannot use the center base installation holes.
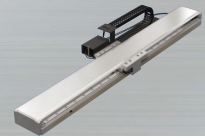In such cases, use a base installation nut (P15), and secure with a T slot.
*4 The slider weight is the value with a magnetic pole sensor. In the case of no magnetic pole sensor, the weight is -0.2kg.
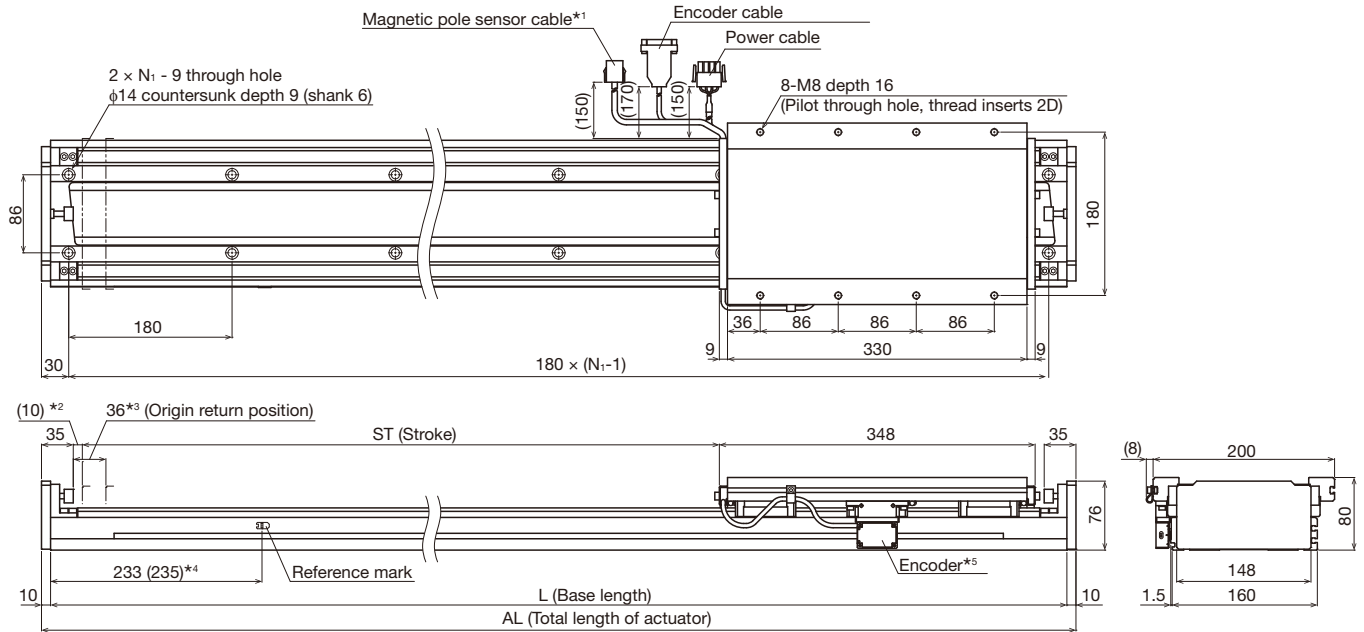*5 The main unit weight is the value with a magnetic pole sensor and cover.

GLM20AP

M type: Flat type with core

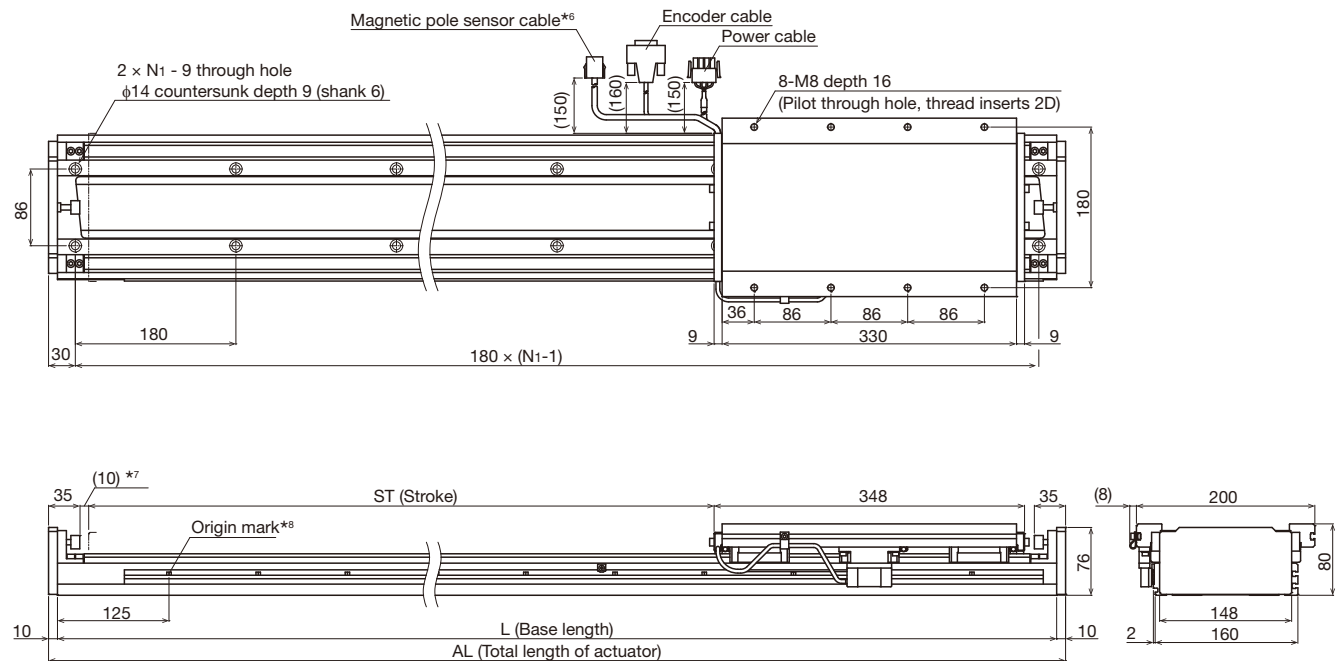Height: 80mm, Stroke: 160 to 2500mm

Dimension Diagram

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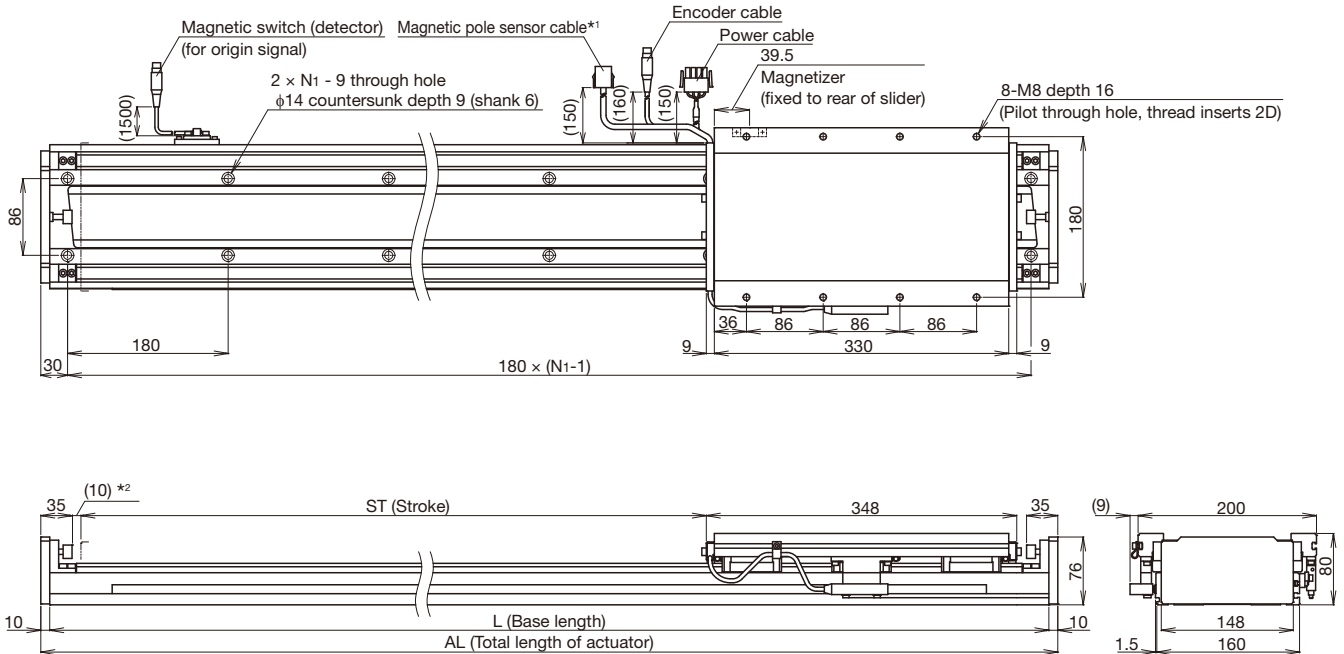● Specifications of optical linear encoder (RENISHAW Inc.)

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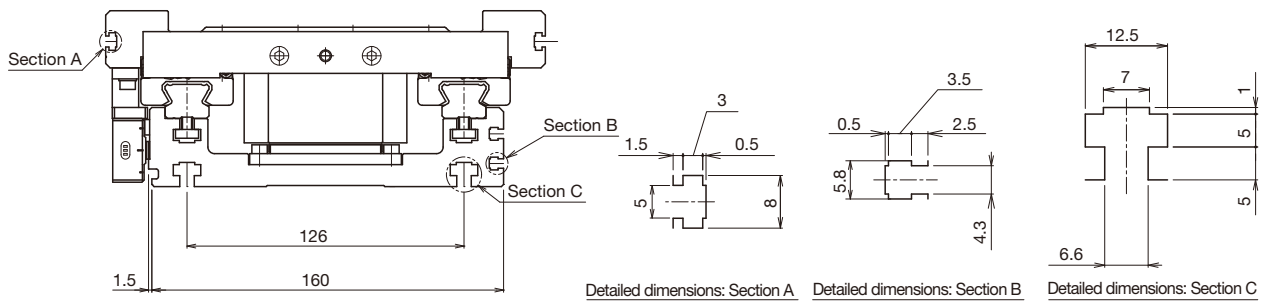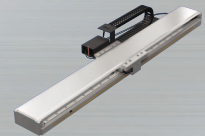
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● Specifications of magnetic linear encoder (Magnescale Co., Ltd.)

Magnetic switch (detector) (for origin signal)
Magnetic pole sensor cable*1
Encoder cable
Power cable
Magnetizer (fixed to rear of slider)
39.5
2 × N1 - 9 through hole
φ14 countersunk depth 9 (shank 6)
8-M8 depth 16 (Pilot through hole, thread inserts 2D)

(1500) (150) (160) (150) 86 180
180 × (N1-1)
30 180
9 36 86 86 86 9 180
330

ST (Stroke) 348 35 (9) 200
35 (10) *2 76 80
10 L (Base length) 10 148 1.5 160
AL (Total length of actuator)

*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

Section A
Section B
Section C
126
1.5 160

12.5
7
5 1
5
6.6

3
1.5 0.5
5 8

0.5 3.5 2.5
5.8 4.3

Detailed dimensions: Section A   Detailed dimensions: Section B   Detailed dimensions: Section C

▌ 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	N1	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Slider weight *3 [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: *4 [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

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

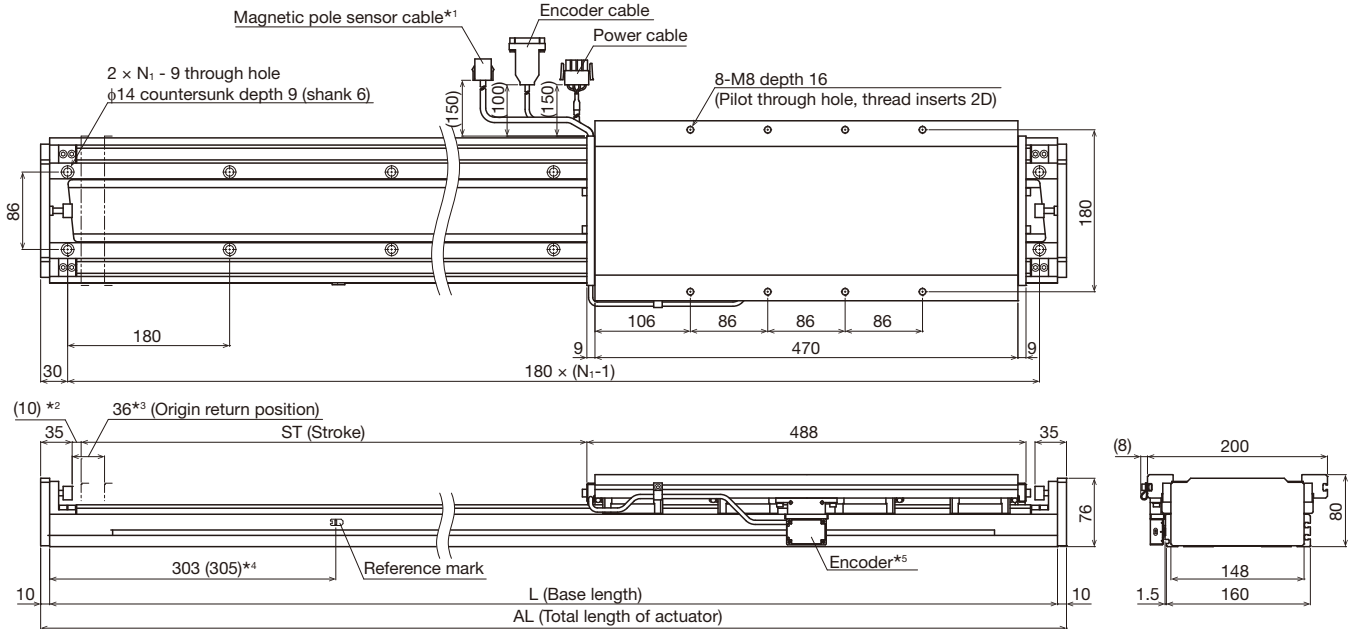*4 The main unit weight is the value with a magnetic pole sensor and cover.

GLM20AP

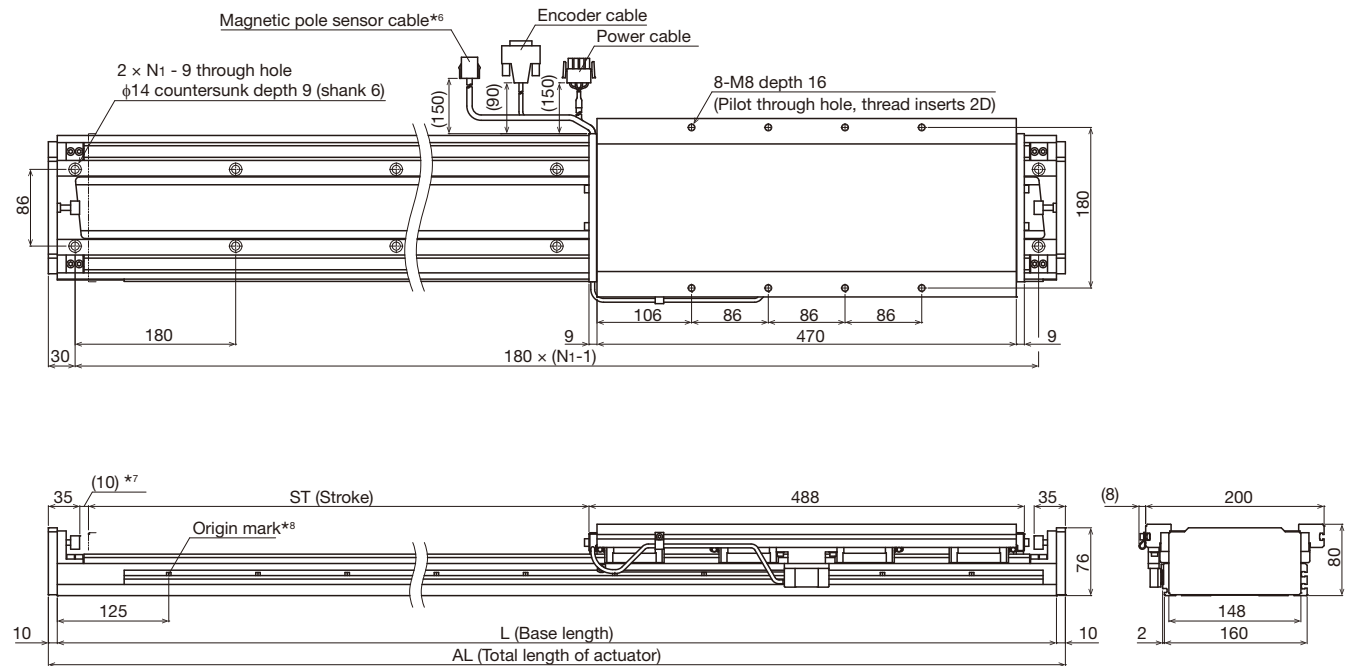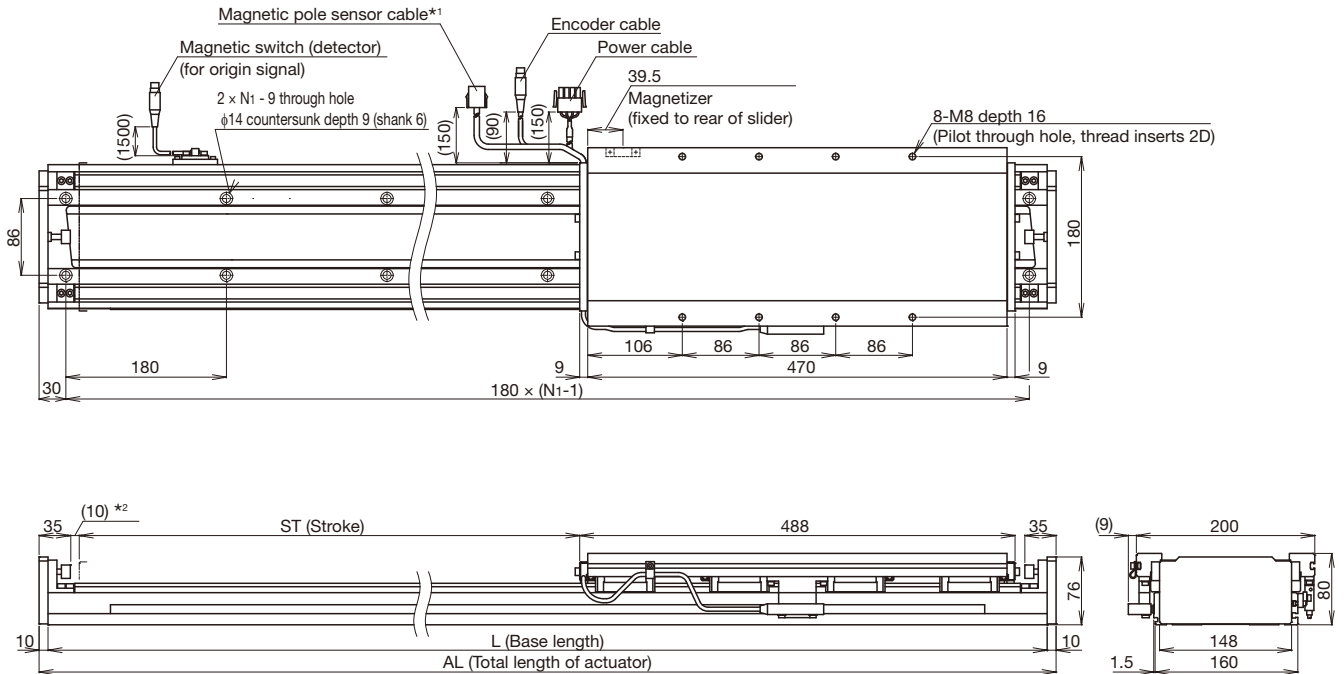**L type: Flat type with core**

Height: 80mm, Stroke: 200 to 2360mm

Dimension Diagram

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

Magnetic pole sensor cable*1
Encoder cable
Power cable
$2 \times N_1 - 9$ through hole
$\phi14$ countersunk depth 9 (shank 6)
8-M8 depth 16 (Pilot through hole, thread inserts 2D)
(150) 100 (150)
86
180
180
106 86 86 86
470
9 9
30
$180 \times (N_1-1)$

(10) *2
35
36*3 (Origin return position)
ST (Stroke)
488
35
(8)
200
76
80
303 (305)*4
Reference mark
Encoder*5
L (Base length)
148
AL (Total length of actuator)
160
10
10
1.5

*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.)

Magnetic pole sensor cable*6
Encoder cable
Power cable
$2 \times N_1 - 9$ through hole
$\phi14$ countersunk depth 9 (shank 6)
8-M8 depth 16 (Pilot through hole, thread inserts 2D)
(150) (90) (150)
86
180
180
106 86 86 86
470
9 9
30
$180 \times (N_1-1)$

35
(10) *7
ST (Stroke)
488
35
(8)
200
76
80
Origin mark*8
125
L (Base length)
148
AL (Total length of actuator)
160
10
10
2

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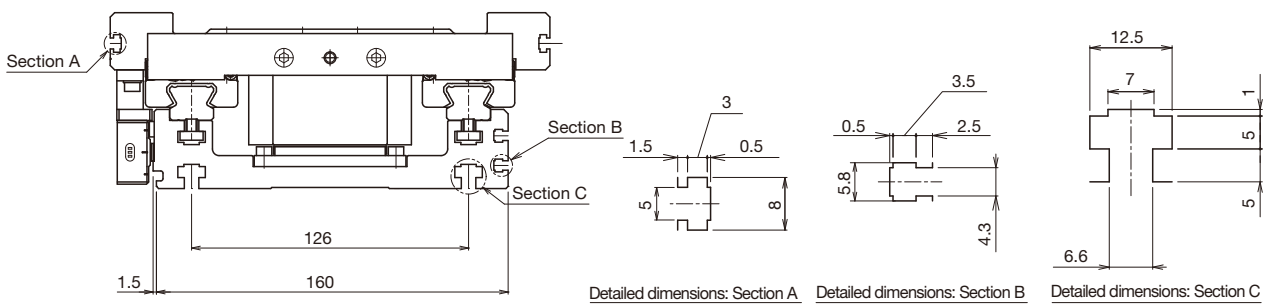
● Specifications of magnetic linear encoder (Magnescale Co., Ltd.)

Magnetic pole sensor cable*1
Magnetic switch (detector)
(for origin signal)
Encoder cable
Power cable
39.5
Magnetizer
(fixed to rear of slider)
8-M8 depth 16
(Pilot through hole, thread inserts 2D)
2 × N1 - 9 through hole
φ14 countersunk depth 9 (shank 6)

(1500)
(150)
(90)
(150)

86
180

180
30
9
180 × (N1-1)
106
86
86
86
470
9

180

(10) *2
35
ST (Stroke)
488
35
(9)
200

10
L (Base length)
10
1.5
148
160
AL (Total length of actuator)

76
80

*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

Section A
Section B
Section C

126
1.5
160

3
1.5
0.5
5
8

3.5
0.5
2.5
5.8
4.3

12.5
7
1
5
5
6.6

Detailed dimensions: Section A
Detailed dimensions: Section B
Detailed dimensions: Section C

Detailed Dimensions

GLM20AP-L-		0200*3	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	N1	5	6	7	8	9	10	11	12	13	14	15	16	17
Slider weight *4 [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: *5 [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
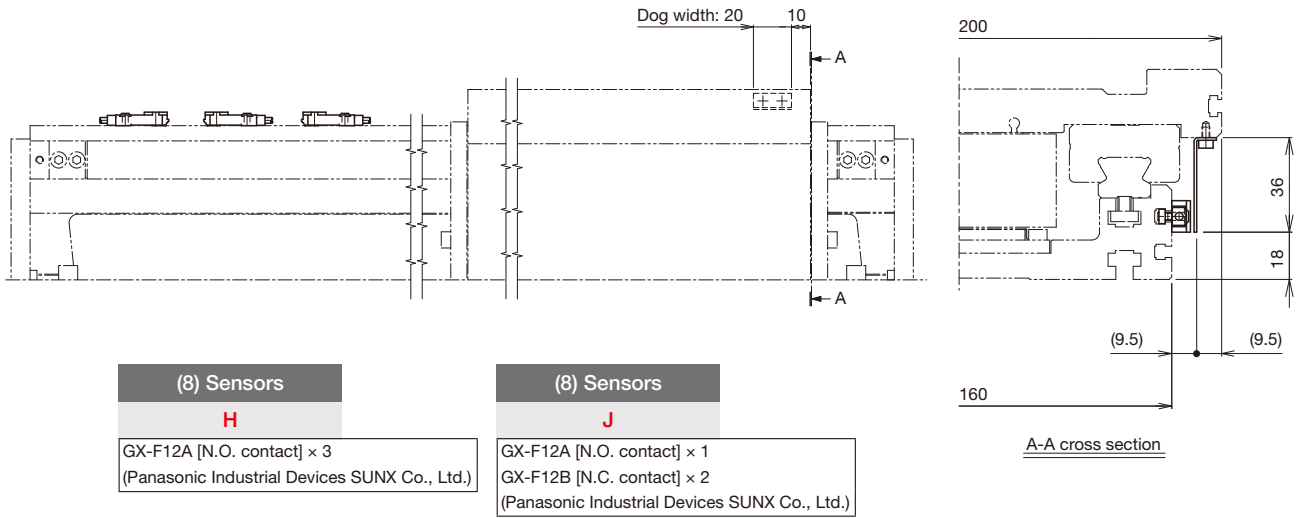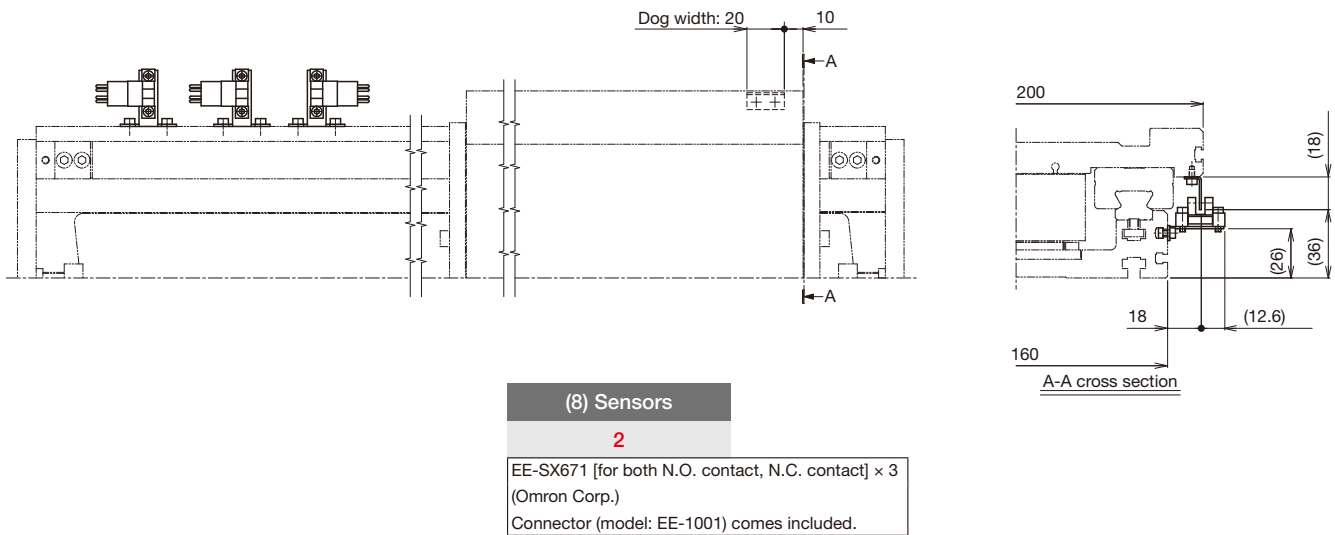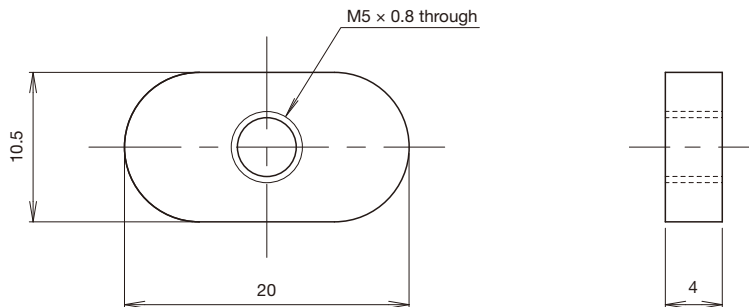
Proximity sensor [H], [J]

Dog width: 20   10

A

200

36

18

(9.5)   (9.5)

160

A-A cross section

(8) Sensors	(8) Sensors
H	**J**
GX-F12A [N.O. contact] × 3 (Panasonic Industrial Devices SUNX Co., Ltd.)	GX-F12A [N.O. contact] × 1 GX-F12B [N.C. contact] × 2 (Panasonic Industrial Devices SUNX Co., Ltd.)

Photo sensor [2]

Dog width: 20   10

A

200

(18)

(26)   (36)

18   (12.6)

160

A-A cross section

(8) Sensors
2
EE-SX671 [for both N.O. contact, N.C. contact] × 3 (Omron Corp.) Connector (model: EE-1001) comes included.

Outer Dimensions of Base Installation Nuts

M5 × 0.8 through

10.5

20

4

Contact THK for base installation nuts.

Dimensions at Cable Chain Installation

Connector box [M]
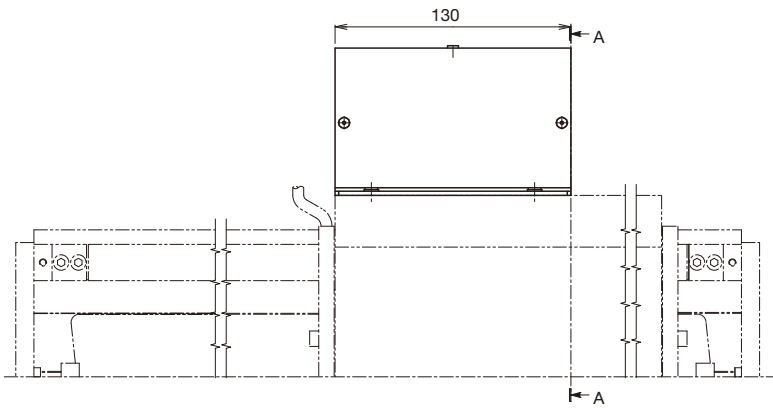
(9) Cable chain
M
Connector box only
* The cable chain should be provided by the customer.

A-A cross section
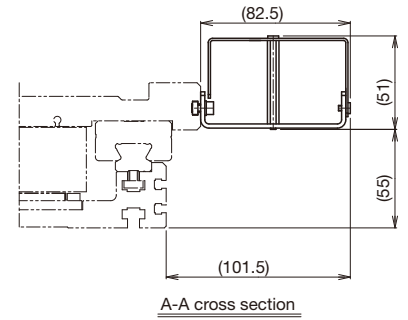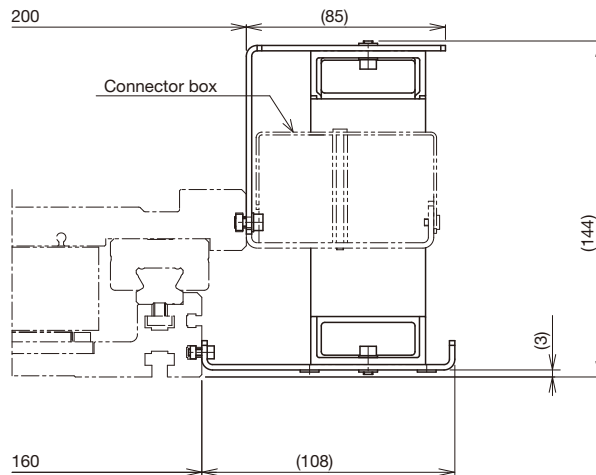
Cable chain [C]

(9) Cable chain
C
TKP18H14-30W40R50TC (Tsubakimoto Chain CO.)
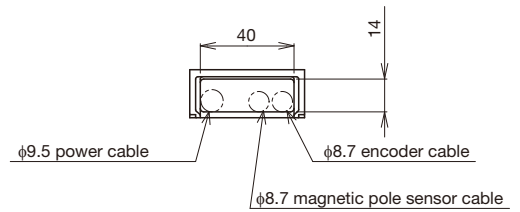
φ9.5 power cable   φ8.7 encoder cable

φ8.7 magnetic pole sensor cable

Cable chain cross section

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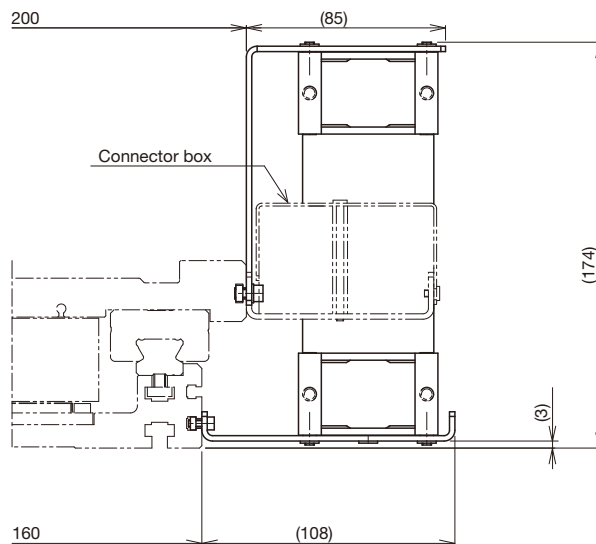
Cable chain [Q]

(9) Cable chain
Q
E6.29.040.055.0 (igus K.K.)

φ9.5 power cable   φ8.7 encoder cable

φ8.7 magnetic pole sensor cable

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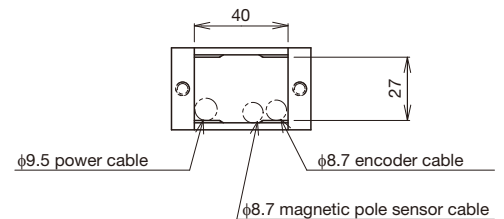
Note) If a model with a cable chain is selected, a connector box is always supplied with it.

Medium and large capacity driver for single axis

TDP

■ Features

1 Auto-tuning

Auto-tuning functionality built-in. Helps realize reductions in adjustment work.
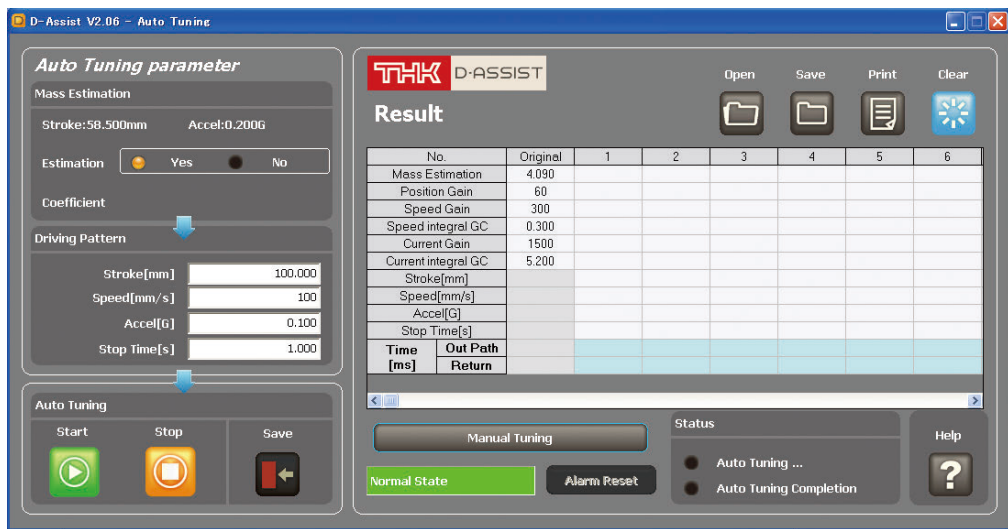
2 Vibration suppression function during stop

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
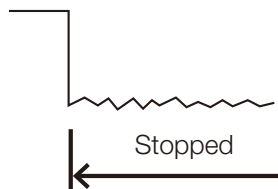
With vibration suppression function during stop

Stopped

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.

THK

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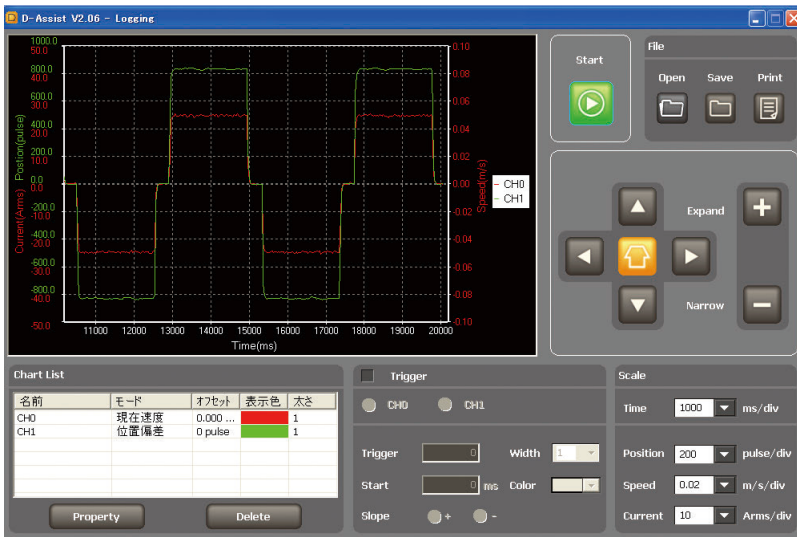
Note) When using D-Assist, the PC communication cable K232-01 (sold separately) or a USB cable are required.

USB cable (commercially available)*

<PC side>
USB (A type) male
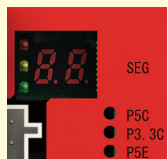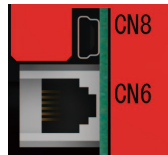
<Driver side>
USB (mini-B type) male

Ferrite core

* For the USB cable, use a commercially available product with a ferrite core.
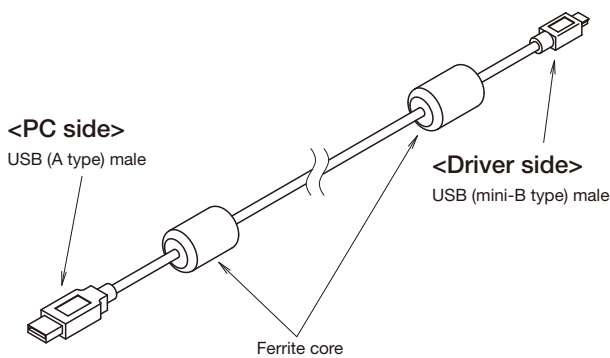
Computer communication cableK232-01

<PC side>
Socket

<Driver side>
Modular jack plug

6-core modular cable (length: approximately 1000mm)

TDP Medium and large capacity driver for single axis

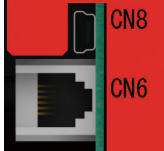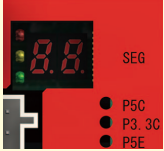## ▮ Specification (main circuit voltage 100V AC)

Model			TDP			
	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)

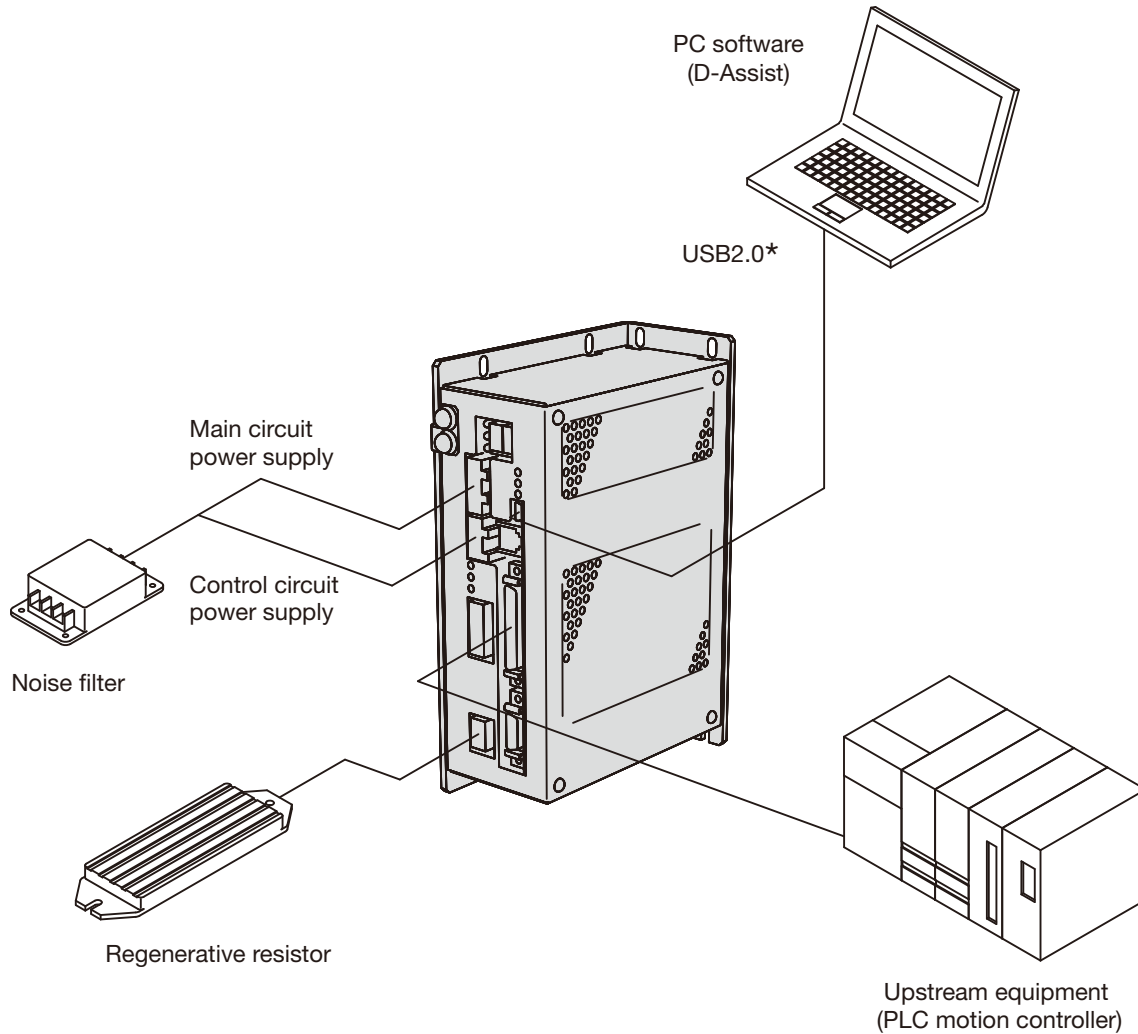| Model			TDP						
	Model number		TDP						
	Capacity		100W	200W	450W	750W	1kW	1.5kW	3kW
Model	Appearance								
Input power supply	Main circuit		200V AC single-phase/three-phase, 50/60Hz (Allowable voltage: 170 to 250V)				200V AC three-phase, 50/60Hz (Allowable voltage: 170 to 250V)		
	Control circuit		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)						
		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)						
		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

PC software
(D-Assist)

USB2.0*

Main circuit
power supply

Control circuit
power supply

Noise filter

Regenerative resistor

Upstream equipment
(PLC motion controller)

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

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 100CU: 1kW 020CU: 200W 150CU: 1.5kW 045CU: 450W 300CU: 3kW 075CU: 750W

(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 GA15S : GLM15AP S type GA20MU : GLM20AP M type K46S : KLM46 S type GA20LU : GLM20AP L type * Refer to the "Model number list" on page 5 for details.

(5) Resolution	10U : 10.0µm 5U : 5.0µm 1U : 1.0µm 500N : 0.5µm 100N : 0.1µm

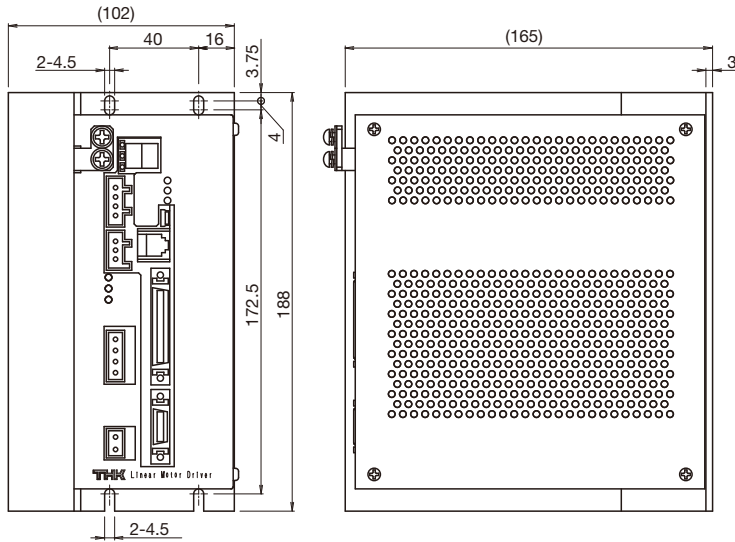| Actuator	Resolution				
	10U (10.0µm)	5U (5.0µm)	1U (1.0µm)	500N (0.5µm)	100N (0.1µm)
GLM10		●	●	●	●
GLM15AP	●	●	●	●	●
GLM20AP	●	●	●	●	●
GLM25	●	●	●	●	●
KLM46			●	●	●

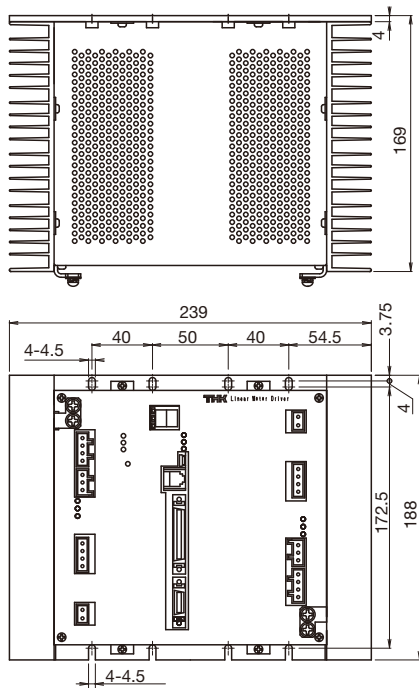| (6) Magnetic pole sensor	J : With magnetic pole sensor N : Without magnetic pole sensor *Only N (without magnetic pole sensor) is used for KLM46.

Model Number List

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

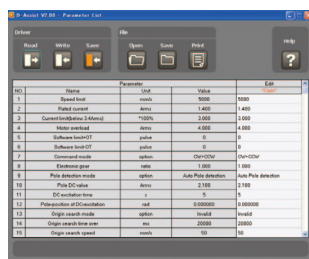## Support for realizing optimal motion

The D-Assist is a user support tool.

Provides support for setting of driver functions or linear motor adjustments.
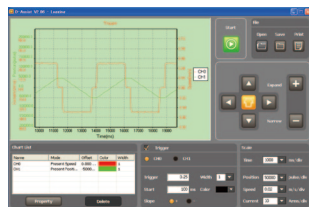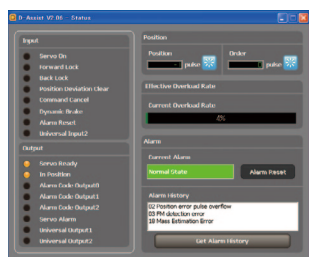
*D-Assist can be downloaded free of charge (https://tech.thk.com/).

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.
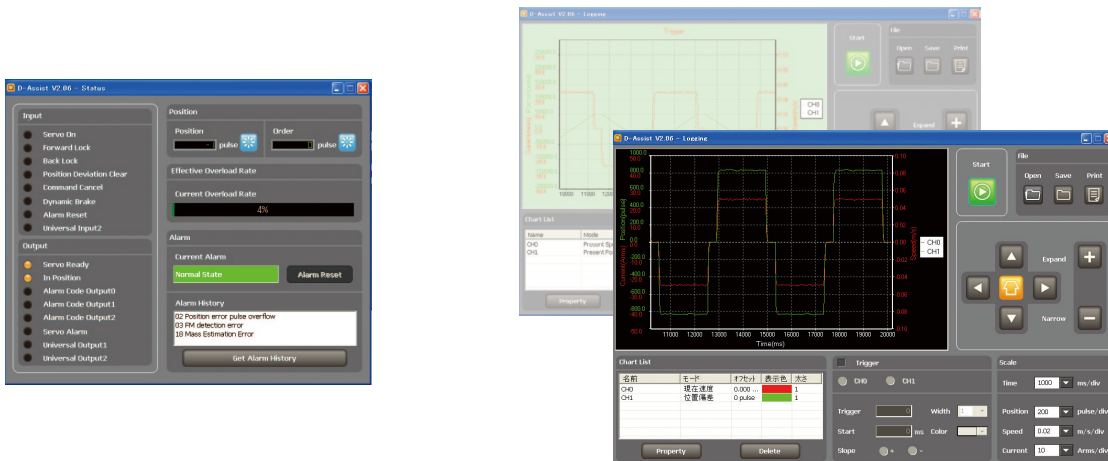
Support for multiple languages

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.

<When tuning manually>

Placement/adjustment start

↓

Gain estimate

↓

Motion confirmation

↓

Gain adjustment

↓

Adjustment complete

<When auto-tuning>

Placement/adjustment start

↓

Auto adjustment

↓

Adjustment complete

Reduction

Cable Specification
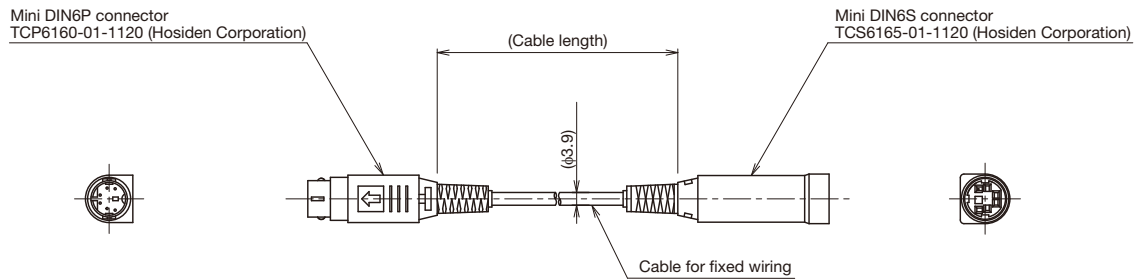
KDK-∗∗-CU: Power cable (for GLM15AP/20AP/25/KLM46)

<Motor side>   (150)   <Driver side>

Round crimp terminal R1.25-4

(Cable length)

Robot cable

(φ9.5)

Cap   : 350780-1 (Tyco Electronics Japan G.K.)
Socket: 350550-3 (Tyco Electronics Japan G.K.)

Plug: 231-104 (WAGO)

KET-∗∗-CU: Optical linear encoder cable (for GLM10/15AP/20AP/25)

<Linear encoder side>   <Driver side>

(Cable length)

Robot cable

(φ8.7)

Hood   : XM2S-1513 (Omron Corp.)
Socket: XM3D-1521 (Omron Corp.)

NS square connector : 10320-52A0-008 (Sumitomo 3M Limited)
Plug   : 10120-3000PE (Sumitomo 3M Limited)

KJET-∗∗-CU: Optical linear encoder/magnetic pole sensor cable (for GLM15AP/20AP/25)

<Linear encoder side>
Hood   : XM2S-1513 (Omron Corp.)
Socket: XM3D-1521 (Omron Corp.)

(Cable length)

(φ8.7)

<Magnetic pole sensor side>

Robot cable

<Driver side>

Plug/housing: 172170-1 (Tyco Electronics Japan G.K.)
Pin   : 170363-1 (Tyco Electronics Japan G.K.)

(φ8.7)

NS square connector : 10320-52A0-008 (Sumitomo 3M Limited)
Plug   : 10120-3000PE (Sumitomo 3M Limited)

CK-∗∗: Magnetic linear encoder cable (for GLM15AP/20AP/25/GLS20)

<Interpolator side>   Robot cable   <Linear encoder side>

(φ4.5)

Mini DIN8P connector
TCP6180-01-1120 (Hosiden Corporation)

(Cable length)

Mini DIN8S connector
TCS6185-01-1120 (Hosiden Corporation)

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

<Interpolator side>　　　　　　　　　　　　　　<Driver side>

(1000)

Robot cable

Cable cover : PCS-E20LC (Honda Tsushin Kogyo Co., Ltd.)
Connector　: PCR-E20FS+ (Honda Tsushin Kogyo Co., Ltd.)

(φ8.7)

NS square connector: 10320-52A0-008 (Sumitomo 3M Limited)
Plug　　　　　　: 10120-3000PE (Sumitomo 3M Limited)
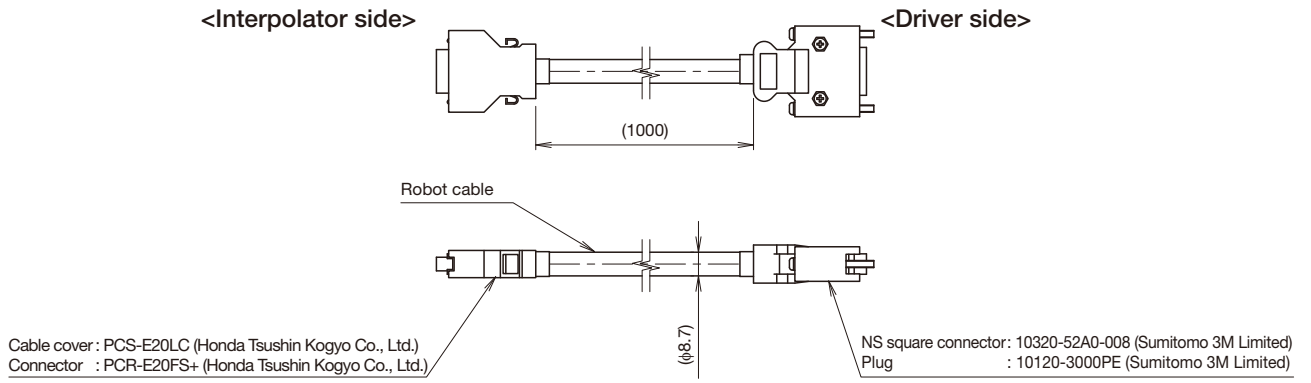
KSJT-∗∗-CU: Connection cable between interpolator and magnetic pole sensor (for GLM15AP/20AP/25)

<Interpolator side>
Cable cover: PCS-E20LC (Honda Tsushin Kogyo Co., Ltd.)
Connector　: PCR-E20FS+ (Honda Tsushin Kogyo Co., Ltd.)

(1000)

(φ8.7)

Robot cable

<Driver side>

<Magnetic pole sensor side>
Plug/housing : 172170-1 (Tyco Electronics Japan G.K.)
Pin　　　　　: 170363-1 (Tyco Electronics Japan G.K.)

NS square connector : 10320-52A0-008 (Sumitomo 3M Limited)
Plug　　　　　　　　: 10120-3000PE (Sumitomo 3M Limited)

(φ8.7)

(Cable length)
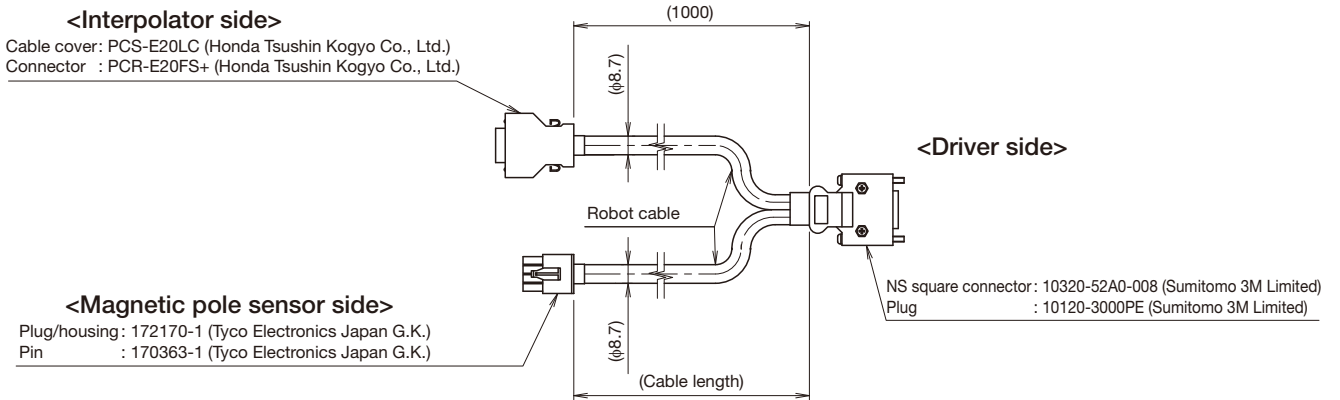
CE09-∗∗: Origin detector cable (for GLM15AP/20AP/25)

Mini DIN6P connector
TCP6160-01-1120 (Hosiden Corporation)

(Cable length)

Mini DIN6S connector
TCS6165-01-1120 (Hosiden Corporation)

(φ3.9)

Cable for fixed wiring

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

<Linear encoder side>　　　　　　　　　　　　　<Driver side>

(Cable length)

Robot cable

Hood　: XM2S-1513 (Omron Corp.)
Socket : XM3D-1521 (Omron Corp.)

(φ8.7)

NS square connector: 10320-52A0-008 (3M Japan)
Plug　　　　　　: 10120-3000PE (3M Japan)

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^2)	
μ	Friction coefficient	
$α$	Acceleration	[m/s^2]
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_1	Acceleration time	[s]
t_2	Constant speed time	[s]
t_3	Deceleration time	[s]
t_4	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: μ	0.01		
Maximum load capacity [kg] *1	46.1	86.1	134.6
Estimated load capacity [kg] *2	7.7	15.0	24.5

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

*1 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.

*2 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 / RF180 100Ω	RH220 100Ω / RF240 100Ω	RH300C 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]
$F = \mu \times m1 \times g$

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_{peak} of the actuator at the motion speed from the thrust-speed characteristics chart in product specifications ($\rightarrow$ P.5).

Maximum thrust ratio (%): $\dfrac{F_{max}}{F_{peak}} \times 100$ 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_{rms} [N]
$F_{rms} = \sqrt{\dfrac{F_a{}^2 \times t_1 + F^2 \times (t_2 + t_4) + F_{d1}{}^2 \times t_3}{T}}$

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

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

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

RMS thrust ratio (%): $\dfrac{F_{rms}}{F_{cont}} \times 100$ 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]
$E_1 = F_{d2} \times t_3 \times \dfrac{V}{2}$

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

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

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

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 : α = 10 [m/s^2]

Stroke : L = 1.0 [m]

Friction coefficient : µ = 0.01
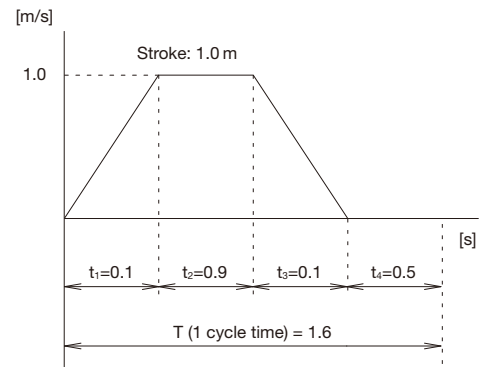
Gravitational acceleration : g = 9.807 [m/s^2]

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.

Load force : F = µ × m_1 × g
= 0.01 × 10 × 9.807
= 1.0 [N]

Thrust during acceleration : F_a = (m_1 + m_2) × α + F
= (5.1 + 10) × 10 + 1.0
= 152.0 [N]

Thrust during deceleration : F_{d1} = (m_1 + m_2) × α − F
= (5.1 + 10) × 10 − 1.0
= 150.0 [N]

From the above calculation results:

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

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

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

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

$$\frac{F_{max}}{F_{peak}} \times 100 = \frac{152}{325} \times 100 = \underline{\underline{47[\%]}}(\leq 80\%)$$
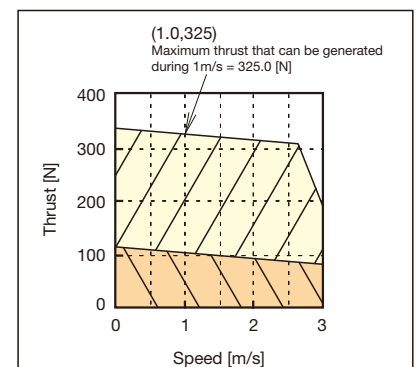
Motor type : S type
Driver : TDP-045CU-200AC-GA20SU

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:

$$F_{rms} = \sqrt{\frac{F_a{}^2 \times t_1 + F^2 \times (t_2 + t_4) + F_{d1}{}^2 \times t_3}{T}}$$

$$= \sqrt{\frac{152.0^2 \times 0.1 + 1.0^2 \times (0.9 + 0.5) + 150.0^2 \times 0.1}{1.6}}$$
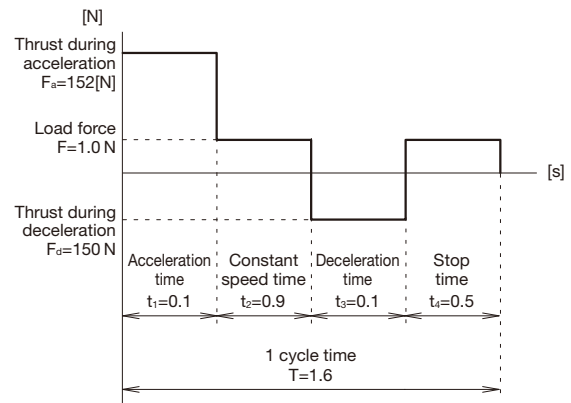
$$= 53.4 [N]$$

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} (at the time of average speed 0.625m/s) = 111.5 [N]

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

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

As the result above, of the maximum thrust ratio and RMS thrust ratio, this application shall be concluded operative.
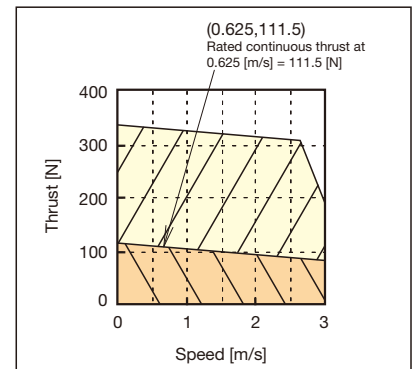
Motor type : S type
Driver : TDP-045CU-200AC-GA20SU

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.

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

Motor attraction force : $P = 1232$ [N]

Sliding resistance of LM block : $f = 3.7$ [N]

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

Deceleration time : $t_3 = 0.1$ [s]

Cycle time : $T = 1.6$ [s]

Motion speed : $V = 1.0$ [m/s]

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

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

$E_2 = 4.5$ [J]

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

The required capacity of the external regenerative resistor is: $W_K = \dfrac{(E_1 - E_2)}{0.2 \times T} = 5.06$ [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 [Ω]

Therefore, select the RH120 100Ω (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 (→ P.32 Table 2).
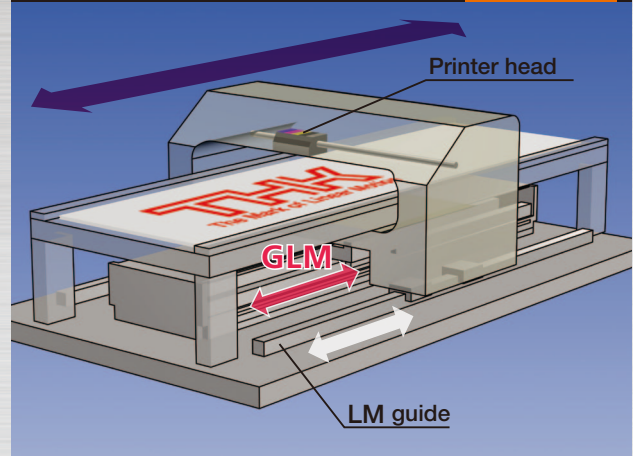
Product Usage Example

Laser marking | Processing / Assembly
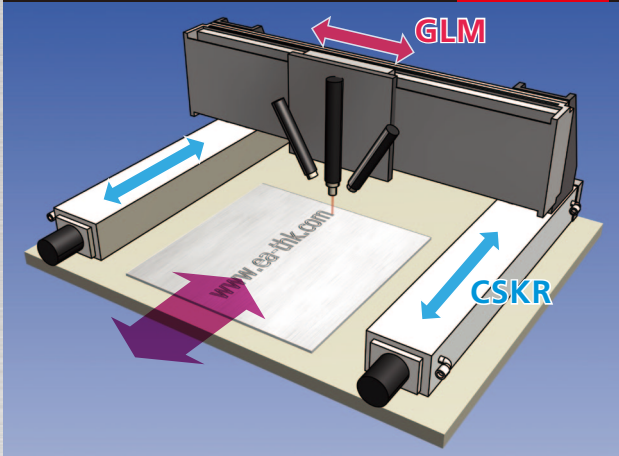
Model Number Used
CSKR **GLM**

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.
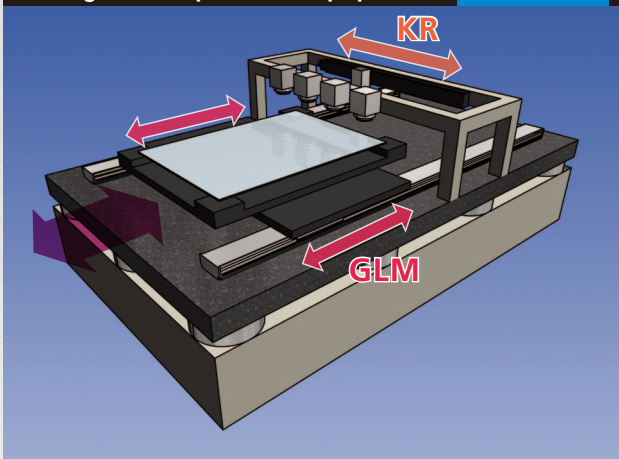
Printer | Other

Printer head

GLM

LM guide

Model Number Used
GLM **LM guide**

GLM is used for the head moving section. High resolution printing is possible using a high accuracy, high resolution GLM.
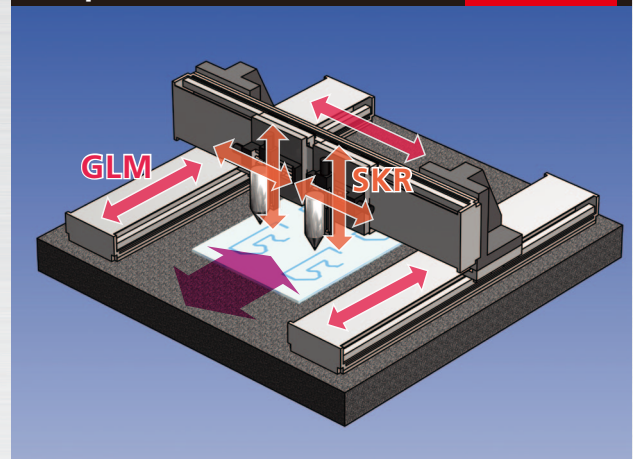
LCD glass inspection equipment | Inspection

KR

GLM

Model Number Used
KR **GLM**

Using a GLM that supports long strokes and high speed, larger works with an improved takt time have been achieved.
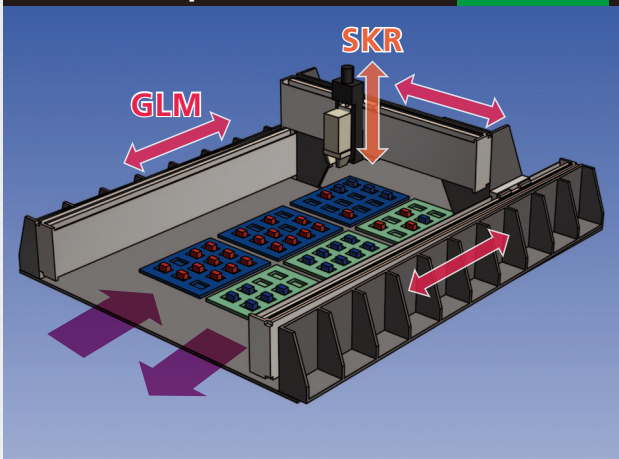
Dispenser | Processing / Assembly

GLM

SKR

Model Number Used
SKR **GLM**

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

Pick and press | Transport

SKR

GLM

Model Number Used
GLM **SKR**

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.

Glass board inspection device | Inspection

SKR

GLM
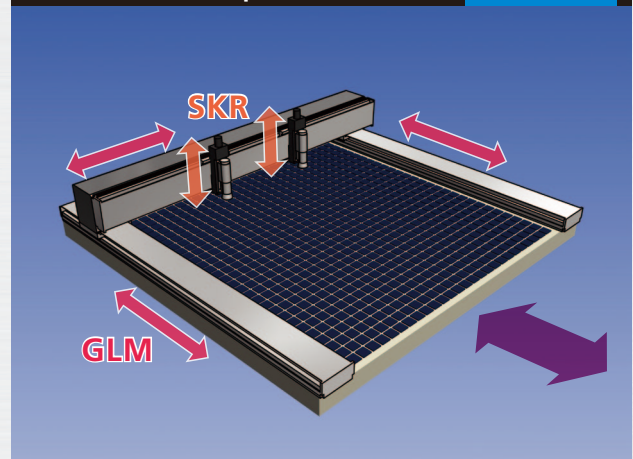
Model Number Used
GLM **SKR**

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

THK

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

$C\epsilon$

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.

t_1

t_2

t_3
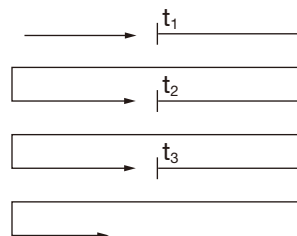
= 1/2 of the maximum difference between t_1 t_2...t_7

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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● The actual products may differ from the pictures and photographs in this catalog.

● Outward appearances and specifications is subject to change without notification for purposes of improvement, please inquire before using them.

● Although great care has been taken in the production of this catalog, THK will not take any responsibility for damage resulting from typographical errors or omissions.

● In exporting our products and technology, or selling them for the purpose of export, THK has a basic policy of observing laws relating to foreign exchange, trade and other laws. For export of THK products as single items, contact THK in advance.

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