THK

Linear Motor Actuator

GLM20AP

Linear Motor Series

GLM

Flat Type with Core

CE

Connector box

Magnetic plate (stator)

Cover

Slider

Encoder head

Linear encoder scale

GLM structure
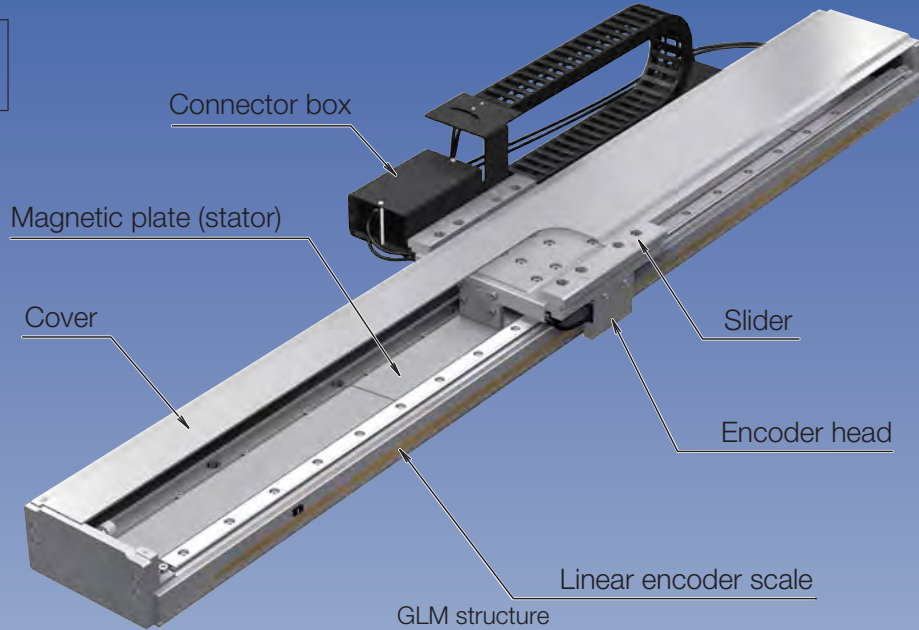
* The connector box is supported only on GLM20AP.

Linear motor
(Flat type with core)

Caged Ball LM Guide
Model SSR

GLM is equipped with an AC linear servo motor with a core. An exceedingly strong magnetic field generated by a coil of wire surrounding an iron core provides the motor with characteristics such as high thrust and high acceleration/deceleration despite its small volume.
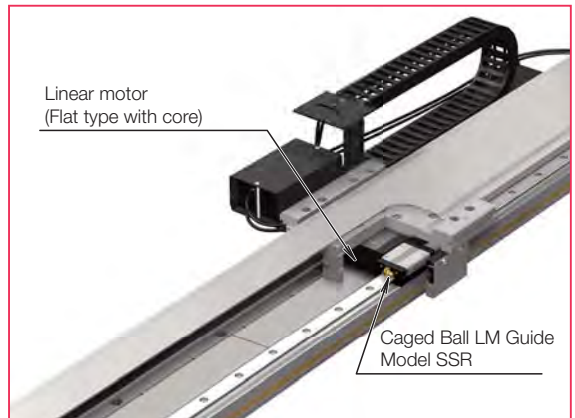
Structure diagram of Caged Ball LM Guide Model SSR

LM block

End plate

End seal

LM rail

Caged ball

90°

30°

Cross section view
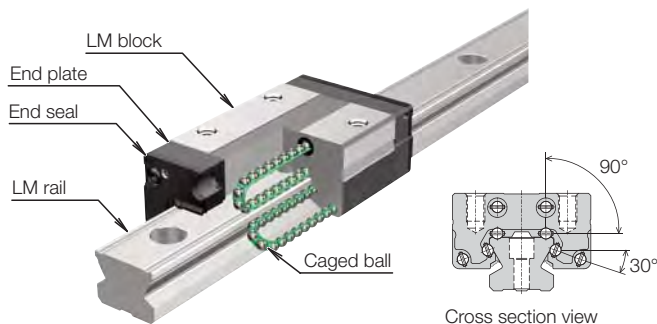
Caged Ball LM Guide Model SSR, equipped with caged balls that eliminate mutual friction between balls, has achieved low noise, good sound quality, long-term maintenance-free operation, long life, and high speed.

Features

1 High speed

The linear motor actuator, being capable of converting electromagnetic forces directly to linear motions, achieves high speeds even with long strokes.

GLM10 realizes the series' maximum speed of 4 m/s.
Other models can realize the maximum speed of 3 m/s.

2 High acceleration/deceleration and trackability

The use of aluminum parts in the slider has achieved weight reduction and realized high acceleration and deceleration of 2G.
Furthermore, the light weight and high rigidity of the slider have realized high trackability.

3 High accuracy

The full-closed control of the linear encoder[*] realizes a high positioning accuracy.
* Full-closed control: A method to directly detect the position of the moving slider using the linear encoder.

4 Long stroke

The linear motor actuator, to which magnetic plates can be added, supports long strokes that cannot be realized by a ball screw drive.
Furthermore, GLM20AP can support even longer strokes when joint base configuration is used.

5 Multi-slider support

More than one slider can be placed on the base of one axis, and each of them can be controlled independently.

6 Conformance to overseas standard

If a GLM model with a cable chain is selected, the acquisition of CE marking is supported.
Furthermore, GLM20AP is equipped with a newly designed motor to reduce temperature rises and support the UL standards.
The linear motor actuator realizes high speeds, high acceleration and deceleration, high accuracy, and conforms to safe and reliable overseas standard.

GLM20AP

Model configuration

Model number	Number of sliders/motor type	Stroke	Encoder/ resolution	Magnetic pole sensor	Driver
GLM20AP -	S	- 0490 -	R01K	- J -	TDP20
①	②	③	④	⑤	⑥

① GLM20AP

②
- S: S type
- M: M type
- L: L type
- 2S: S type x 2 (Multi-slider)
- 2M: M type x 2 (Multi-slider)
- 2L: L type x 2 (Multi-slider)

② Number of sliders + Motor type
Example: 2S
2: Slider x 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: 130 mm
- to
- 2650: 2650 mm

③ See Table 1, "List of strokes."
* For details, see the GLM20AP dimension diagram (-> P.12 to 17).

④ See Table 2, "List of encoders."
Note) The maximum speed and repetitious positioning accuracy of the actuator vary depending on the encoder resolution.

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

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 200 VAC specifications

⑥ Driver + Input power voltage
Example: TDP20
TDP: Driver TDP
20: 200 VAC specification

Table 1. List of strokes
③ Stroke
****

Stroke [mm]	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 actuator length [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. For details, contact THK.
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
④ Encoder/resolution
****

Encoder manufacturer	Model number	Resolution [μm]		Repetitious positioning accuracy [μm]	Maximum speed [m/s]
Magnescale Co., Ltd.	PL25	G10K	10.0	±10	
Magnescale Co., Ltd.	PL25	G05K	5.0	±5	3.0
RENISHAW Inc.	RGH22X	R01K	1.0		
HEIDENHAIN Inc.	LIDA277	H01K	1.0	±1	
RENISHAW Inc.	RGH22Z	R500	0.5		1.5
RENISHAW Inc.	RGH22Y	R100	0.1		0.3

Note 1) The linear motor has different maximum speed and repetitious positioning accuracy depending on the encoder resolution.
Note 2) The maximum speed may be limited depending on the encoder to be used. For details, see the GLM20AP basic specifications (-> P.8).
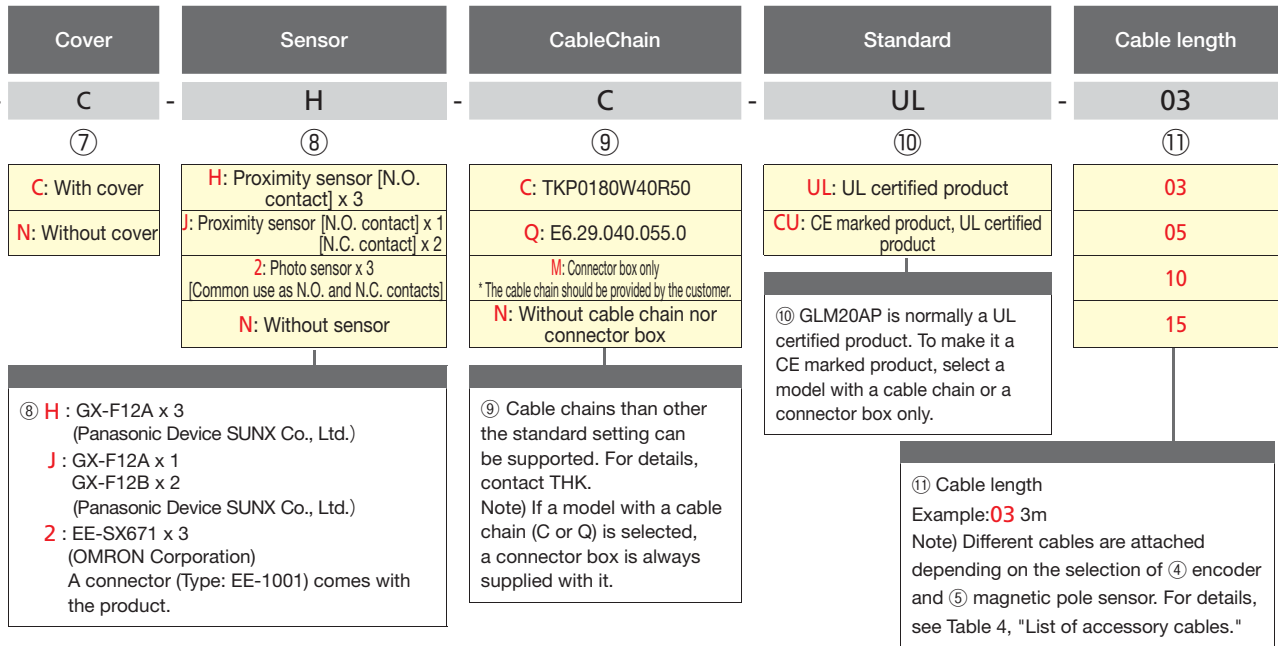Note 3) The resolution is the value after multilpying by 4.

Table 3. Drivers
⑥ Driver
****

⑥ Driver	Motor type	Attached driver
TDP20	SType	TDP-045CU-200AC-GA20SU-①[*1]-②[*2]
	MType	TDP-075CU-200AC-GA20MU-①[*1]-②[*2]
	LType	TDP-100CU-200AC-GA20LU-①[*1]-②[*2]

*1 The symbol ① setting of the attached driver complies with the actuator resolution. For details, see the driver model number (-> P.6).
*2 The symbol ② setting of the attached driver complies with the magnetic pole sensor of the actuator. For details, see the driver model number (-> P.6).

	Cover		Sensor		CableChain		Standard		Cable length
-	C	-	H	-	C	-	UL	-	03
	⑦		⑧		⑨		⑩		⑪

⑦
C: With cover
N: Without cover

⑧
H: Proximity sensor [N.O. contact] x 3
J: Proximity sensor [N.O. contact] x 1 [N.C. contact] x 2
2: Photo sensor x 3 [Common use as N.O. and N.C. contacts]
N: Without sensor

⑧ H : GX-F12A x 3
(Panasonic Device SUNX Co., Ltd.)
J : GX-F12A x 1
GX-F12B x 2
(Panasonic Device SUNX Co., Ltd.)
2 : EE-SX671 x 3
(OMRON Corporation)
A connector (Type: EE-1001) comes with the product.

⑨
C: TKP0180W40R50
Q: E6.29.040.055.0
M: Connector box only
* The cable chain should be provided by the customer.
N: Without cable chain nor connector box

⑨ Cable chains than other the standard setting can be supported. For details, contact THK.
Note) If a model with a cable chain (C or Q) is selected, a connector box is always supplied with it.

⑩
UL: UL 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.

⑪
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, see Table 4, "List of accessory cables."

Note) The above model configuration includes the actuator, driver, and cables. If only the actuator is required, contact THK.
The motion controller and a cable to connect the controller and the driver should be provided by customer.
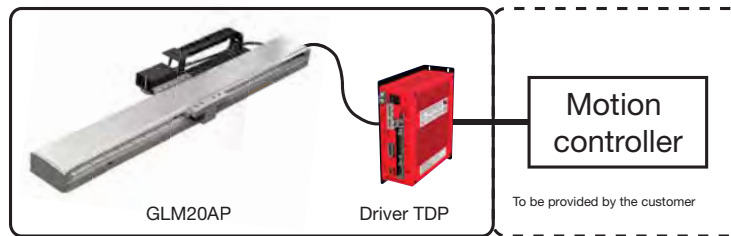
GLM20AP   Driver TDP   Motion controller   To be provided by the customer

Table 4. List of accessory cables

⑪Cable length
**

④Encoder/resolution	⑤Magnetic pole sensor	Motor cable	Encoder/magnetic pole sensor cable	Origin detector cable	Cable between interpolator/ magnetic pole sensor and driver	Cable between interpolator and driver
R01K/R500/R100	J: With magnetic pole sensor	KDK-**-CU	KJET-**-CU	—	—	—
R01K/R500/R100	N: Without magnetic pole sensor		KET-**-CU	—	—	—
H01K	J: With magnetic pole sensor		KHET-**-CU	—	—	—
H01K	N: Without magnetic pole sensor		KEK-**-CU	—	—	—
G10K/G05K	J: With magnetic pole sensor		CK-**	CE09-**	KSJT-**-CU	-
G10K/G05K	N: Without magnetic pole sensor		CK-**	CE09-**	-	KSET-01-CU

Note) For the actual cable length, check the GLM20AP system configuration diagram (-> P.10 to 11).

Detailed content pages

④ Motor type	P.8 to 9	Basic Specifications, Thrust/Speed Characteristics
⑤ Stroke	P.12 to 17	Dimension Diagram
⑥ Encoder/resolution	P.8	Basic Specifications
⑦ Driver	P.6, P.22	Model Configurations, Driver Basic Specifications
⑧ Sensor	P.18	Dimensions at Sensor Installation
⑨ Cable chain	P.19	Dimensions at Cable Chain Installation
⑩ Standard	P.35	Glossary
⑪ Cable length	P.10 to 11	System Configuration

Driver

* GLM20AP consists of an actuator as the main body and a driver TDP provided with it.
  If a driver TDP to be used for maintenance is needed, please order it with the following model number.

$$\underset{①}{\underline{TDP}} - \underset{②}{\underline{045CU}} - \underset{③}{\underline{200AC}} - \underset{④}{\underline{GA20SU}} - \underset{⑤}{\underline{1U}} - \underset{⑥}{\underline{N}}$$

① Model number	TDP
② Capacity	045CU: 450 W (For S type motor) 075CU: 750 W (For M type motor) 100CU: 1 kW (For L type motor)
③ Input power	200AC: Single/three-phase 200 VAC * The 1-kW capacity specifications support only the input power of three-phase 200 VAC.
④ Motor type	GA20SU : GLM20AP S type GA20MU : GLM20AP M type GA20LU : GLM20AP L type
⑤ Resolution (numeric value + unit)	10U : 10.0 μm 5U : 5.0 μm 1U : 1.0 μm 500N : 0.5 μm 100N : 0.1 μm
⑥ Magnetic pole sensor	N : Without magnetic pole sensor J : With magnetic pole sensor

Cable

* GLM20AP consists of an actuator as the main body and a motor cable, encoder cable, and magnetic pole sensor cable provided with it.
  If a cable to be used for maintenance is needed, please order it with the following model number according the specifications of the linear encoder.

● **Case of specifications of optical linear encoder (RENISHAW Inc.)**

$$\underset{①}{\underline{K}} \underset{②}{\underline{DK}} - \underset{③}{\underline{03}} - CU$$

① Symbol	K	
② Type	DK : Motor cable	(Standard cable length: 3 m, 5 m, 10 m, 15 m)
	ET : Encoder cable	(Standard cable length: 3 m, 5 m, 10 m, 15 m)
	JET : Encoder/magnetic pole sensor cable	(Standard cable length: 3 m, 5 m, 10 m, 15 m)
③ Cable length	03: 3 m (if the standard cable length is 3 m) * Contact THK if a cable with length other than the standard length is needed.	

● **Case of specifications of optical linear encoder (HEIDENHAIN Inc.)**

$$\underset{①}{\underline{K}} \underset{②}{\underline{DK}} - \underset{③}{\underline{03}} - CU$$

① Symbol	K	
② Type	DK : Motor cable	(Standard cable length: 3 m, 5 m, 10 m, 15 m)
	EK : Encoder cable	(Standard cable length: 3 m, 5 m, 10 m, 15 m)
	HET: Encoder/magnetic pole sensor cable	(Standard cable length: 3 m, 5 m, 10 m, 15 m)
③ Cable length	03: 3 m (if the standard cable length is 3 m) * Contact THK if a cable with length other than the standard length is needed.	

● Case of specifications of magnetic linear encoder (Magnescale Co., Ltd.)

<u>K</u> <u>DK</u> - <u>03</u> - CU
① ② ③

① Symbol	K
② Type	DK : Motor cable (Standard cable lengths: 3 m, 5 m, 10 m, 15 m) SET : Cable between interpolator and driver (Standard cable length: 1 m) SJT : Cable between magnetic pole sensor/interpolator and driver 　　　(Standard length of cable between interpolator and driver: 1 m commonly) 　　　(Standard length of cable between magnetic pole sensor and driver: 3 m, 5 m, 10 m, and 15 m)
③ Cable length	03: 3 m (if the standard cable length is 3 m) * Contact THK if a cable with length other than the standard length is needed.

<u>C</u> <u>K</u> - <u>03</u>
① ② ③

① Symbol	C	
② Type	K : Encoder cable	(Standard cable length: 3 m, 5 m, 10 m, 15 m)
	E09 : Origin detector cable	(Standard cable length: 3 m, 5 m, 10 m, 15 m)
③ Cable length	03: 3 m (if the standard cable length is 3 m) * Contact THK if a cable with length other than the standard length is needed.	

Setup tool

● Digital operator

D - CON2
①

① Type	D-CON2: Digital operator (-> P.21)

Note) D-CON2 is not provided with the actuator or the driver TDP. Please order them with the above model number.

● Communication cable (PC communication cable RS-232C when using D-Assist)

K232 - <u>01</u>
①

① Cable length	01: 1 m

Note) D-Assist Ver.2 is a required tool to change the driver TDP parameter settings. The use of USB cables on the driver TDP is supported. For details of USB cables, contact THK. Communication cables are not provided with the actuator or the driver TDP. Please order them with the above model number. For details about D-Assist Ver.2, see P.21.

Encoder adjustment device

<u>APS27</u>
①

① Type	APS27: Encoder adjustment device (-> P.21)

Note) APS27 is an encoder adjustment device used to evaluate the installation tolerance of LIDA277 with TTL interface (HEIDENHAIN Inc.).
　　　Although the encoder has been adjusted at the shipment of the actuator, it is needed for readjustment during maintenance and inspection, etc.

GLM20AP

Basic Specifications

Item / Motor type	S type					M type					L Type				
Driver model number	TDP-045CU-200AC-GA20SU					TDP-075CU-200AC-GA20MU					TDP-100CU-200AC-GA20LU				
Main circuit power voltage	Single/three-phase 200 VAC					Single/three-phase 200 VAC					Three-phase 200 VAC				
Maximum thrust[*1][N]	336					618					954				
Rated thrust[*1][N]	118					220					344				
Maximum speed[*2][m/s]	3.0	3.0	3.0	1.5	0.3	3.0	3.0	3.0	1.5	0.3	3.0	3.0	3.0	1.5	0.3
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
Repetitious positioning accuracy [μm]	±10	±5	±1			±10	±5	±1			±10	±5	±1		
Maximum transportable weight[*3][kg]	46.1					86.1					134.6				
Assumed transportable weight[*4][kg]	7.7					15.0					24.5				

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

*2 The maximum speed varies depending on the resolution.
   Example: The maximum speed is 0.3 m/s when the motor type is S, the driver model number is TDP-045CU-200AC-GA20SU, and the resolution is 0.1μm.

*3 The specifications of the operating speed, acceleration/deceleration, etc. are limited by the load weight. See "Selection Method for Linear Motors" on P.511 to 520.
   The maximum transportable weight is a weight that can be driven at an approximate acceleration of 0.5 G.

*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 2 G and a maximum operating speed of 1.0 m/s.
   Depending on the operating conditions, the movable weight may change under the influence of the thrust and speed characteristics.
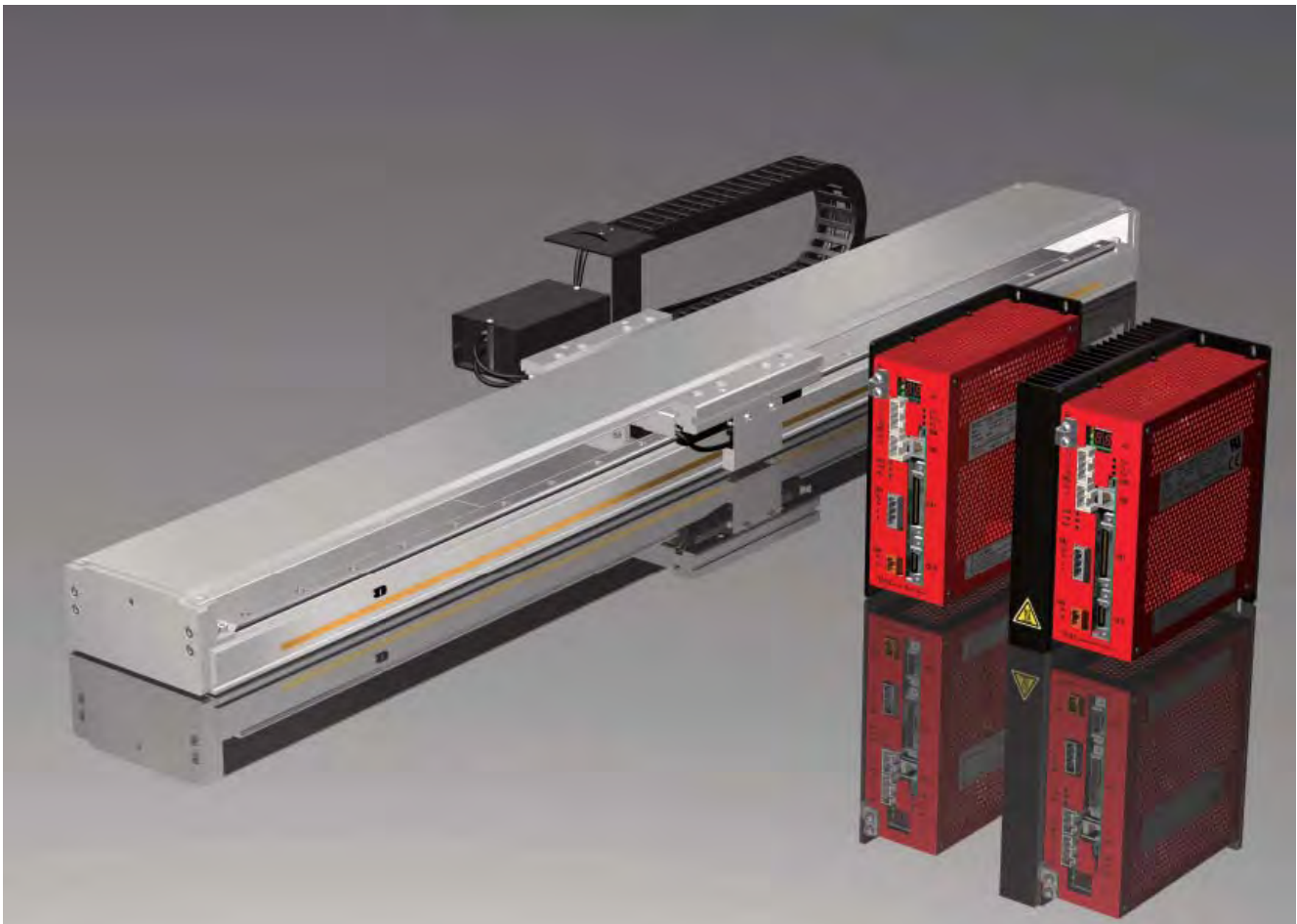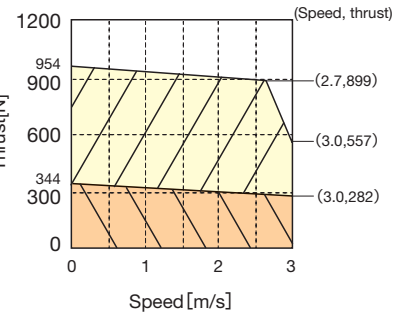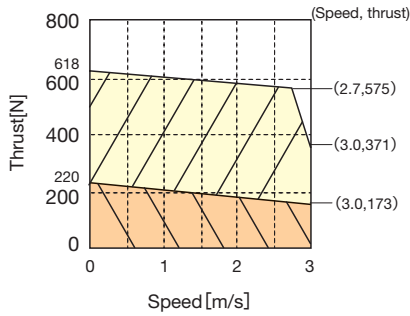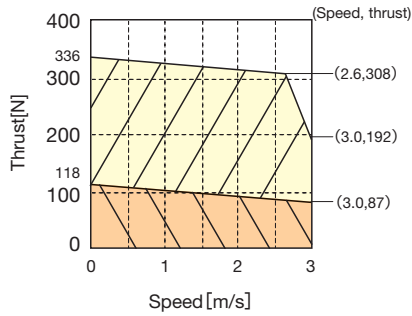
Thrust/Speed Characteristics

[200 VAC 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 |

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.
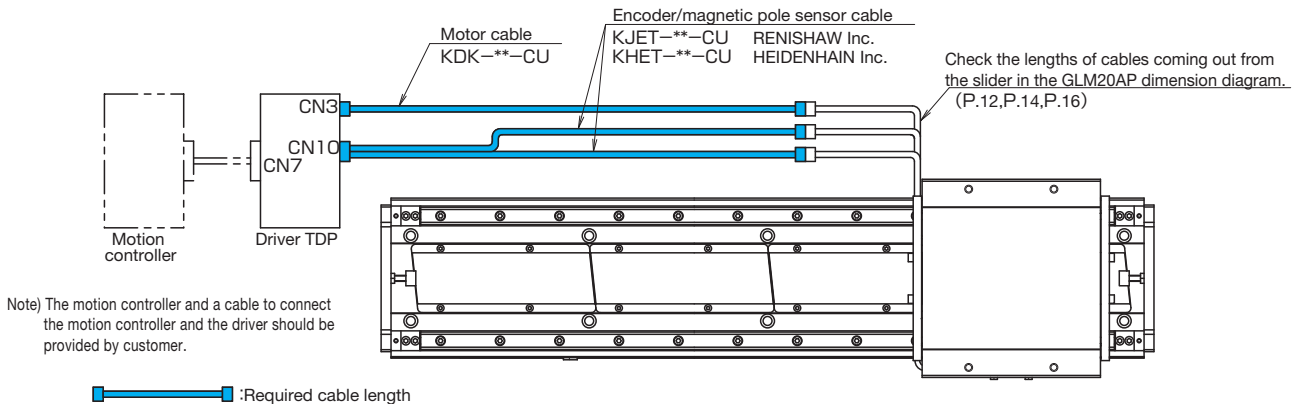
Transportable Weight and Acceleration
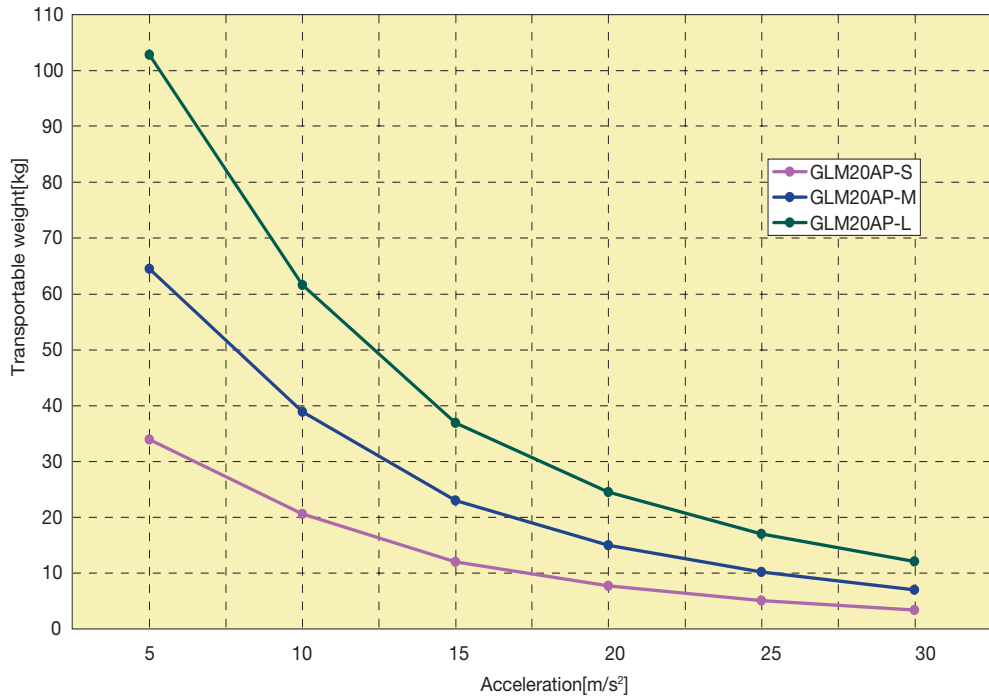
Note) At a maximum operating speed of 1.0 m/s, the unit can be driven for a certain stroke at a duty ratio of 50 % at this weight. For details about selection, see "Selection Method for Linear Motors" on P.511 to 520.

System Configuration

● Optical linear encoder (RENISHAW Inc./HEIDENHAIN Inc.) with a magnetic pole sensor

Motor cable
KDK−**−CU

Encoder/magnetic pole sensor cable
KJET−**−CU   RENISHAW Inc.
KHET−**−CU   HEIDENHAIN Inc.

Check the lengths of cables coming out from
the slider in the GLM20AP dimension diagram.
(P.12,P.14,P.16)

CN3
CN10
CN7

Motion
controller

Driver TDP

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

:Required cable length

⑪Cable length
**

Cable length	Motor cable	Length	Encoder/magnetic pole sensor cable		Length
			RENISHAW Inc.	HEIDENHAIN Inc.	
03	KDK–03–CU	3 m	KJET–03–CU	KHET–03–CU	3 m
05	KDK–05–CU	5 m	KJET–05–CU	KHET–05–CU	5 m
10	KDK–10–CU	10 m	KJET–10–CU	KHET–10–CU	10 m
15	KDK–15–CU	15 m	KJET–15–CU	KHET–15–CU	15 m

Note) The above table shows standard combinations of cable lengths. Contact THK if combinations other than those shown in the above table is required.

● Optical linear encoder (RENISHAW Inc./HEIDENHAIN Inc.) without a magnetic pole sensor
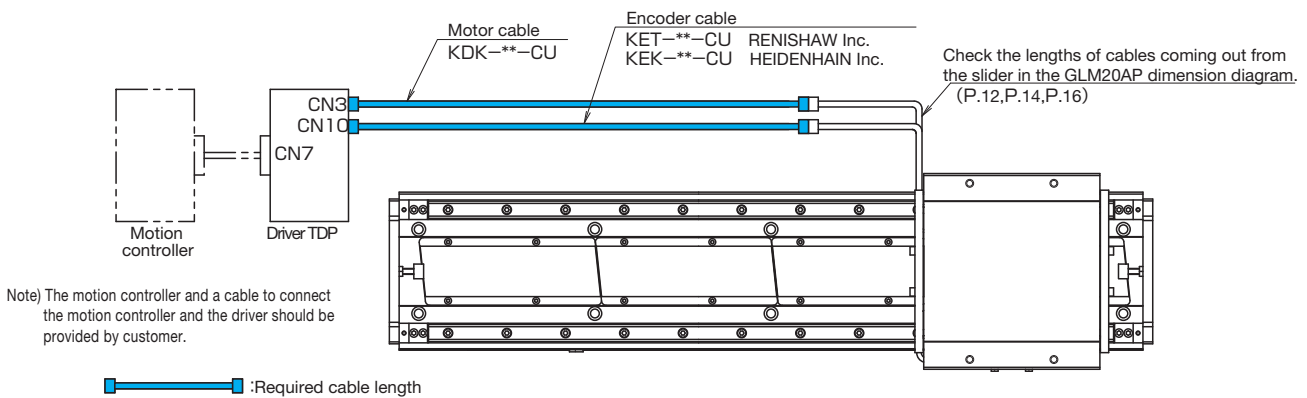
Motor cable
KDK−**−CU

Encoder cable
KET−**−CU   RENISHAW Inc.
KEK−**−CU   HEIDENHAIN Inc.

Check the lengths of cables coming out from
the slider in the GLM20AP dimension diagram.
(P.12,P.14,P.16)

CN3
CN10
CN7

Motion
controller

Driver TDP

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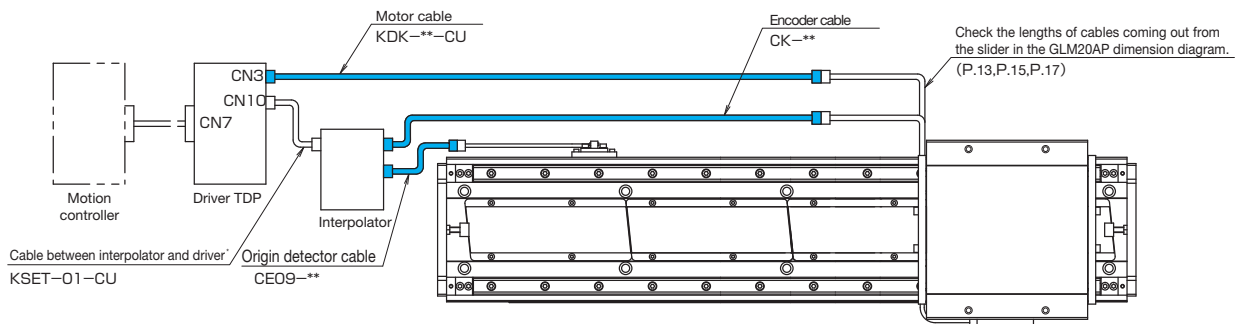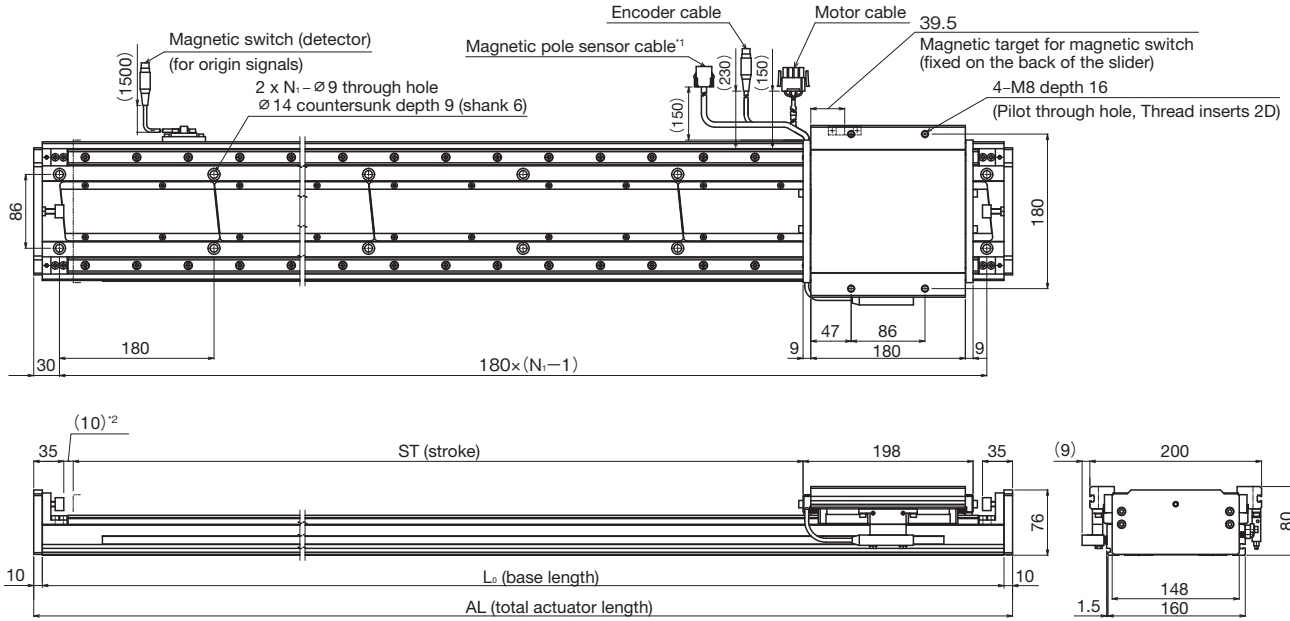provided by customer.

:Required cable length

⑪Cable length
**

Cable length	Motor cable	Length	Encoder/magnetic pole sensor cable		Length
			RENISHAW Inc.	HEIDENHAIN Inc.	
03	KDK–03–CU	3 m	KET–03–CU	KEK–03–CU	3 m
05	KDK–05–CU	5 m	KET–05–CU	KEK–05–CU	5 m
10	KDK–10–CU	10 m	KET–10–CU	KEK–10–CU	10 m
15	KDK–15–CU	15 m	KET–15–CU	KEK–15–CU	15 m

Note) The above table shows standard combinations of cable lengths. Contact THK if combinations other than those shown in the above table is required.

● Magnetic linear encoder (Magnescale Co., Ltd.) with a magnetic pole sensor
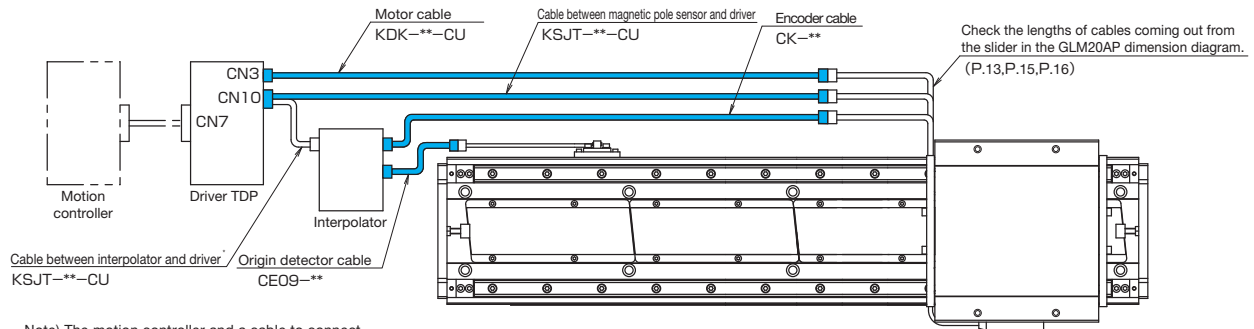
Motor cable
KDK−**−CU

Cable between magnetic pole sensor and driver
KSJT−**−CU

Encoder cable
CK−**

Check the lengths of cables coming out from the slider in the GLM20AP dimension diagram.（P.13,P.15,P.16)

CN3
CN10
CN7

Motion controller

Driver TDP

Interpolator

Cable between interpolator and driver
KSJT−**−CU

Origin detector cable
CE09−**

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

：Required cable length

⑪Cable length
**

Cable length	Motor cable	Length	Encoder cable	Length	Cable between magnetic pole sensor and driver	Length	Origin detector cable	Length
03	KDK-03-CU	3 m	CK-03	3 m	KSJT-03-CU	3 m	CE09-03	3 m
05	KDK-05-CU	5 m	CK-05	5 m	KSJT-05-CU	5 m	CE09-05	5 m
10	KDK-10-CU	10 m	CK-10	10 m	KSJT-10-CU	10 m	CE09-10	10 m
15	KDK-15-CU	15 m	CK-15	15 m	KSJT-15-CU	15 m	CE09-15	15 m

Note) The above table shows standard combinations of cable lengths. Contact THK if combinations other than those shown in the above table is required.
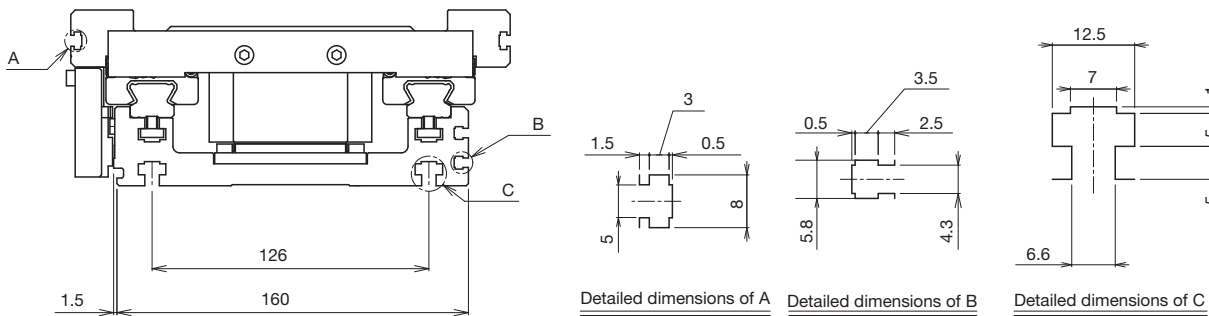* The cable between the interpolator and the driver is fixed to a length of about 1 m.

● Magnetic linear encoder (Magnescale Co., Ltd.) without a magnetic pole sensor

Motor cable
KDK−**−CU

Encoder cable
CK−**

Check the lengths of cables coming out from the slider in the GLM20AP dimension diagram.（P.13,P.15,P.17)

CN3
CN10
CN7

Motion controller

Driver TDP

Interpolator

Cable between interpolator and driver
KSET−01−CU

Origin detector cable
CE09−**

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

：Required cable length

⑪Cable length
**

Cable length	Motor cable	Length	Encoder cable	Length	Cable between interpolator and driver	Origin detector cable	Length
03	KDK-03-CU	3 m	CK-03	3 m		CE09-03	3 m
05	KDK-05-CU	5 m	CK-05	5 m	KSET-01-CU (Cable length of 1 m only)	CE09-05	5 m
10	KDK-10-CU	10 m	CK-10	10 m		CE09-10	10 m
15	KDK-15-CU	15 m	CK-15	15 m		CE09-15	15 m

Note) The above table shows standard combinations of cable lengths. Contact THK if combinations other than those shown in the above table is required.
* The cable between the interpolator and the driver is fixed to a length of about 1 m.
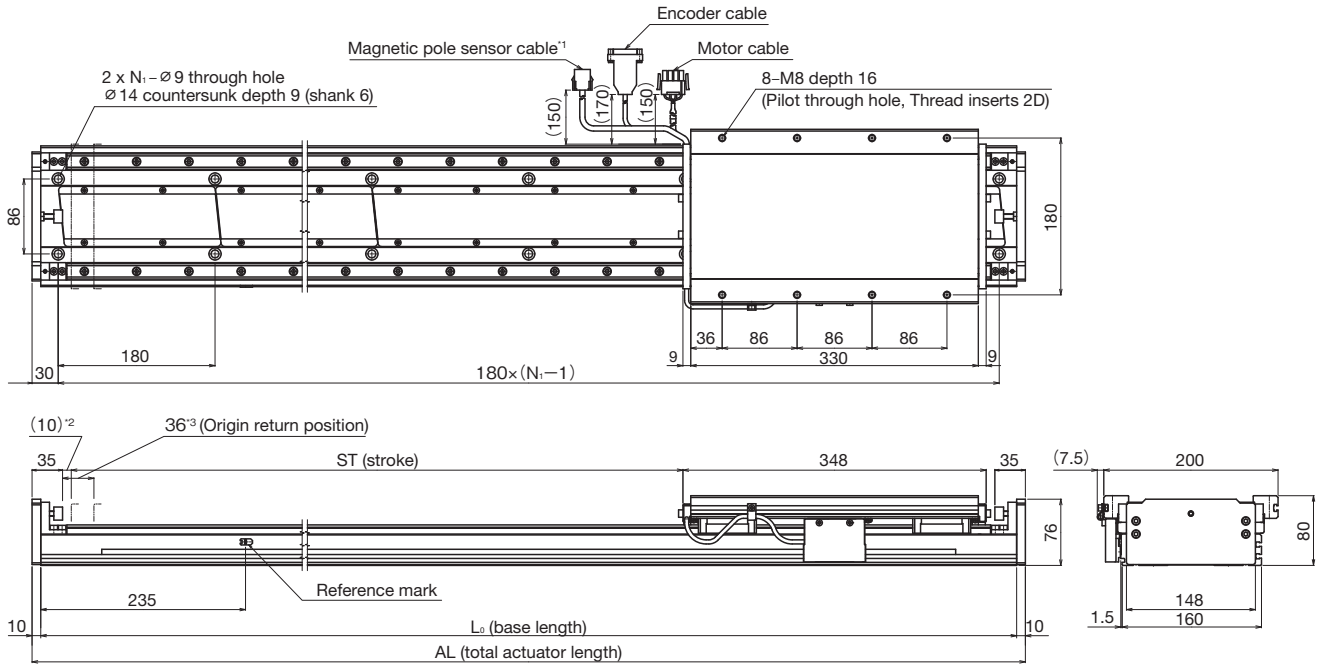
GLM20AP

S Type Flat Type with Core

Height: 80 mm, Stroke: 130 to 2650 mm

Dimension Diagram

● 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 Shows stroke margin between hard stop stroke and rated stroke. Actual stroke margin must be determined from coast stroke considering carrying load that can safely stop from maximum operation speed.
*3 The origin return position if the reference mark is used.

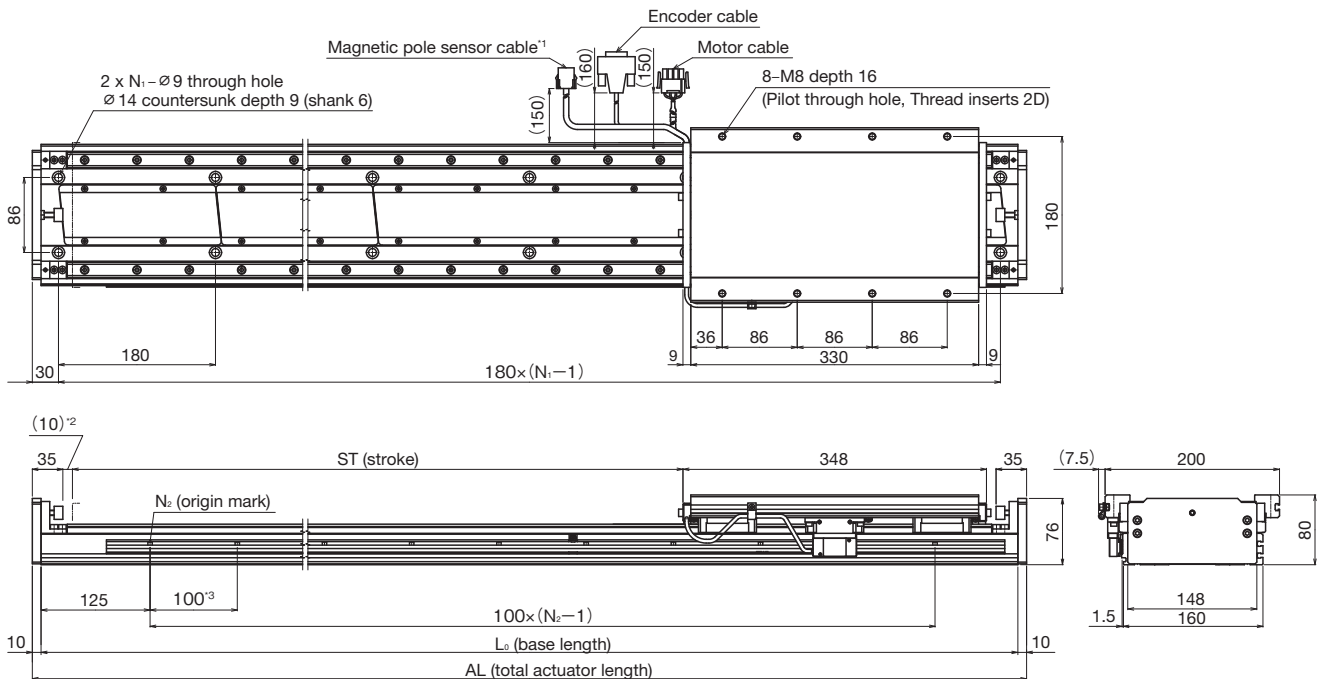● Specifications of optical linear encoder (HEIDENHAIN Inc.)

*1 Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.
*2 Shows stroke margin between hard stop stroke and rated stroke. Actual stroke margin must be determined from coast stroke considering carrying load that can safely stop from maximum operation speed.
*3 An origin is output every 100 mm. Select an origin position to be actually used using an external sensor.

Dimension Diagram

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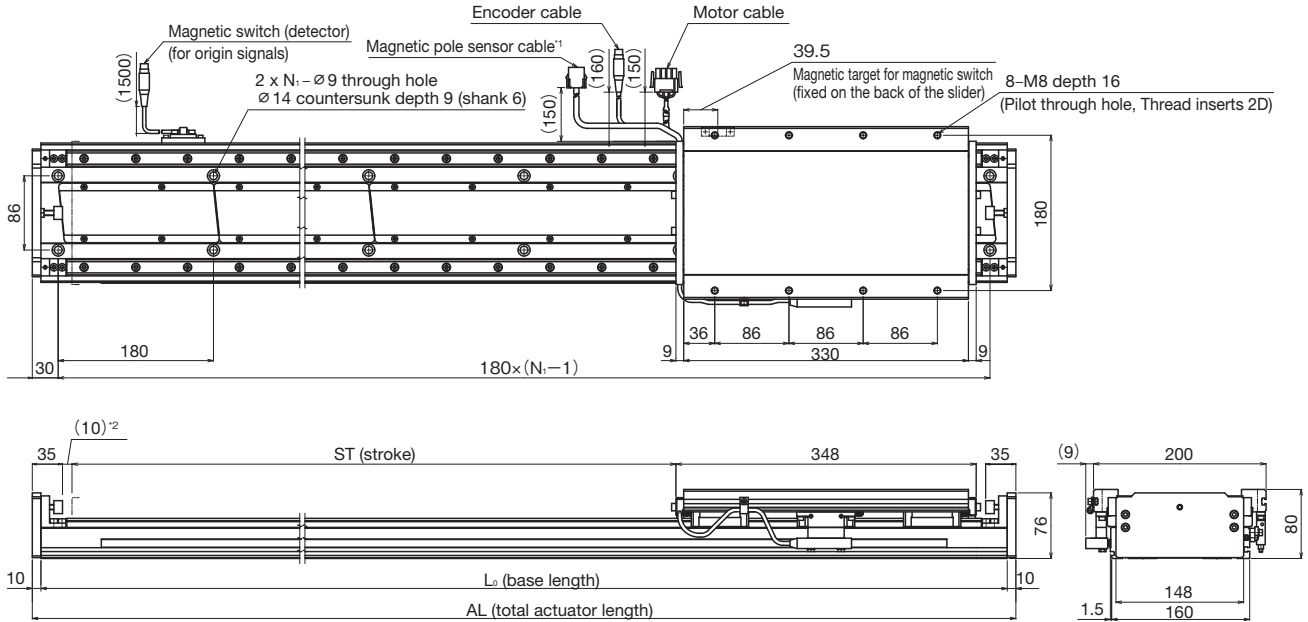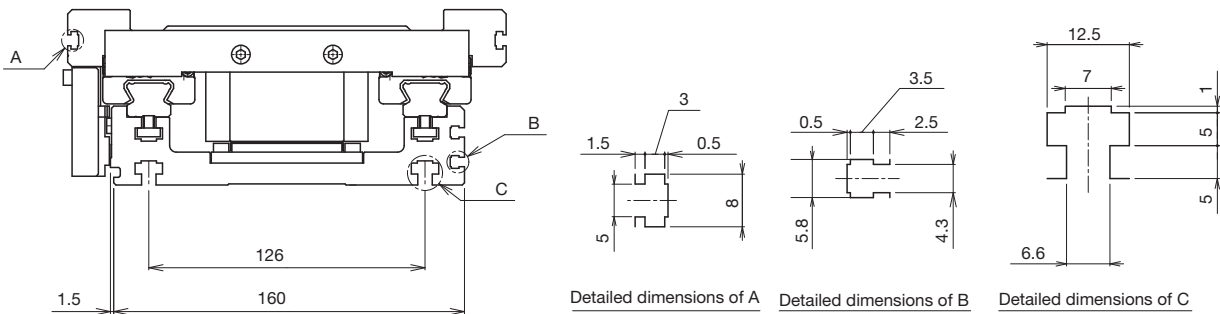

*1 Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.
*2 Shows stroke margin between hard stop stroke and rated stroke. Actual stroke margin must be determined from coast stroke considering carrying load that can safely stop from maximum operation speed.

T Slot Dimensions

Detailed dimensions of A   Detailed dimensions of B   Detailed dimensions of C

Detailed Dimensions

GLM20AP-S-		0130[1]	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_0	400	580	760	940	1120	1300	1480	1660	1840	2020	2200	2380	2560	2740	2920
Total actuator length [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
Number of origin marks (HEIDENHAIN Inc. only)	N_2	1	3	4	6	8	10	11	13	15	17	19	21	22	24	26
Slider weight[2][kg]	m2	5.3														
Base weight [kg]	m3	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[3][kg]	M	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

*1 Due to a short stroke, some of the base installation holes in the center may be unusable. In this case, use the base installation nuts (->P.18) for fixing on the T slot.
*2 The slider weight is the value when it is equipped with a magnetic pole sensor. Without a magnetic pole sensor, the slider weight is -0.2 kg.
*3 The main unit weight is the value when it is equipped with a magnetic pole sensor and a cover.
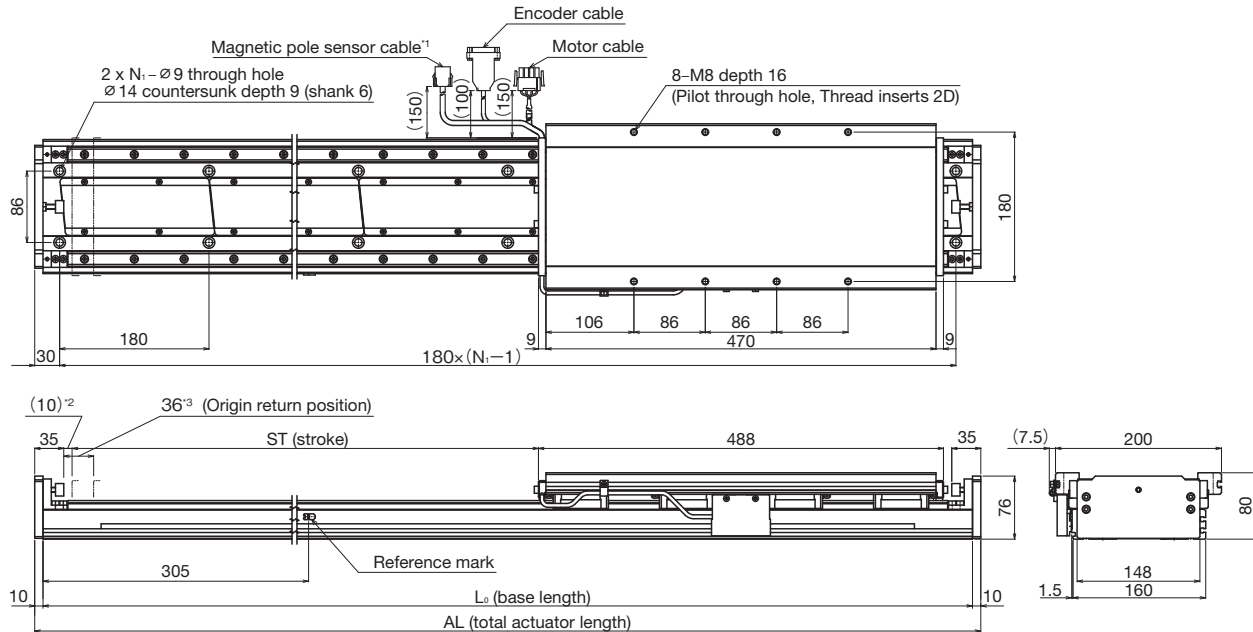
GLM20AP

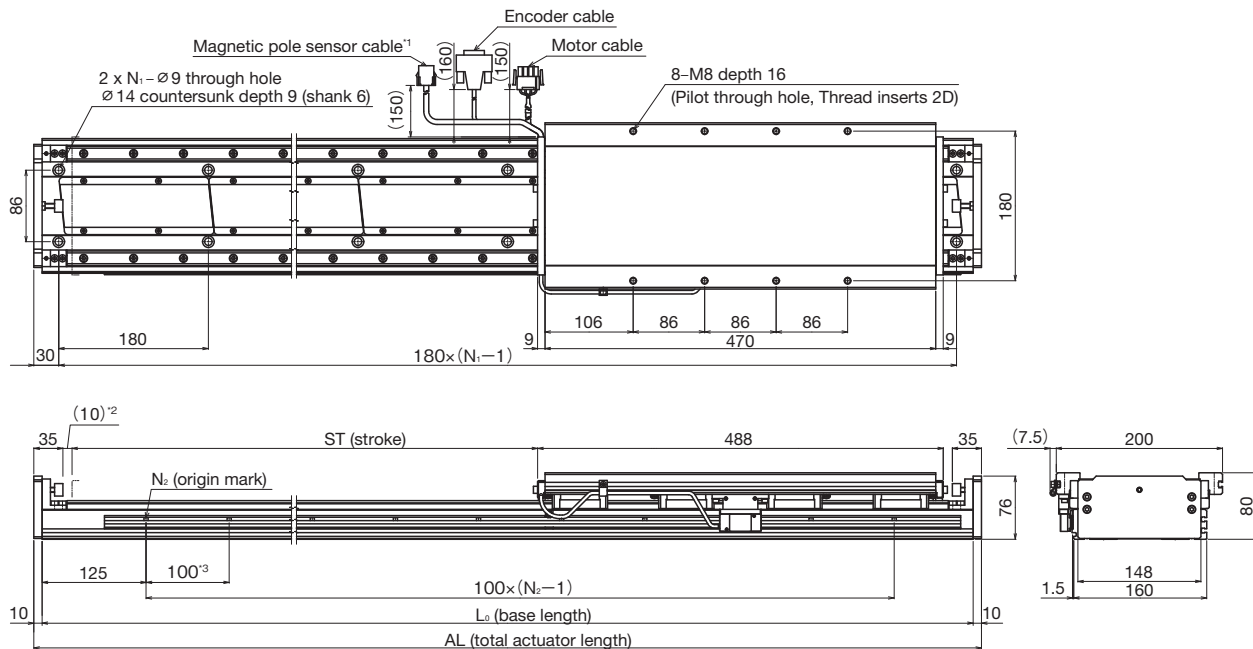**M Type Flat Type with Core**

Height: 80 mm, Stroke: 160 to 2500 mm

Dimension Diagram

● Specifications of optical linear encoder (RENISHAW Inc.)

- Encoder cable
- Magnetic pole sensor cable[*1]
- Motor cable
- 2 x N_1 – Ø9 through hole Ø14 countersunk depth 9 (shank 6)
- 8–M8 depth 16 (Pilot through hole, Thread inserts 2D)
- (150) (170) (150)
- 86
- 180
- 30
- 180
- 180×(N_1−1)
- 36 86 86 86
- 9 330 9
- (10)[*2]
- 36[*3] (Origin return position)
- 35
- ST (stroke)
- 348
- 35
- (7.5)
- 200
- 76
- 80
- 235
- Reference mark
- 10
- L_0 (base length)
- 10
- 1.5
- 148
- 160
- AL (total actuator length)

*1 Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.
*2 Shows stroke margin between hard stop stroke and rated stroke. Actual stroke margin must be determined from coast stroke considering carrying load that can safely stop from maximum operation speed.
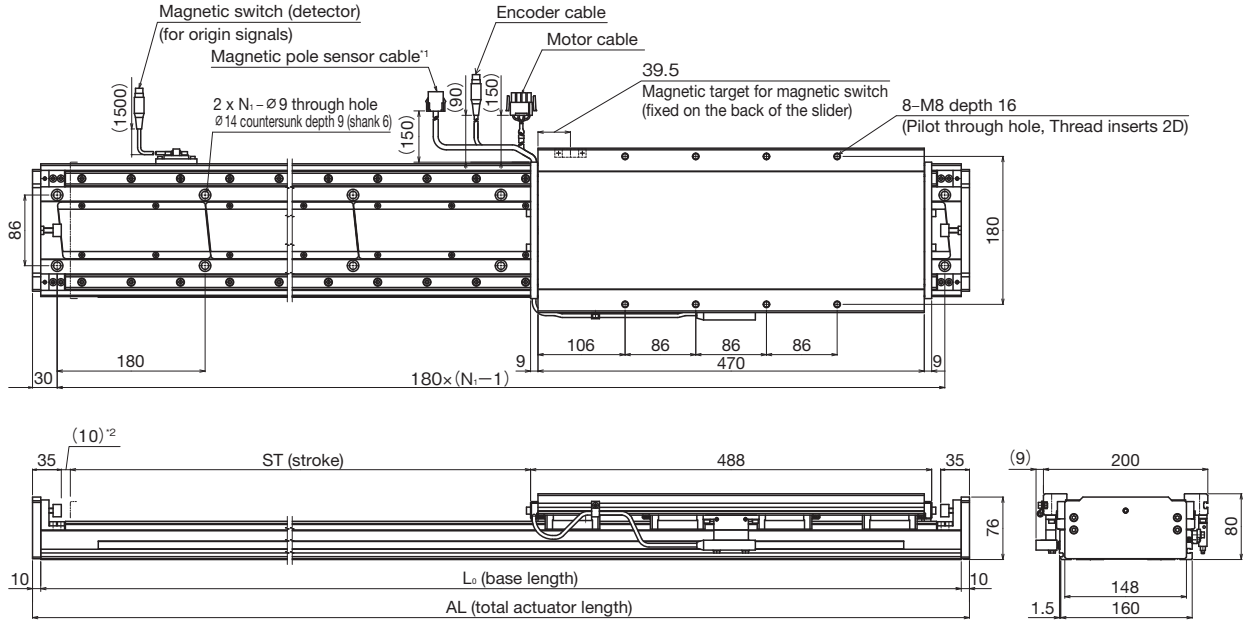*3 The origin return position if the reference mark is used.

● Specifications of optical linear encoder (HEIDENHAIN Inc.)

- Encoder cable
- Magnetic pole sensor cable[*1]
- Motor cable
- 2 x N_1 – Ø9 through hole Ø14 countersunk depth 9 (shank 6)
- 8–M8 depth 16 (Pilot through hole, Thread inserts 2D)
- (150) (160) (150)
- 86
- 180
- 30
- 180
- 180×(N_1−1)
- 36 86 86 86
- 9 330 9
- (10)[*2]
- 35
- N_2 (origin mark)
- ST (stroke)
- 348
- 35
- (7.5)
- 200
- 76
- 80
- 125
- 100[*3]
- 100×(N_2−1)
- 10
- L_0 (base length)
- 10
- 1.5
- 148
- 160
- AL (total actuator length)

*1 Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.
*2 Shows stroke margin between hard stop stroke and rated stroke. Actual stroke margin must be determined from coast stroke considering carrying load that can safely stop from maximum operation speed.
*3 An origin is output every 100 mm. Select an origin position to be actually used using an external sensor.
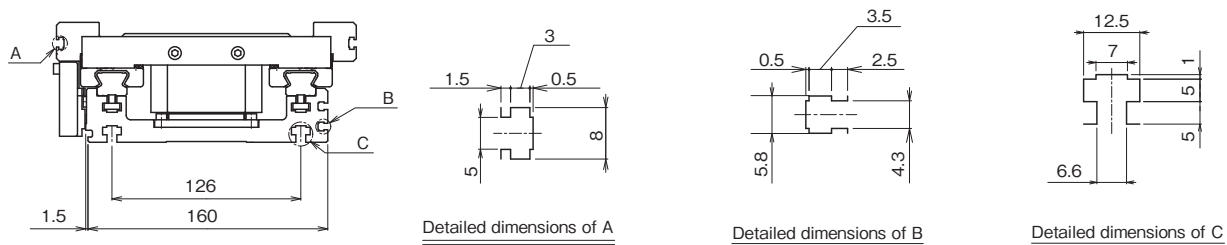
Dimension Diagram

● 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 Shows stroke margin between hard stop stroke and rated stroke. Actual stroke margin must be determined from coast stroke considering carrying load that can safely stop from maximum operation speed.

T Slot Dimensions

Detailed dimensions of A   Detailed dimensions of B   Detailed dimensions of 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_0	580	760	940	1120	1300	1480	1660	1840	2020	2200	2380	2560	2740	2920
Total actuator length [mm]	AL	600	780	960	1140	1320	1500	1680	1860	2040	2220	2400	2580	2760	2940
Number of installation holes per column	N_1	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Number of origin marks (HEIDENHAIN Inc. only)	N_2	2	4	6	7	9	11	13	15	16	18	20	22	24	25
Slider weight*1 [kg]	m2	9.1													
Base weight [kg]	m3	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*2 [kg]	M	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

*1 The slider weight is the value when it is equipped with a magnetic pole sensor. Without a magnetic pole sensor, the slider weight is −0.2 kg.
*2 The main unit weight is the value when it is equipped with a magnetic pole sensor and a cover.

GLM20AP

L Type Flat Type with Core

Height: 80 mm, Stroke: 200 to 2360mm

Dimension Diagram

● **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 Shows stroke margin between hard stop stroke and rated stroke. Actual stroke margin must be determined from coast stroke considering carrying load that can safely stop from maximum operation speed.
*3 The origin return position if the reference mark is used.

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

*1 Note that the magnetic pole sensor cable is not provided with the model without a magnetic pole sensor.
*2 Shows stroke margin between hard stop stroke and rated stroke. Actual stroke margin must be determined from coast stroke considering carrying load that can safely stop from maximum operation speed.
*3 An origin is output every 100 mm. Select an origin position to be actually used using an external sensor.

Dimension Diagram

● 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 Shows stroke margin between hard stop stroke and rated stroke. Actual stroke margin must be determined from coast stroke considering carrying load that can safely stop from maximum operation speed.

T Slot Dimensions

Detailed dimensions of A

Detailed dimensions of B

Detailed dimensions of C

Detailed Dimensions

GLM20AP-L-		0200*1	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_0	760	940	1120	1300	1480	1660	1840	2020	2200	2380	2560	2740	2920
Total actuator length [mm]	AL	780	960	1140	1320	1500	1680	1860	2040	2220	2400	2580	2760	2940
Number of installation holes per column	N_1	5	6	7	8	9	10	11	12	13	14	15	16	17
Number of origin marks (HEIDENHAIN Inc. only)	N_2	2	4	6	8	9	11	13	15	17	18	20	22	24
Slider weight*2 [kg]	m2	12.9												
Base weight [kg]	m3	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*3 [kg]	M	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

*1 Due to a short stroke, some of the base installation holes in the center may be unusable. In this case, use the base installation nuts (-> P.18) for fixing on the T slot.

*2 The slider weight is the value when it is equipped with a magnetic pole sensor. Without a magnetic pole sensor, the slider weight is −0.2 kg.

*3 The main unit weight is the value when it is equipped with a magnetic pole sensor and a cover.

Dimensions at Sensor Installation

Proximity sensor "H", "J"

Width of the sensor dog:20 | 10

A

200

36

18

(9.5)   (9.5)

160

A-A cross section

⑧ Sensor
H
GX-F12A [N.O. contact] x 3 (Panasonic Device SUNX Co., Ltd.)

⑧ Sensor
J
GX-F12A [N.O. contact] x 1 GX-F12B [N.C. contact] x 2 (Panasonic Device SUNX Co., Ltd.)

Photo sensor "2"

Width of the sensor dog:20 | 10

A

200

(18)

(26)   (36)

18   (12.6)

160

A-A cross section

⑧ Sensor
2
EE-SX671 [Common use as N.O. and N.C. contacts] x 3 (OMRON Corporation) A connector (Type: EE-1001) comes with the product.

Outer Dimensions of Base Installation Nuts

M5 x 0.8 through hole

10.5

20

4
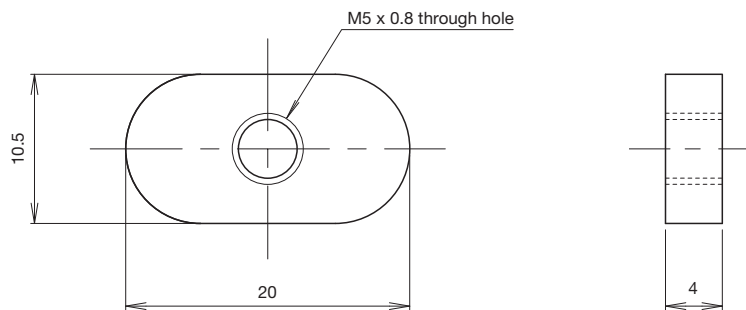
Contact THK if base installation nuts is required.

Dimensions at Cable Chain Installation

Connector box "M"
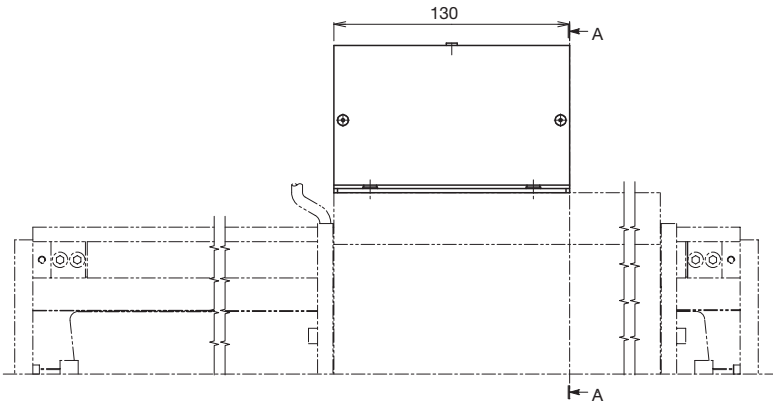
⑨Cable chain
M
Connector box only
* The cable chain should be provided by the customer.
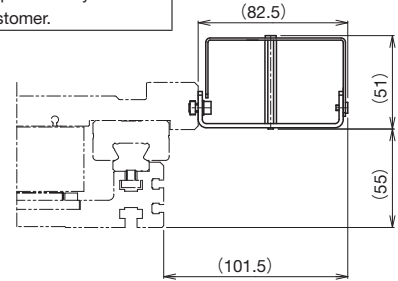
A-A cross section

Cable chain "C"
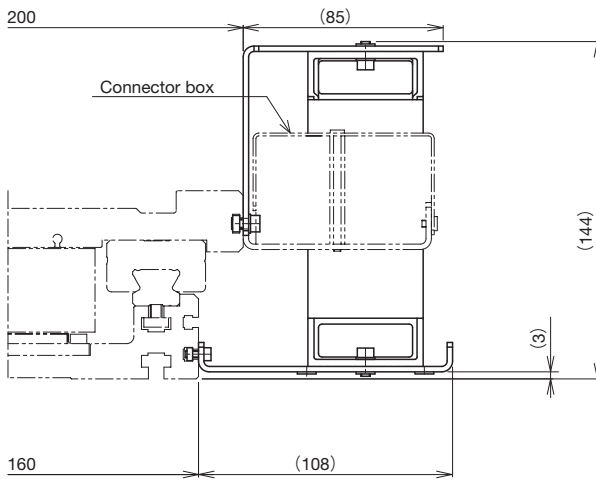
Connector box

⑨Cable chain
C
TKP0180W40R50 (TSUBAKIMOTO CHAIN CO.)
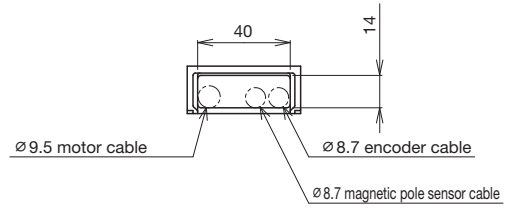
∅9.5 motor cable
∅8.7 encoder cable
∅8.7 magnetic pole sensor cable

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"
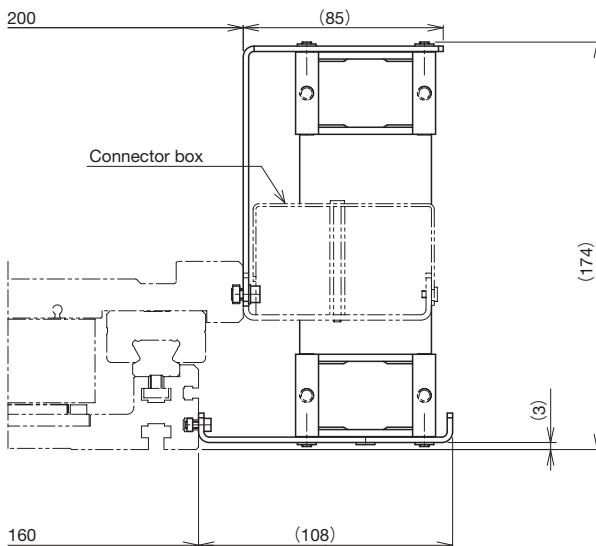
Connector box

⑨Cable chain
Q
E6.29.040.055.0 (igus K.K.)
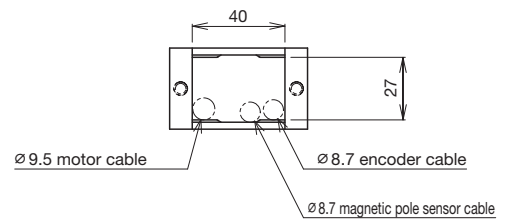
∅9.5 motor cable
∅8.7 encoder cable
∅8.7 magnetic pole sensor cable

Cable chain cross section

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

Driver TDP Specifically Designed for Linear Motor Drive

Model number	Main circuit power voltage	Outer dimensions/ weight	Power supply capacity [kVA]	Appearance	Supported linear motor actuator
TDP-045CU-200AC	Single/ three-phase AC200V	W: 60mm H: 188mm L: 125mm Weight:1.0kg	1.4	CE	GLM20AP-S
TDP-075CU-200AC	Single/ three-phase AC200V	W: 65mm H: 188mm L: 162mm Weight:1.3kg	1.9	CE	GLM20AP-M
TDP-100CU-200AC	Three-phase AC200V	W: 94.5mm H: 188mm L: 165mm Weight: 2.0kg	2.3	CE	GLM20AP-L

Features

1. Driver specifically designed for linear motor drive

This is the driver specifically designed for linear motor drive to get the most out of the features of the linear motor actuator, i.e., high speed, high acceleration/deceleration, and constant velocity.

2. Auto tuning

Equipped with an auto tuning function. Reduces the time required for adjustment operations.

3. Conformance to safe and reliable international standards

All the electronic parts/printed circuit boards and sheet metals/coating are compliant to RoHS directive.
Increased reliability and safety by acquiring CE marking and UL standards. Also, fully compliant to THK Green Procurement.

4. Rich lineup of setup tools

The digital operator D-CON2 and PC software D-Assist Ver.2 facilitates the setup of parameters, etc.

Setup tool

To change parameters for driver TDP, D-CON2 or D-Assist is required.

Digital operator D-CON2

W: 83 mm
H: 141 mm
T: 23 mm

Note) D-CON2 is not included with the product. If required, please place an order seperately.

Features

Quick setup	Just connecting the unit to the driver TDP enables quick setup.
Easy operation	With sheet keys and clear LCD (16 characters x 2 rows), parameters can be set easily.

Functions

● Check/change/write/save parameters
● Monitoring (I/O, position, alarm, effective load factor)
● JOG/FEED operation
● Set communication speed

PC software D-Assist

Note) Either PC communication cable K232-01 or a USB cable is required. For details of USB cables, contact THK.

Features

Easy operation on PC	In addition to D-CON2, parameters can also be set on your PC. Operation status can be observed with waveform display.
PC software is available for free on Web site	PC software can be downloaded for free after logging into the following Technical Support site: (available in English/Japanese/Simplified Chinese) http://tech.thk.com/

Functions

● Supported OS: Windows XP, Vista, and 7
● Auto tuning function settings

Encoder adjustment device

* Only for the HEIDENHAIN Inc. optical linear encoder specifications

Encoder adjustment device APS27

APS27 is an encoder adjustment device used to evaluate the installation tolerance of the LIDA277 with TTL interface (HEIDENHAIN Inc.). Although the encoder has been adjusted at the shipment of the actuator, it is needed for readjustment during maintenance and inspection, etc. To perform adjustment, either connect LIDA277 via the PS27 test connector to the encoder cable or operate the PG27 test unit directly. The installation has been correctly done if the LEDs for incremental signals and origin signals light up in green. The readjustment of installation is required if either of the LEDs lights up in red.
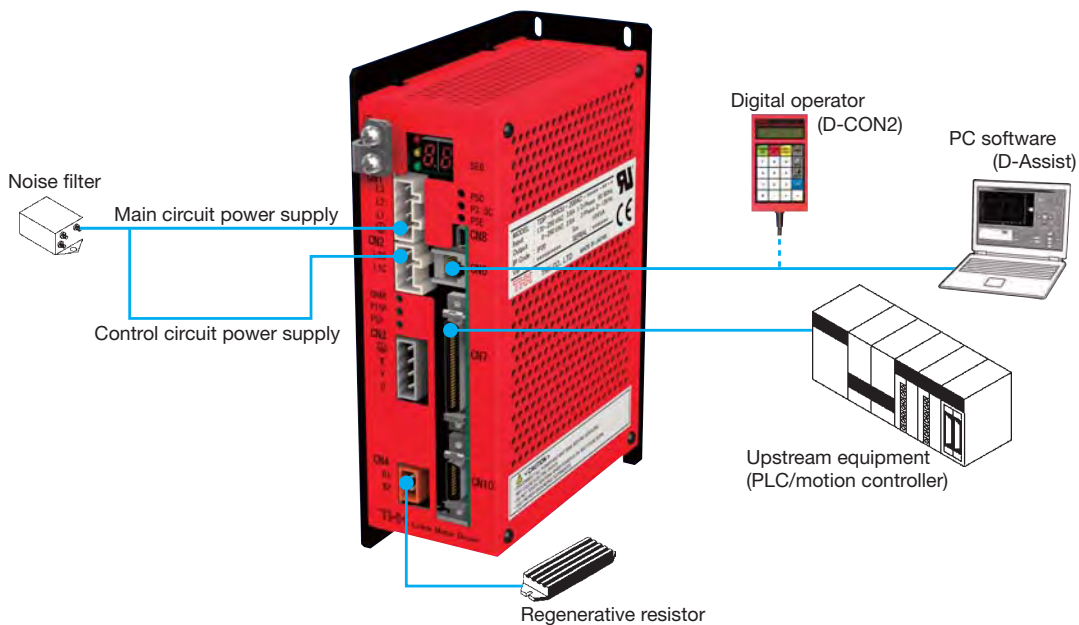

	APS27
Encoder	LIDA277
Function	Pass/fail evaluation ofTTL signals (Incremental signals and origin signals)
Accessories	PS27: Test connector PG27: Test unit PG27 power supply unit (110 to 240 VAC, including an adapter plug) Light shielding film

Specifications

Driver model number TDP-		045CU–200AC	075CU–200AC	100CU–200AC
Supported motor type	GLM20AP	S	M	L
Main circuit power supply	Voltage/frequency	Single/three-phase 170 to 250 VAC 50/60Hz		Three-phase 170 to 250 VAC 50/60Hz
Control circuit power supply	Voltage/frequency	Single-phase 170 to 250 VAC 50/60 Hz		
Power supply capacity [kVA]		1.4	1.9	2.3
Control specifications	Control method	Single or three-phase full-wave rectification IGBT, PWM control, sine wave drive method		
	Feedback	Two-phase pulse (phase A + phase B) with 90° phase differential		
Command input pulse	Type	Select one of the following: sign + pulse column, CCW + CW pulse column, or two-phase pulse (phase A + phase B) with 90° phase differential		
	Form	Line driver (+5 V level)		
	Frequency	Up to 5 MHz		
LED display		Charge LED, internally-powered LED x 5, seven segment LED two digits, display LED x 3		
I/O signal	Positional signal output	Phases A, B, Z: Line driver output		
	Sequence input	Photocoupler input: Servo on, forward run prohibited, reverse run prohibited, alarm reset, reference pulse inhibit, DB input, universal input x 2		
	Sequence output	Photocoupler output: Servo alarm, alarm code (3 bits), positioning completion, servo ready, universal output x 2		
Operating environment	Operating/storage temperature	Operating temperature: 0 to +50 ℃ Storage temperature: -20 to +85℃ (non-freezing)		
	Operating/storage humidity	90 % RH or below (non-condensing)		
Vibration/shock resistance		2G (JIS C60068–2–6)/100G (JIS C60068–2–27)		
Line noise tolerance		1500 V 500 ns common mode, normal mode		
Communication function		RS232C x 1 port, miniUSB x 1 port: PC software, digital operator connection, status display (I/O), parameter setting, alarm display, JOG operation, auto tuning[1]		
Protective function		Regeneration overload, IPM module error, motor overcurrent (phases U and V), main circuit overvoltage/ insufficient voltage, motor overload, encoder alarm, system alarm, driver overheat, excess location deviation, abnormal motion error detection (when servo is on), EEPROM error, magnetic pole detection error, electrical thermal, parameter setting error, software limit, origin return time exceeded, abnormal operation alarm		
Weight [kg]		1.0	1.3	2.0

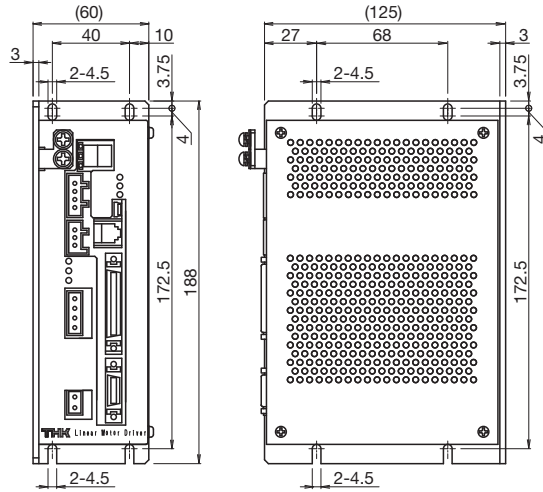*1 The auto tuning function is not available for use with the digital operator.

Peripherals Configuration
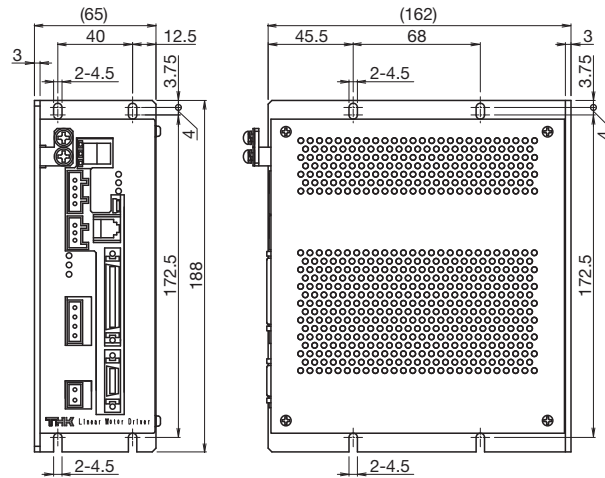

Digital operator (D-CON2)

PC software (D-Assist)

Noise filter

Main circuit power supply

Control circuit power supply

Upstream equipment (PLC/motion controller)

Regenerative resistor

Driver Outer Dimensions
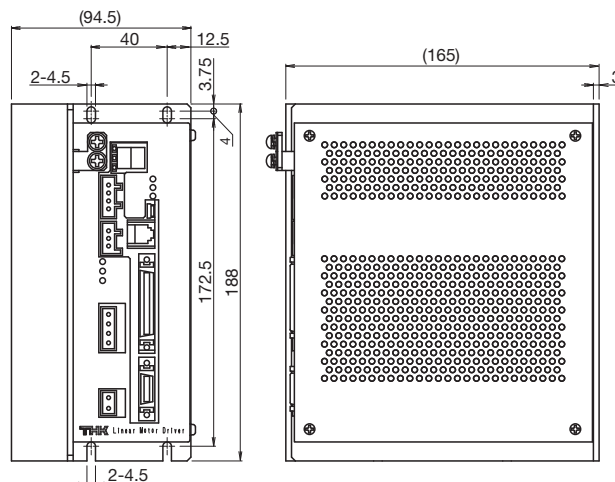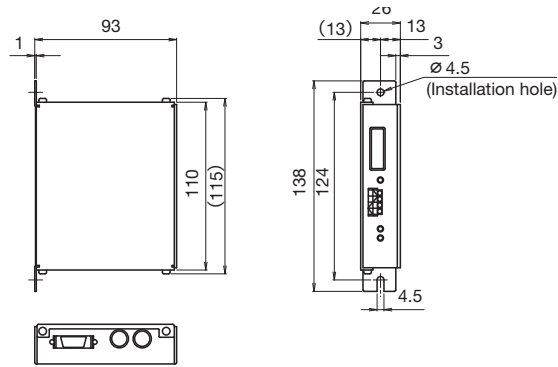

TDP–045CU

TDP–075CU

TDP–100CU

Interpolator Outer Dimensions (Case of Specifications of Magnetic Linear Encoder (Magnescale Co., Ltd.))

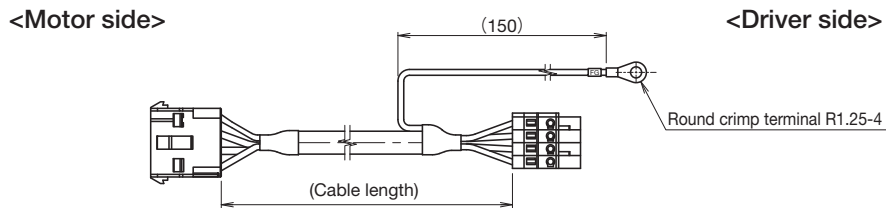**MJ100**

Note) Provided with the magnetic linear encoder made by Magnescale Co., Ltd.

Cable Specifications

KDK–**–CU: Motor cable

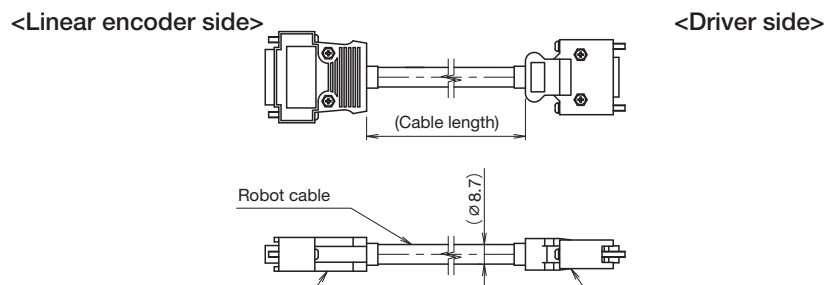<Motor side>   <Driver side>

(150)

Round crimp terminal R1.25-4

(Cable length)

Robot cable

(Ø 9.5)

Plug housing: 172167-1 (Tyco Electronics Japan G.K.)
Socket: 171639-1 (Tyco Electronics Japan G.K.)

Plug: 231–104 (WAGO Company of Japan, Ltd.)

KET–**–CU: Optical linear encoder cable

Note) Used for the optical linear encoder made by RENISHAW Inc.

<Linear encoder side>   <Driver side>

(Cable length)

Robot cable

Ø 8.7

Hood: XM2S-1513 (OMRON Corporation)
Socket: XM2D-1501 (OMRON Corporation)

Non-shield shell kit: 10320-52A0-008 (Sumitomo 3M Limited)
Plug: 10120-3000PE (Sumitomo 3M Limited)

KJET–**–CU: Optical linear encoder/magnetic pole sensor cable

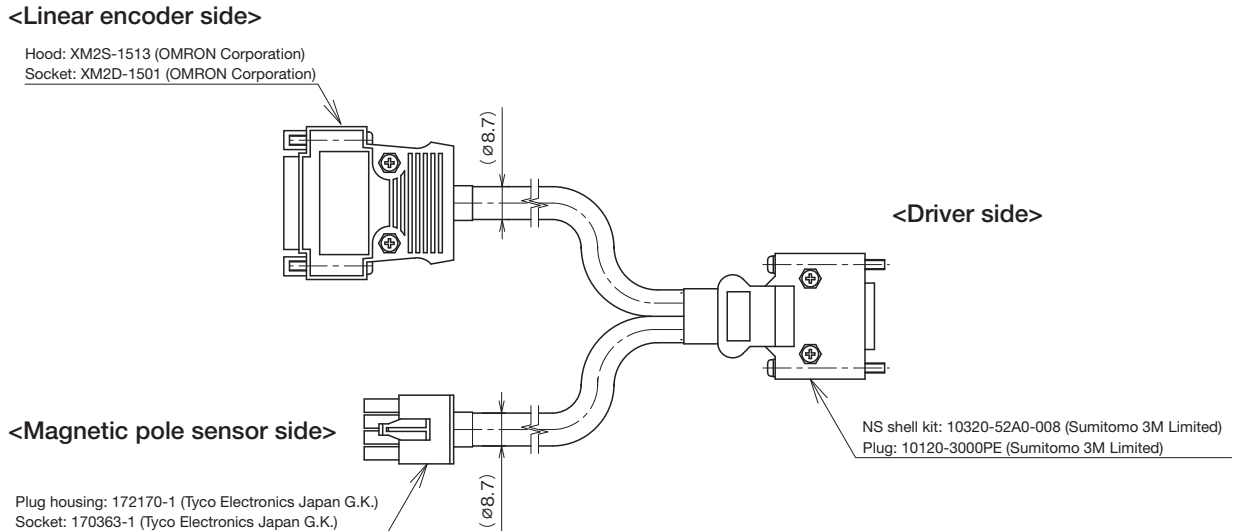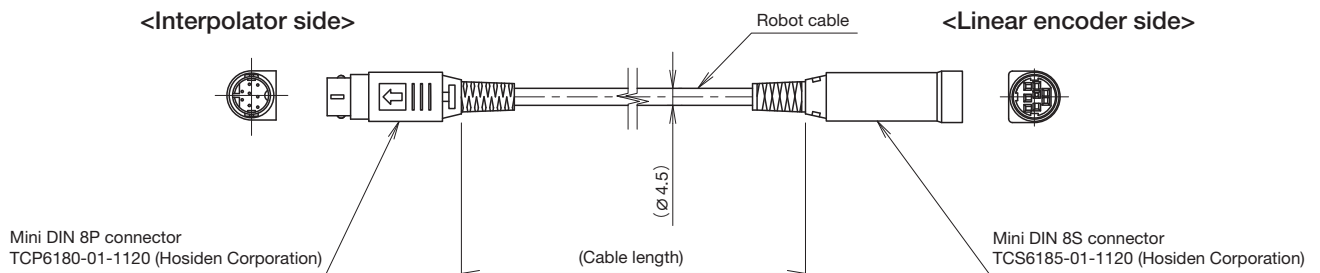Note) Used for the optical linear encoder made by RENISHAW Inc.

<Linear encoder side>
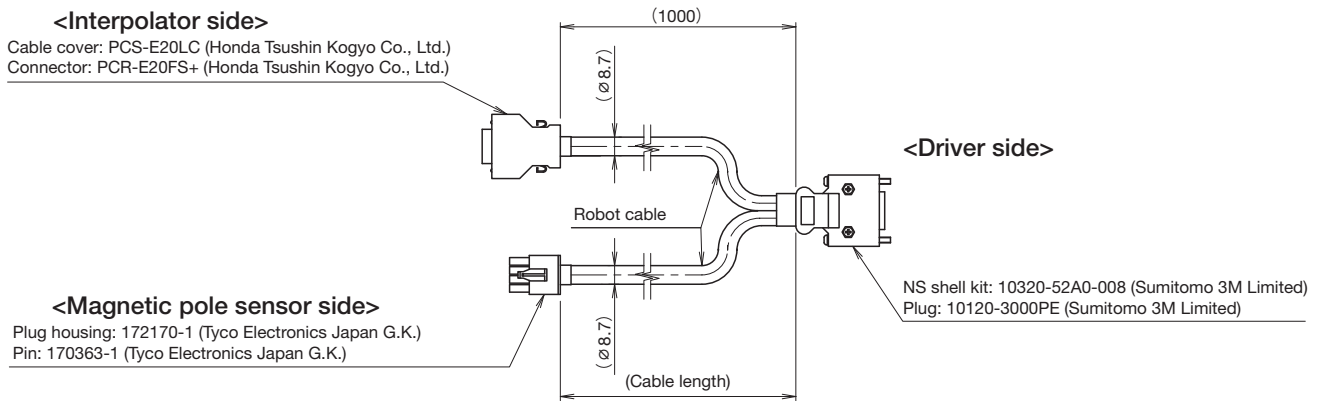Hood: XM2S-1513 (OMRON Corporation)
Socket: XM2D-1501 (OMRON Corporation)

(Cable length)

(∅8.7)

<Driver side>

<Magnetic pole sensor side>

Robot cable

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

(∅8.7)

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

KEK–**–CU: Optical linear encoder cable

Note) Used for the optical linear encoder made by HEIDENHAIN Inc.

<Linear encoder side>

<Driver side>

(Cable length)

Robot cable

Hood: XM2S-1513 (OMRON Corporation)
Socket: XM2D-1501 (OMRON Corporation)

(∅8.7)

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

KHET–**–CU: Optical linear encoder/magnetic pole sensor cable

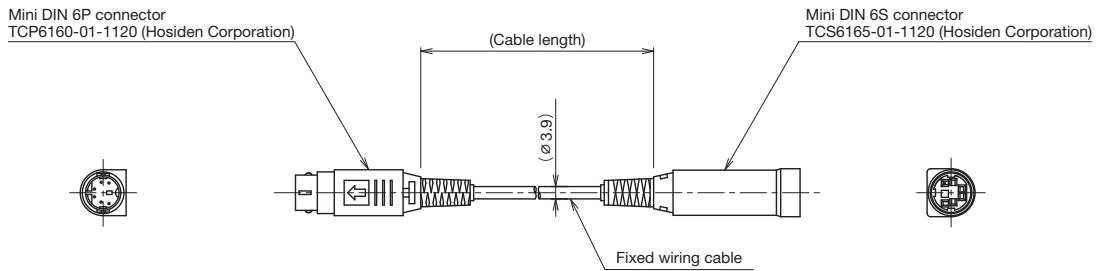Note) Used for the optical linear encoder made by HEIDENHAIN Inc.

<Linear encoder side>
Hood: XM2S-1513 (OMRON Corporation)
Socket: XM2D-1501 (OMRON Corporation)

(∅8.7)

<Driver side>

<Magnetic pole sensor side>

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

(∅8.7)

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

CK–**: Magnetic linear encoder cable

<Interpolator side>

Robot cable

<Linear encoder side>

(∅4.5)

Mini DIN 8P connector
TCP6180-01-1120 (Hosiden Corporation)

(Cable length)

Mini DIN 8S connector
TCS6185-01-1120 (Hosiden Corporation)
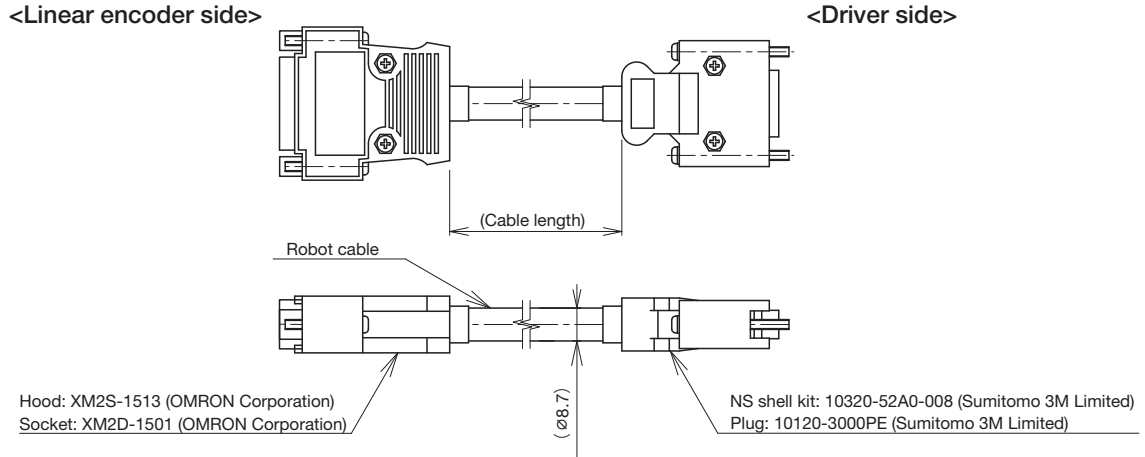
KSET.01.CU: Connection cable between interpolator and driver

<Interpolator side>   <Driver side>

(1000)

Robot cable

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

(∅8.7)

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

KSJT–**-CU: Connection cable between interpolator/magnetic pole sensor and driver

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

(1000)

(∅8.7)

<Driver side>

Robot cable

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

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

(∅8.7)

(Cable length)

CE09-**: Origin detector cable

Mini DIN 6P connector
TCP6160-01-1120 (Hosiden Corporation)

(Cable length)

Mini DIN 6S connector
TCS6165-01-1120 (Hosiden Corporation)

(∅3.9)

Fixed wiring cable

K232–01: PC communication cable RS–232C

<PC side>
Hood: XM2S-0911 (OMRON Corporation)
Socket: XM2D-0901 (OMRON Corporation)

<Driver side>
Modular jack plug: MS6-6 (Kameda)

(1000)

6-core modular cable: TMC-61V (Kameda)
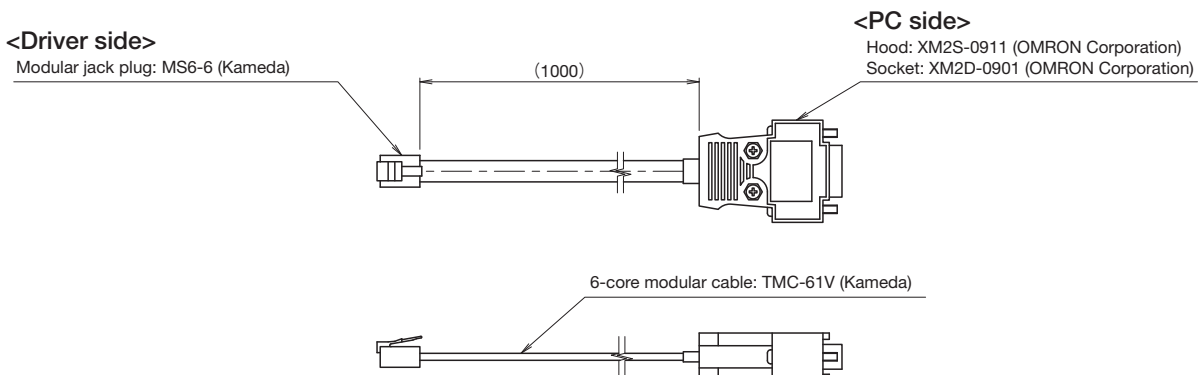
GLM20AP Selection Method

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.32) 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 27 to 31.
   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 1.0 m/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
TD–045CU–200AC–GA20SU	4.5	100	70	90	120	200
TD–075CU–200AC–GA20MU	13.1	100	70	90	120	200
TD–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*** 100Ω *	Without thermostat	Iwaki Musen Kenkyusho
	RH*** 100Ω * –***B	With thermostat (external)	
	RF*** 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 (→ P.7).

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]
$V_{ave} = \dfrac{L}{T \ (1 \ cycle \ time)}$

Find the rated continuous thrust F_{cont} of the motor from the thrust-speed characteristics chart in product specifications (→ P.7).

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]

$$E_1 = F_{d2} \times t_3 \times \frac{V}{2}$$

Check the permissible regenerative energy E_2 of the driver to be used. ($\rightarrow$ P.28 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 200VAC 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/s²]

Stroke : L = 1.0 [m]

Friction coefficient : μ = 0.01

Gravitational acceleration : g = 9.807 [m/s²]
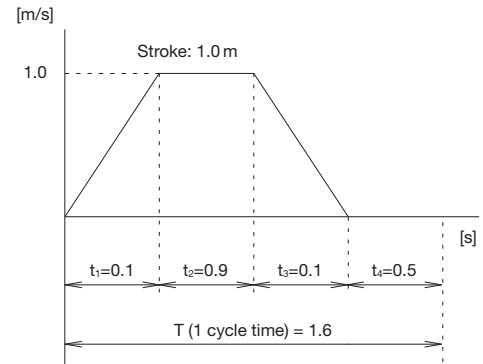
Figure: Motion profile

(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 : $F = μ \times m_1 \times g$
$= 0.01 \times 10 \times 9.807$
$= 1.0$ [N]

Thrust during acceleration : $F_a = (m_1 + m_2) \times \alpha + F$
$= (5.1 + 10) \times 10 + 1.0$
$= 152.0$ [N]

Thrust during deceleration : $F_{d1} = (m_1 + m_2) \times \alpha - F$
$= (5.1 + 10) \times 10 - 1.0$
$= 150.0$ [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:

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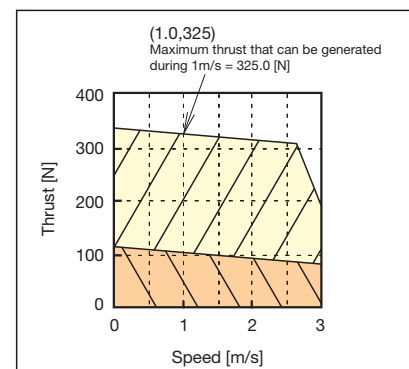
Motor type : S type
Driver : TD-045CU-200AC-GA20SU

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:

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

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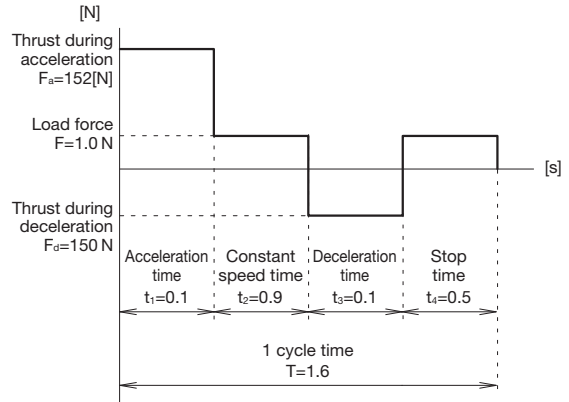
$$= 53.4 \, [N]$$

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:

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

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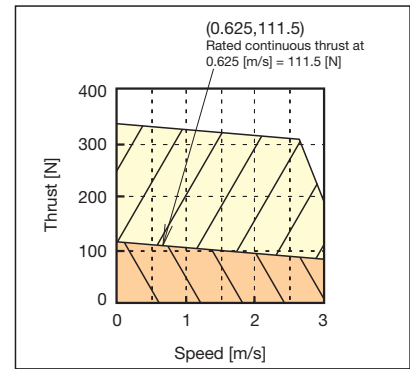
Motor type : S type
Driver   : TD-045CU-200AC-GA20SU

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.27, 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: $W_K = \dfrac{(E_1 - E_2)}{0.2 \times T} = \underline{\underline{5.06 \text{ [W]}}}$

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

* Minimum permissible resistance of TD-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.28 Table 2).

Application Example

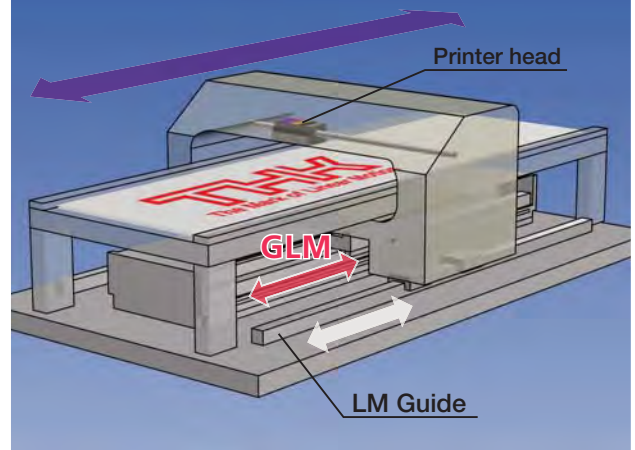### Laser marking | Machining, assembly

GLM
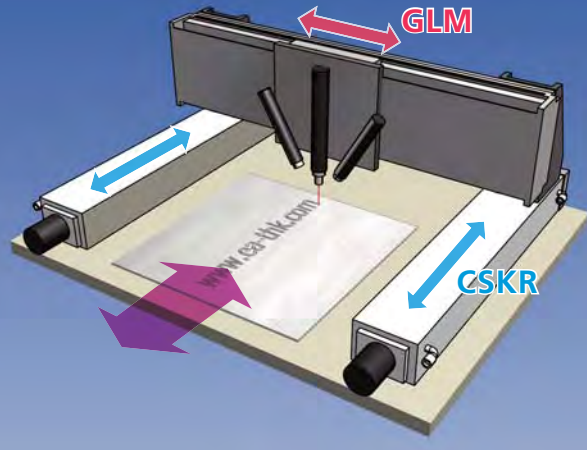
CSKR

Model No.

| CSKR | GLM |

CSKR and GLM are used for the section that moves the laser. By using CSKR, clean series, and GLM, a series that drives the load without physical contact and generates little dust, application in a clean room has been made possible.
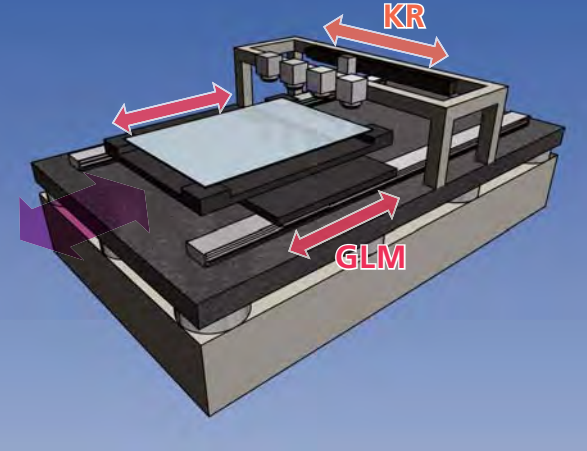
Printer | Other

Printer head

GLM

LM Guide

Model No.

| GLM | LM Guide |

GLM is used for the transfer section of the head. By using GLM that boasts of a high precision and a high resolution, high-definition printing is possible.

Liquid crystal glass inspection equipment | Inspection

KR

GLM

Model No.

| KR | GLM |

GLM that supports long stroke and high speed is used. By using GLM, increase in work size and improvement in takt time have been made possible.

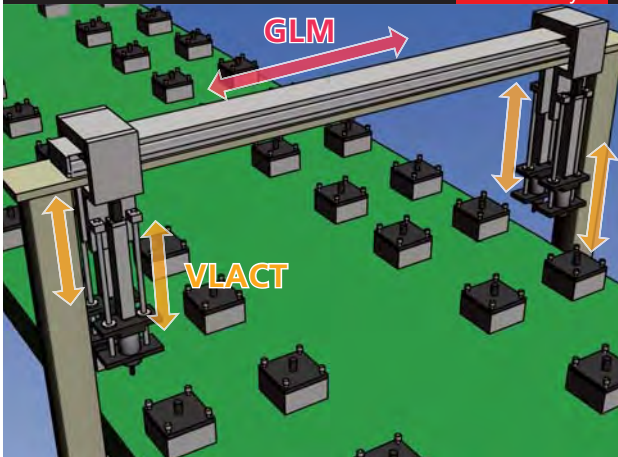### Dispenser | Machining, assembly

GLM

SKR
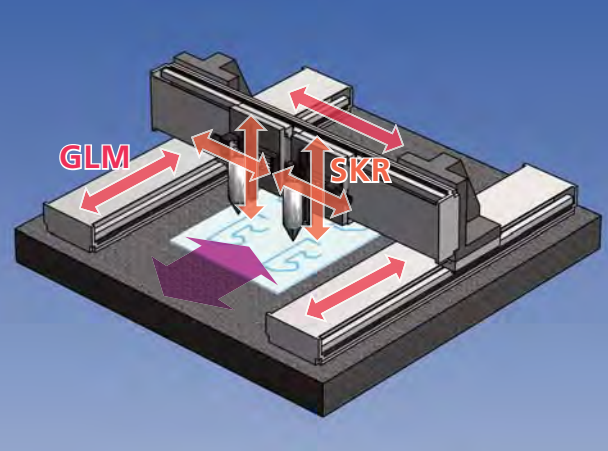
Model No.

| SKR | GLM |

SKR and GLM are used for the dispenser section. The use of a linear motor delivers high-speed and smooth operation, improving the dispensing accuracy.

Nut runner | Machining, assembly

GLM

VLACT

Model No.

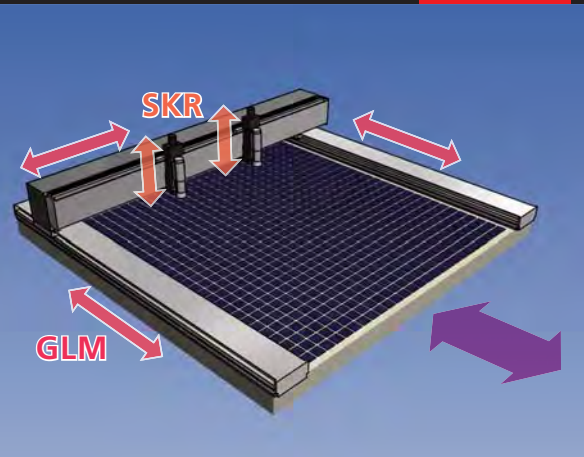| GLM | VLACT |

VLACT is used for the elevating section of a screw tightening machine and GLM is used for the transfer section. By performing independent control operations with a multiple-slider model in the linear motor series, productivity can be improved.

Glass substrate inspection equipment | Inspection

SKR

GLM

Model No.

| GLM | SKR |

GLM and SKR are used for the camera transfer section of the inspection equipment. By using the portal structure, large-sized work can be supported.

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

CE

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 1000VAC and 75 to 1500VDC.

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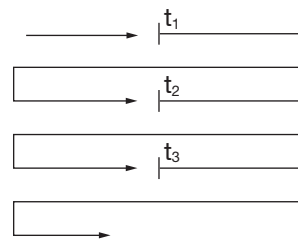
= 1/2 of the maximum difference between t_1 t_2...t_7

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.

● "LM GUIDE," "Caged Ball," and " " are registered trademarks of THK CO., LTD.

● 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.

THK CO., LTD.

HEAD OFFICE 3-11-6, N ISHI-GO TAN DA, S HIN AG AW A -KU, TO KYO 141- 8503 JAPAN
INTERNATIONAL SALES DEPARTMENT PHONE:+81 -3-5434 -0351 FAX:+81 -3-5434 -0353
Global site : http://www.thk.com/

EUROPE
THK GmbH
● EUROPEAN HEADQUARTERS
  Phone:+49-2102-7425-555 Fax:+49-2102-7425-556
● DUSSELDORF OFFICE
  Phone:+49-2102-7425-0   Fax:+49-2102-7425-299
● STUTTGART OFFICE
  Phone:+49-7150-9199-0   Fax:+49-7150-9199-888
● MUNICH OFFICE
  Phone:+49-8937-0616-0   Fax:+49-8937-0616-26
● U.K. OFFICE
  Phone:+44-1384-47-1550 Fax:+44-1384-47-1551
● ITALY MILAN OFFICE
  Phone:+39-039-284-2079 Fax:+39-039-284-2527
● ITALY BOLOGNA OFFICE
  Phone:+39-051-641-2211 Fax:+39-051-641-2230
● SWEDEN OFFICE
  Phone:+46-8-445-7630   Fax:+46-8-445-7639
● AUSTRIA OFFICE
  Phone:+43-7229-51400   Fax:+43-7229-51400-79
● SPAIN OFFICE
  Phone:+34-93-652-5740   Fax:+34-93-652-5746
● TURKEY OFFICE
  Phone:+90-216-362-4050 Fax:+90-216-569-7150
● PRAGUE OFFICE
  Phone:+420-2-41025-100 Fax:+420-2-41025-199
● MOSCOW OFFICE
  Phone:+7-495-649-80-47 Fax:+7-495-649-80-44
THK Europe B.V.
● EINDHOVEN OFFICE
  Phone:+31-040-290-9500 Fax:+31-040-290-9599
THK France S.A.S.
  Phone:+33-4-3749-1400   Fax:+33-4-3749-1401

NORTH AMERICA
THK America,Inc.
● HEADQUARTERS
  Phone:+1-847-310-1111   Fax:+1-847-310-1271
● CHICAGO OFFICE
  Phone:+1-847-310-1111   Fax:+1-847-310-1182
● NORTH EAST OFFICE
  Phone:+1-845-369-4035   Fax:+1-845-369-4909
● ATLANTA OFFICE
  Phone:+1-770-840-7990   Fax:+1-770-840-7897
● LOS ANGELES OFFICE
  Phone:+1-949-955-3145   Fax:+1-949-955-3149
● SAN FRANCISCO OFFICE
  Phone:+1-925-455-8948   Fax:+1-925-455-8965
● DETROIT OFFICE
  Phone:+1-248-858-9330   Fax:+1-248-858-9455
● TORONTO OFFICE
  Phone:+1-905-820-7800   Fax:+1-905-820-7811

SOUTH AMERICA
THK Brasil LTDA
  Phone:+55-11-3767-0100 Fax:+55-11-3767-0101

CHINA
THK (CHINA) CO.,LTD.
● HEADQUARTERS
  Phone:+86-411-8733-7111 Fax:+86-411-8733-7000
● SHANGHAI OFFICE
  Phone:+86-21-6219-3000 Fax:+86-21-6219-9890
● BEIJING OFFICE
  Phone:+86-10-8441-7277 Fax:+86-10-6590-3557

● CHENGDU OFFICE
  Phone:+86-28-8526-8025 Fax:+86-28-8525-6357
● GUANGZHOU OFFICE
  Phone:+86-20-8523-8418 Fax:+86-20-3801-0456
● SHENZHEN OFFICE
  Phone:+86-755-2642-9587 Fax:+86-755-2642-9604
THK (SHANGHAI) CO.,LTD.
  Phone:+86-21-6275-5280 Fax:+86-21-6219-9890

TAIWAN
THK TAIWAN CO.,LTD.
● TAIPEI HEAD OFFICE
  Phone:+886-2-2888-3818 Fax:+886-2-2888-3819
● TAICHUNG OFFICE
  Phone:+886-4-2359-1505 Fax:+886-4-2359-1506
● TAINAN OFFICE
  Phone:+886-6-289-7668   Fax:+886-6-289-7669

KOREA
SEOUL REPRESENTATIVE OFFICE
  Phone:+82-2-3468-4351   Fax:+82-2-3468-4353

SINGAPORE
THK LM SYSTEM Pte. Ltd.
  Phone:+65-6884-5500   Fax:+65-6884-5550

THAILAND
THK LM System Pte.Ltd.Representative Office in Thailand
  Phone:+660-2751-3001   Fax:+660-2751-3003

INDIA
BANGALORE REPRESENTATIVE OFFICE
  Phone:+91-80-2330-1524 Fax:+91-80-2330-1524