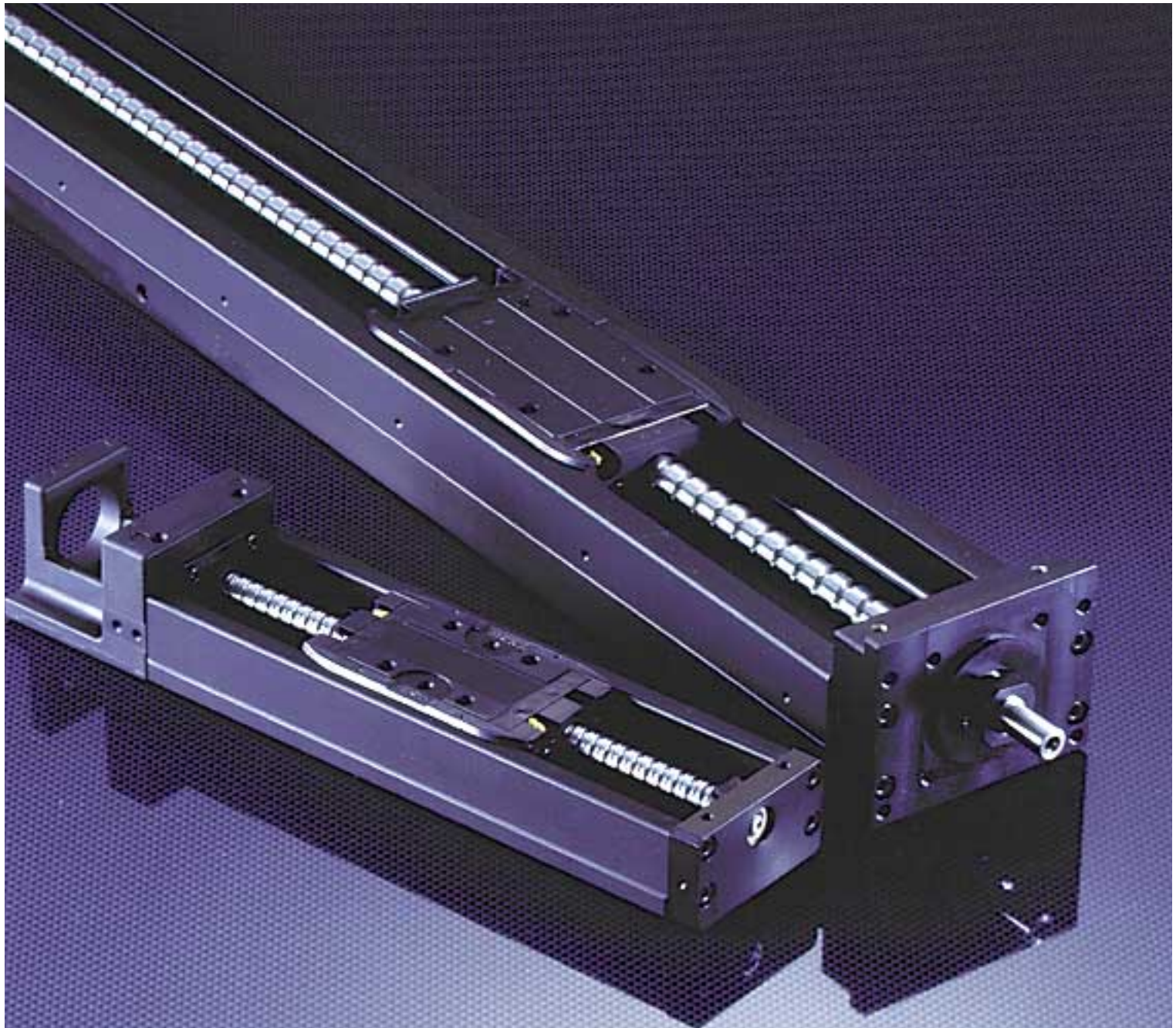


Maintenance-Free Series High-Rigidity Type MCH Monocarrier

Cutting-edge NSK technologies deliver clean, long-term maintenance-free operation, with super high-rigid rails suitable for cantilever beams.



This new product brings powerful features to the unparalleled Maintenance-free Series Monocarrier, a series which resulted from NSK's extensive development efforts.

Monocarriers are light, compact single axis actuators combining ball screws, linear guides, and supporting bearings. In addition to simplified design and installation, MCH Monocarriers feature improved rigidity, making them suitable for cantilever beams. Furthermore, the long-term, maintenance-free NSK K1® lubrication units are built-in as a standard feature, preventing oil contamination of the operating environment.

MCH Monocarriers represent an important new addition to the MCM series, providing users with diverse functionality for systems solutions.



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Features of Maintenance-Free Series High-Rigidity Type MCH Monocarriers

1. Enhanced rail rigidity

While MCM predecessors focussed on light weight, MCH Monocarriers provide improved rail rigidity, which is now available for cantilever beams. MCH Monocarriers are three to eight times more rigid than conventional products against vertical load.

The combined use of the NSK K1 with grease maintains long-term operating efficiency in mechanical environments where lubrication is difficult to apply.

Using NSK K1 with minimal grease ensures sufficient lubrication, even in oil-sensitive locations and in mechanical facilities with severe hygienic restrictions.

4. Excellent corrosion resistance

Low-temperature black chrome treatment on rail and slider as a standard feature prevents corrosion under ordinary storage and usage conditions. Optional low-temperature chrome fluoride treatment further improves anticorrosion properties.

The incorporation of LED into NSK's compact, original hall element type sensor facilitates performance verification. The adoption of an exclusive sensor rail allows sensors to be freely mounted at any position.

6. Simplified design and installation

Rail, ball screws, and support bearings are fully integrated into a single unit to dramatically reduce the time and effort required for design and installation. In addition, standard Shell AV2 grease is prepacked for shipment so that MCH Monocarriers are ready to operate after a break-in period.

Upper seals are mounted as a standard in addition to conventional side seals, preventing the entrance of foreign matter from the upper side.

Product design fully utilizes internal cross-sectional parts to reduce actuator size while achieving a high level of rigidity for cantilever beam.

9. Longer operating life

Actuators incorporate NSK's exclusive, world-leading rolling bearing technologies using ball screws and linear guides, which contribute to less wear and longer accuracy and fatigue life.

Contact angle of guide bearings is set at 45° to provide equivalent support for vertical and lateral loads.

Double slider specifications are also available to improve moment load capacity and straightness.

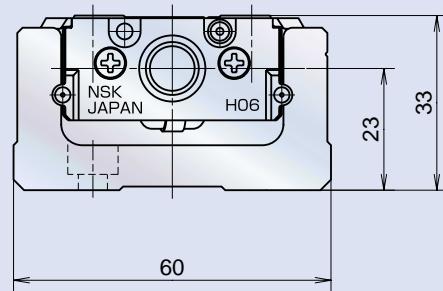
I. MCH Monocarrier Accuracy Standards and Specifications

Sample: **MC H 06 040 H 10 K**

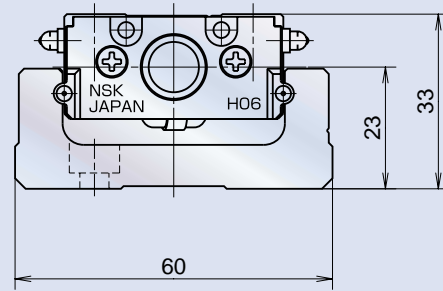
Monocarrier
Series: H: high rigidity
L: low-rail type
L is available only for 06.
Nominal size (rail width)
Stroke (unit: 10mm)

K: single slider
D: double slider
Ball screw lead (mm)
Accuracy grade
H: high grade
P: precision (made to order)

MCH06

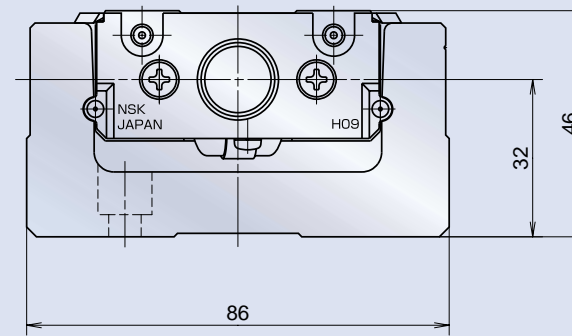


MCL06*



*Except for rail height, MCL06 has the same mounting dimensions as MCH06. Use this series to reduce the weight of mechanisms such as axes to carry effectors of robot.

MCH09



MCH10

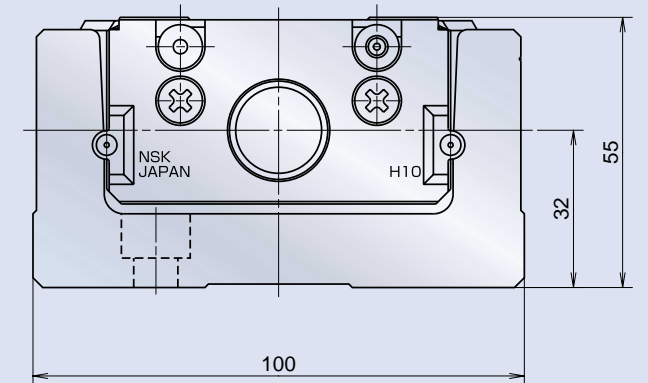


Table I-1 Standard single slider: Combination of stroke and lead (Accuracy grade: high)

MCH06				MCL06			MCH09				MCH10		
Lead (mm)	5	10	20	Lead (mm)	10	20	Lead (mm)	5	10	20	Lead (mm)	10	20
Stroke (mm)				Stroke (mm)			Stroke (mm)				Stroke (mm)		
50	●	●	○	50	○	○	200	●	●	○	400	●	●
100	●	●	○	100	○	○	300	●	●	○	500	●	●
200	●	●	○	200	○	○	400	●	●	○	600	●	●
300	○	●	●	300	○	○	500	○	●	●	700	●	●
400	○	●	●	400	○	○	600	○	●	●	800	●	●
500	○	●	●	500	○	○	800	○	●	●	900	○	●
							1000	○	●	●	1100	○	○
							1200	○	○	○	1200	○	○
							1800	○	○	○	1800	○	○

●: Standard stock ○: Made to order * Double slider specifications are also available. (made to order)

Table I-2 Accuracy standard

Unit: μm

Stroke (mm)	High grade (H)			Precision (P)			
	Repeatability Positioning accuracy	Running parallelism (vertical)	Backlash	Repeatability Positioning accuracy	Positioning accuracy	Running parallelism (vertical)	Backlash
~150	±10	14	20 or less	±3	20	8	3 or less
200							
300							
400		16			25	10	
500							
600							
700		20			30	12	
800							
900							
1000		23			35	15	
1100							
1200							
1200	30	40	20				

Table I-3 Specification

	Symbol	Unit	MCH06 (MCL06)			MCH09			MCH10		
			5	10	20	5	10	20	10	20	
Linear guide	Ball screw lead	mm	5	10	20	5	10	20	10	20	
	Running distance	Km	5	10	20	5	10	20	10	20	
	Basic dynamic load rating	Ca N	22 800	18 100	14 400	52 600	32 200	25 500	44 600	35 400	
	Basic static load rating	COa N	16 300			30 500			42 000		
		MRO Nm	335			890			1 460		
		MPO Nm	133			385			610		
	Static moment rating	MYO Nm	133			385			610		
		MRO Nm	770			1 780			2 920		
		MPO Nm	730			2 070			3 430		
	Double	MYO Nm	730			2 070			3 430		
Shaft diameter		mm	12	12	12	15	15	15	20	20	
Lead		mm	5	10	20	5	10	20	10	20	
Ball screw	High grade	Basic dynamic load rating	Ca N	3 000	1 930	1 930	6 820	5 110	3 290	8 230	5 300
		Basic static load rating	COa N	5 410	3 160	3 160	13 200	9 290	5 620	17 100	10 300
	Precision	Basic dynamic load rating	Ca N	3 760	2 260	2 260	7 100	7 060	4 560	10 900	7 060
		Basic dynamic load rating	COa N	6 310	3 780	3 780	13 000	12 700	7 750	21 700	12 700
Support bearing	Fixed type	Fixed type		WBK08			WBK12			WBK15	
		Basic dynamic load rating	Ca N	4 500			7 100			7 600	
		Load limit	COa N	1 480			3 040			3 380	
	Support type	Fixed type		696ZZ			6900ZZ			6901ZZ	
Basic dynamic load rating		Ca N	1 730			2 700			2 890		
Dynamic torque	Single slider	N•cm	1.0~4.8	1.1~5.8	1.6~7.9	1.0~5.9	2.0~7.8	2.0~10.8	2.7~10.8	3.1~12.7	
	Double slider	N•cm	1.2~5.2	1.5~9.6	2.3~11.8	1.5~7.0	2.5~10.8	4.0~17.2	4.2~15.6	5.0~19.6	

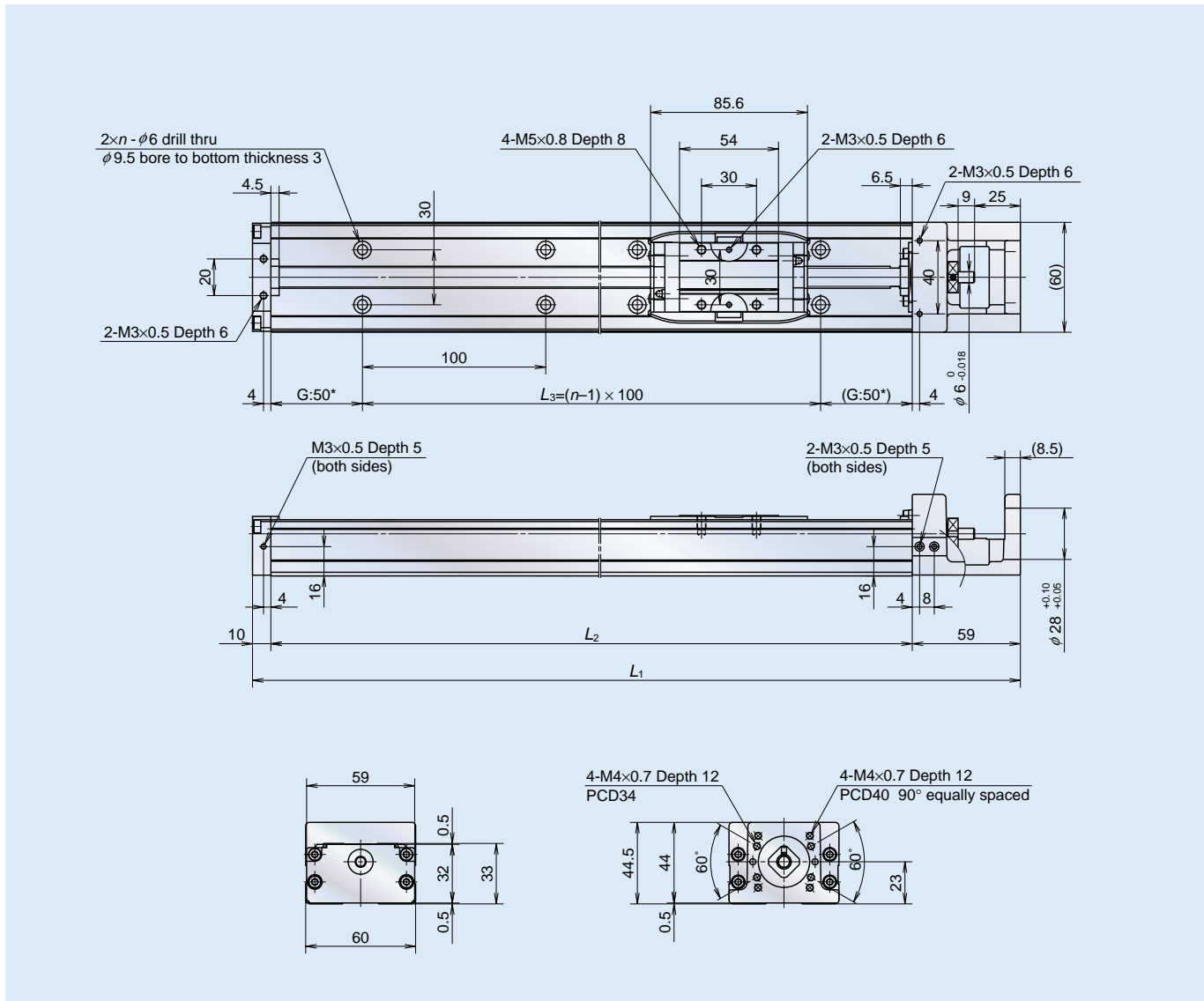
Notes:

- The value of basic dynamic load rating and basic load rating indicates the value per slider. ■ Static moment rating of double slider indicates the numerical value when two sliders with NSK K1 are closely applied. ■ Linear guide load rating is defined as the radial load which permits the linear guide to run up to the running distance while ball screws and support bearings rotate one million times before flaking occurs at 90% rolling fatigue. ■ Basic dynamic load rating of the ball screw is defined as the axial load that permits a cluster of ball screws to rotate one million times under identical conditions before flaking occurs at 90% rolling fatigue.
- Basic support bearing dynamic load rating represents load with no variation in level and direction to achieve rated fatigue life rating at one million rotations.
- Basic static load rating represents the load value at which the sum of the permanent deformation of balls and contact surfaces of balls is maintained at less than 0.01% of ball diameter. ■ Static moment rating represents the moment when surface contact pressure between balls and ball grooves exceeds 4000 N/mm².

II. Dimensions of Standard Products

MCH06 Standard Dimensions

MCH06 Single slider specification

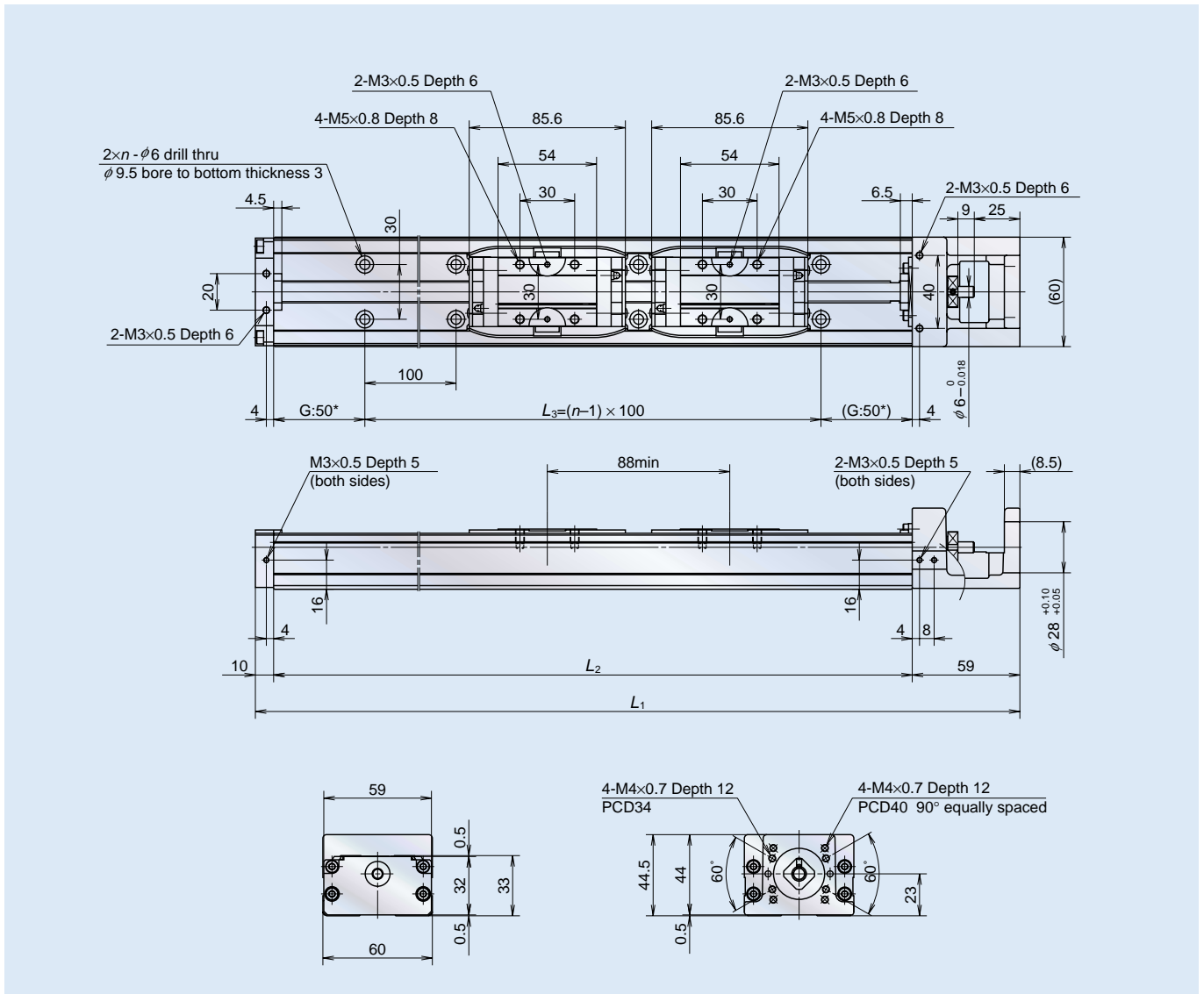


MCH06 Single slider dimensions

Reference number	Nominal stroke (mm)	Stroke limit (mm) (without NSK K1)	Ball screw lead (mm)	Body length (mm)				Inertia $\times 10^{-6}$ (kg·m ²)	Mass (kg)
				L ₁	L ₂	L ₃	n		
*MCH06005H05K	50	53	5	219	150	100	2	2.38	1.8
*MCH06005H10K		(65)	10					3.45	
MCH06010H05K	100	103	5	269	200	100	2	3.17	2.2
MCH06010H10K		(115)	10					4.12	
MCH06020H05K	200	203	5	369	300	200	3	4.51	3.0
MCH06020H10K		(215)	10					5.46	
MCH06030H10K	300	303	10	469	400	300	4	6.80	3.7
MCH06030H20K		(315)	20					10.6	
MCH06040H10K	400	403	10	569	500	400	5	8.13	4.5
MCH06040H20K		(415)	20					11.9	
MCH06050H10K	500	503	10	669	600	500	6	9.47	5.2
MCH06050H20K		(515)	20					13.3	

* indicates G part dimension of 25 instead of 50.

MCH06 Double slider specification

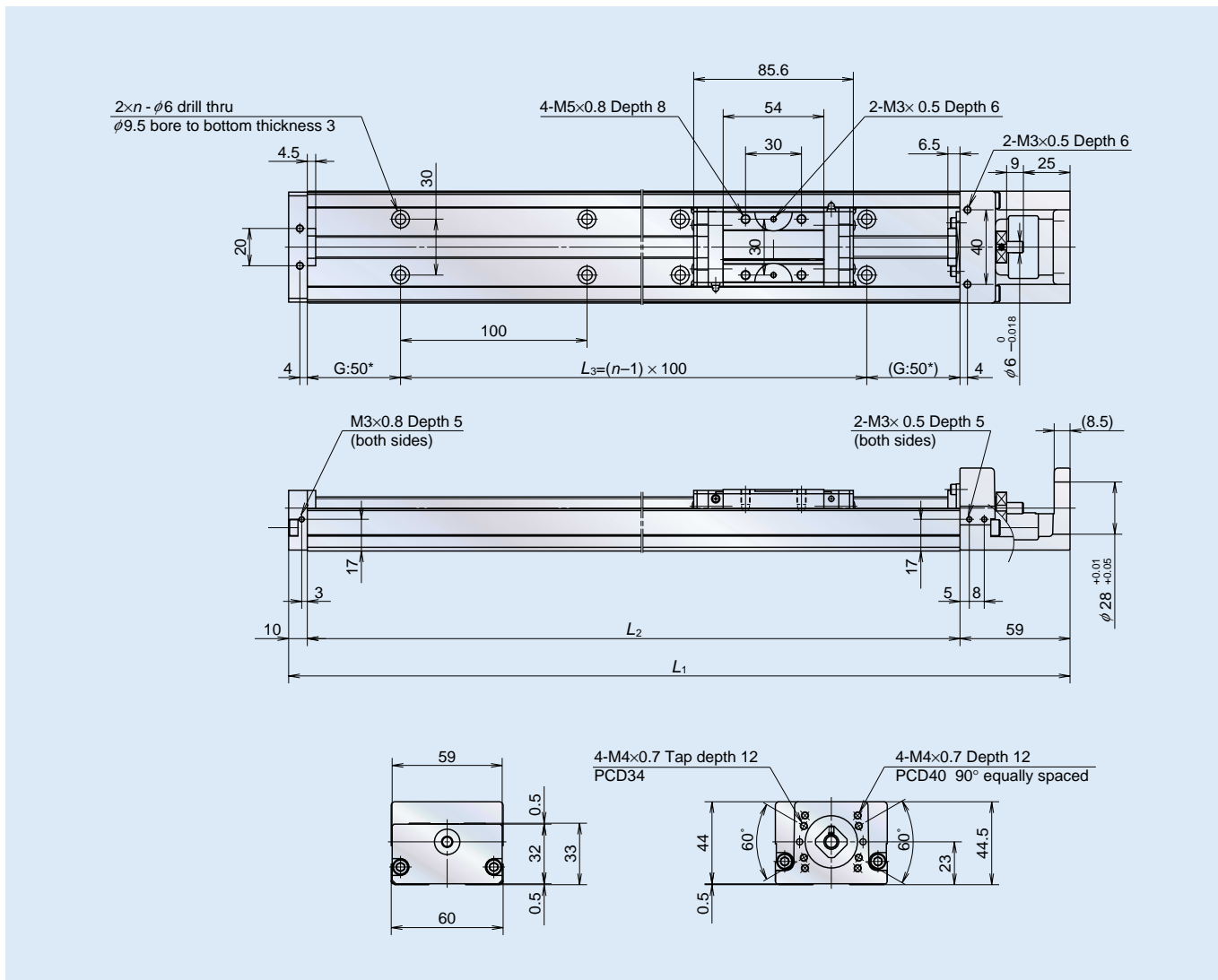


MCH06 Double slider dimensions

Reference number	Nominal stroke (mm)	Stroke limit (mm) (without NSK K1)	Ball screw lead (mm)	Body length (mm)				Inertia $\times 10^{-6}$ (kg·m ²)	Mass (kg)
				L_1	L_2	L_3	n		
MCH06010H05D	100	115	5	369	300	200	3	4.82	3.5
MCH06010H10D		(139)	10					6.72	
MCH06020H05D	200	215	5	469	400	300	4	8.06	4.2
MCH06020H10D		(239)	10					15.7	
MCH06030H05D	300	315	5	569	500	400	5	9.40	5.0
MCH06030H10D		(339)	10					17.0	
MCH06040H10D	400	415	10	669	600	500	6	10.7	5.7
MCH06040H20D		(439)	20					18.3	

MCL06 Standard Dimensions

MCL06 Single slider specification



- MCL06 is identical to MCH06 although with reduced rail height and weight. Rail weight ratio MCH : MCL = 5 : 4
- MCL06 double slider specification is also available.
- The same combination of stroke and lead as MCH06 is available.

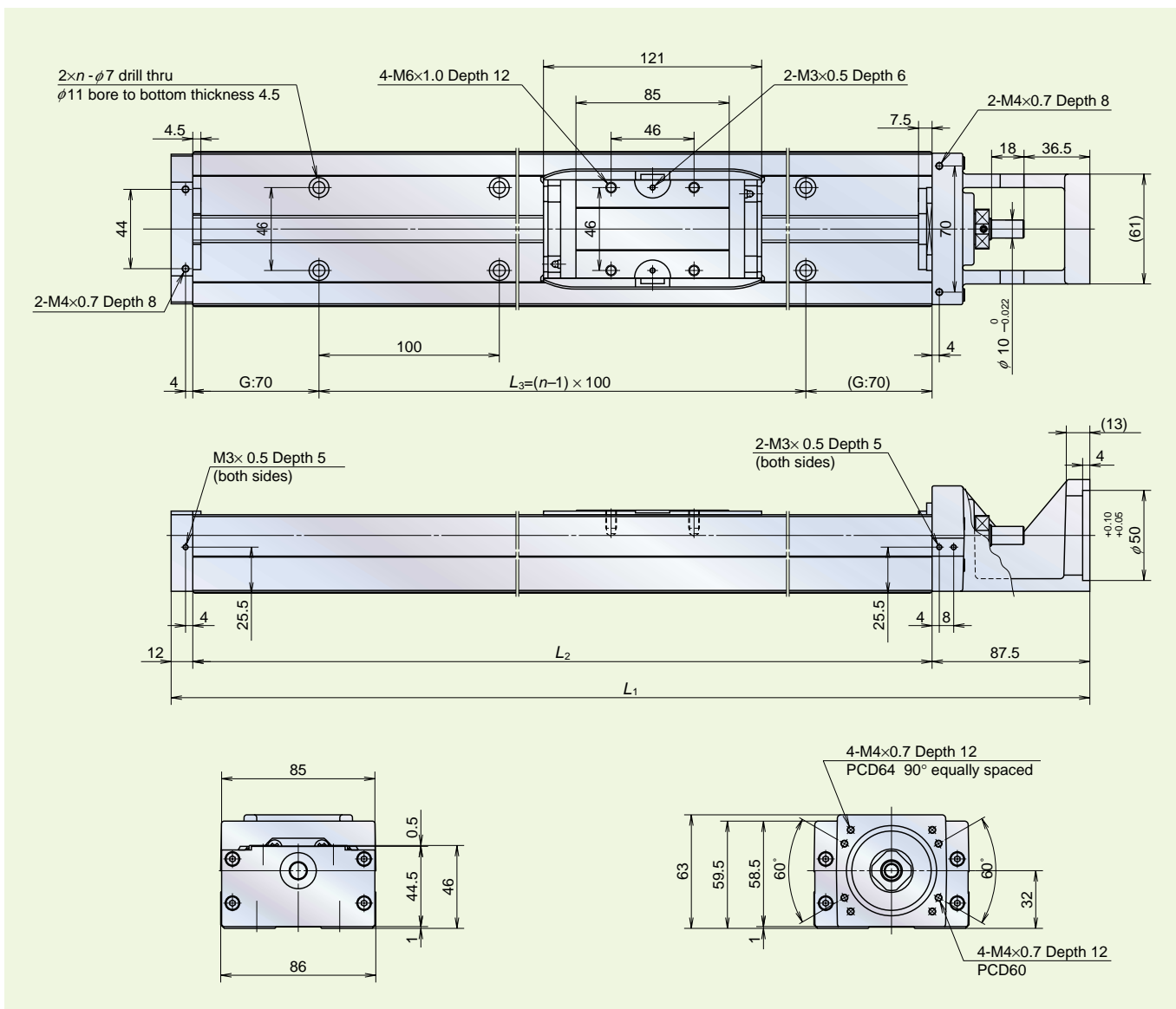
MCL06 Single slider dimensions

Reference number	Nominal stroke (mm)	Stroke limit (mm) (without NSK K1)	Ball screw lead (mm)	Body length (mm)				Inertia $\times 10^{-6}$ (kg·m ²)	Mass (kg)
				L_1	L_2	L_3	n		
*MCL06005H05K	50	53	5	219	150	100	2	2.38	1.0
*MCL06005H10K		(65)	10					3.45	
MCL06010H05K	100	103	5	269	200	100	2	3.17	1.3
MCL06010H10K		(115)	10					4.12	
MCL06020H05K	200	203	5	369	300	200	3	4.51	1.9
MCL06020H10K		(215)	10					5.46	
MCL06030H10K	300	303	10	469	400	300	4	6.80	2.6
MCL06030H20K		(315)	20					10.6	
MCL06040H10K	400	403	10	569	500	400	5	8.13	3.2
MCL06040H20K		(415)	20					11.9	
MCL06050H10K	500	503	10	669	600	500	6	9.47	3.9
MCL06050H20K		(515)	20					13.3	

* indicates G part dimension of 25 instead of 50.

Dimensions of Standard Specification for MCH09

MCH09 Single slider specification

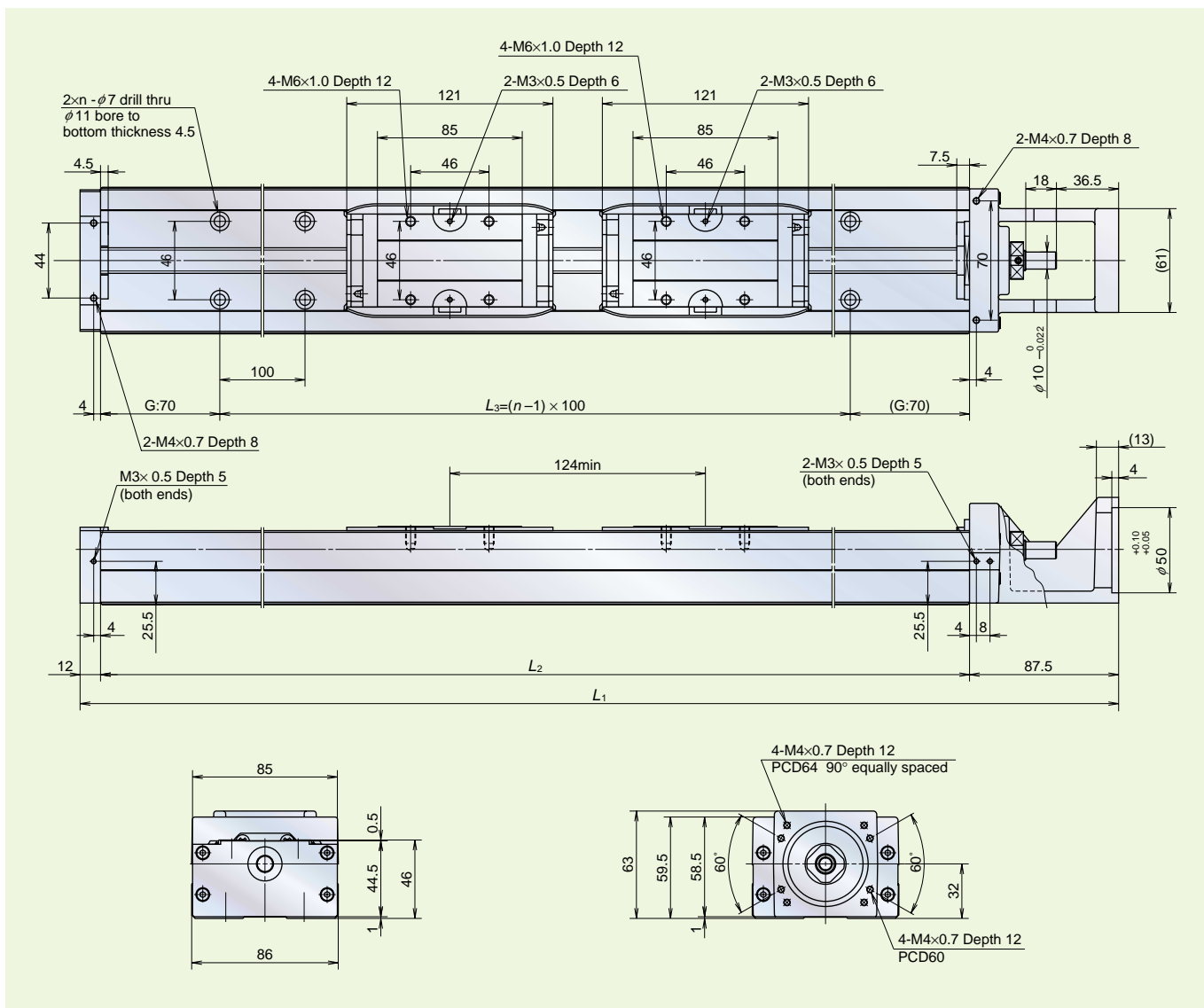


MCL09 Single slider dimensions

Reference number	Nominal stroke (mm)	Stroke limit (mm) (without NSK K1)	Ball screw lead (mm)	Body length (mm)				Inertia $\times 10^6$ (kg·m ²)	Mass (kg)
				L_1	L_2	L_3	n		
MCH09020H05K	200	207 (221)	5	439.5	340	200	3	12.4	6.5
MCH09020H10K			10						
MCH09030H05K	300	307 (321)	5	539.5	440	300	4	15.6	8.1
MCH09030H10K			10						
MCH09040H05K	400	407 (421)	5	639.5	540	400	5	18.8	9.7
MCH09040H10K			10						
MCH09050H10K	500	507 (521)	10	739.5	640	500	6	23.5	11
MCH09050H20K			20						
MCH09060H10K	600	607 (621)	10	839.5	740	600	7	26.7	13
MCH09060H20K			20						
MCH09080H10K	800	807 (821)	10	1 039.5	940	800	9	33.2	16
MCH09080H20K			20						

MCH09 Standard Dimensions

MCH09 Double slider specification

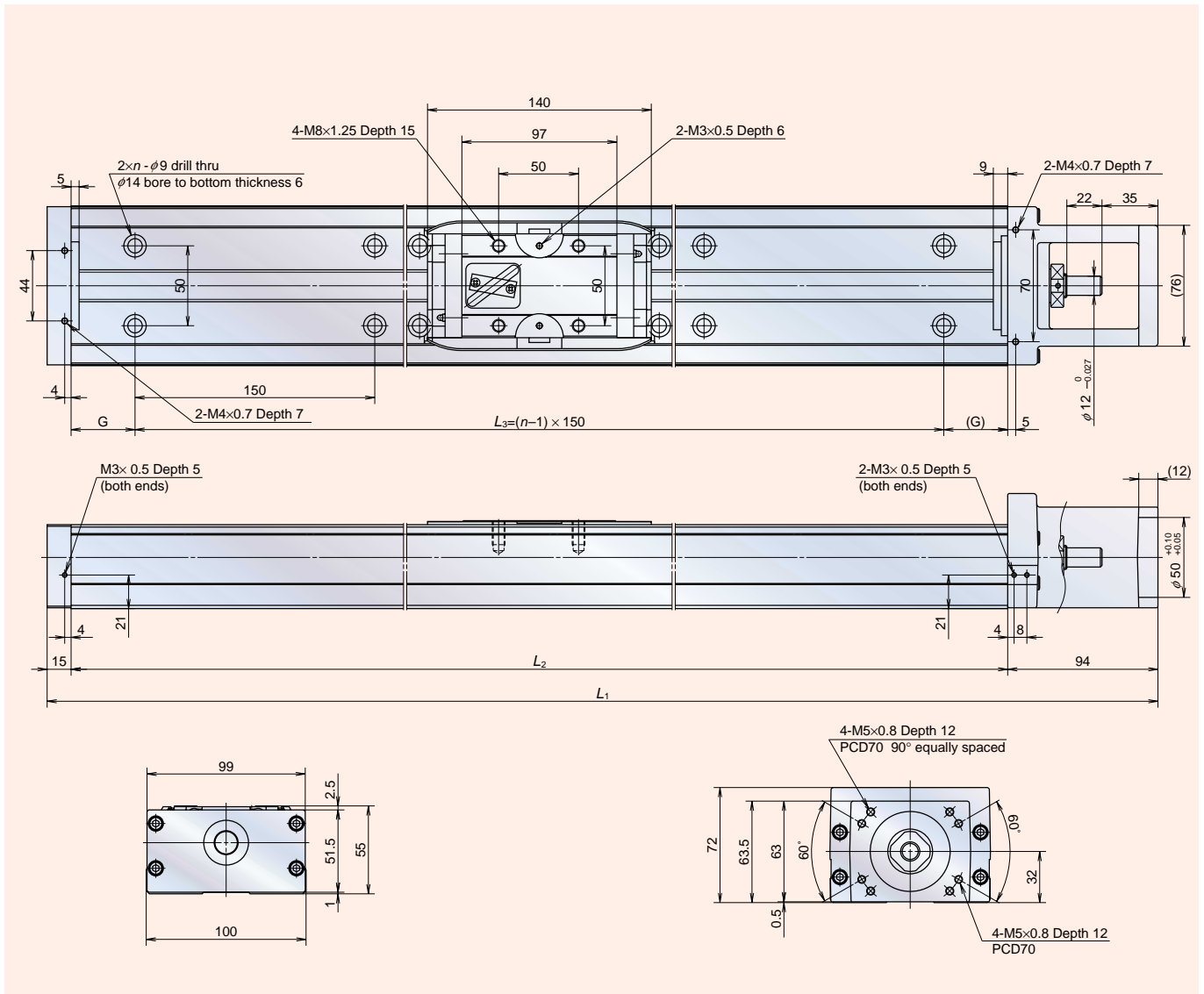


MCH09 Double slider dimensions

Reference number	Nominal stroke (mm)	Stroke limit (mm) (without NSK K1)	Ball screw lead (mm)	Body length (mm)				Inertia $\times 10^{-6}$ (kg·m ²)	Mass (kg)
				L_1	L_2	L_3	n		
MCH09015H05D	150	183	5	539.5	440	300	4	16.1	8.9
MCH09015H10D		(211)	10					19.2	
MCH09025H05D	250	283	5	639.5	540	400	5	19.3	11
MCH09025H10D		(321)	10					22.4	
MCH09035H05D	350	383	5	739.5	640	500	6	22.5	12
MCH09035H10D		(421)	10					25.6	
MCH09045H10D	450	483	10	839.5	740	600	7	28.8	14
MCH09045H20D		(521)	20					40.9	
MCH09065H10D	650	683	10	1 039.5	940	800	9	35.2	17
MCH09065H20D		(621)	20					47.3	

MCH10 Standard Dimensions

MCH10 Single slider specification

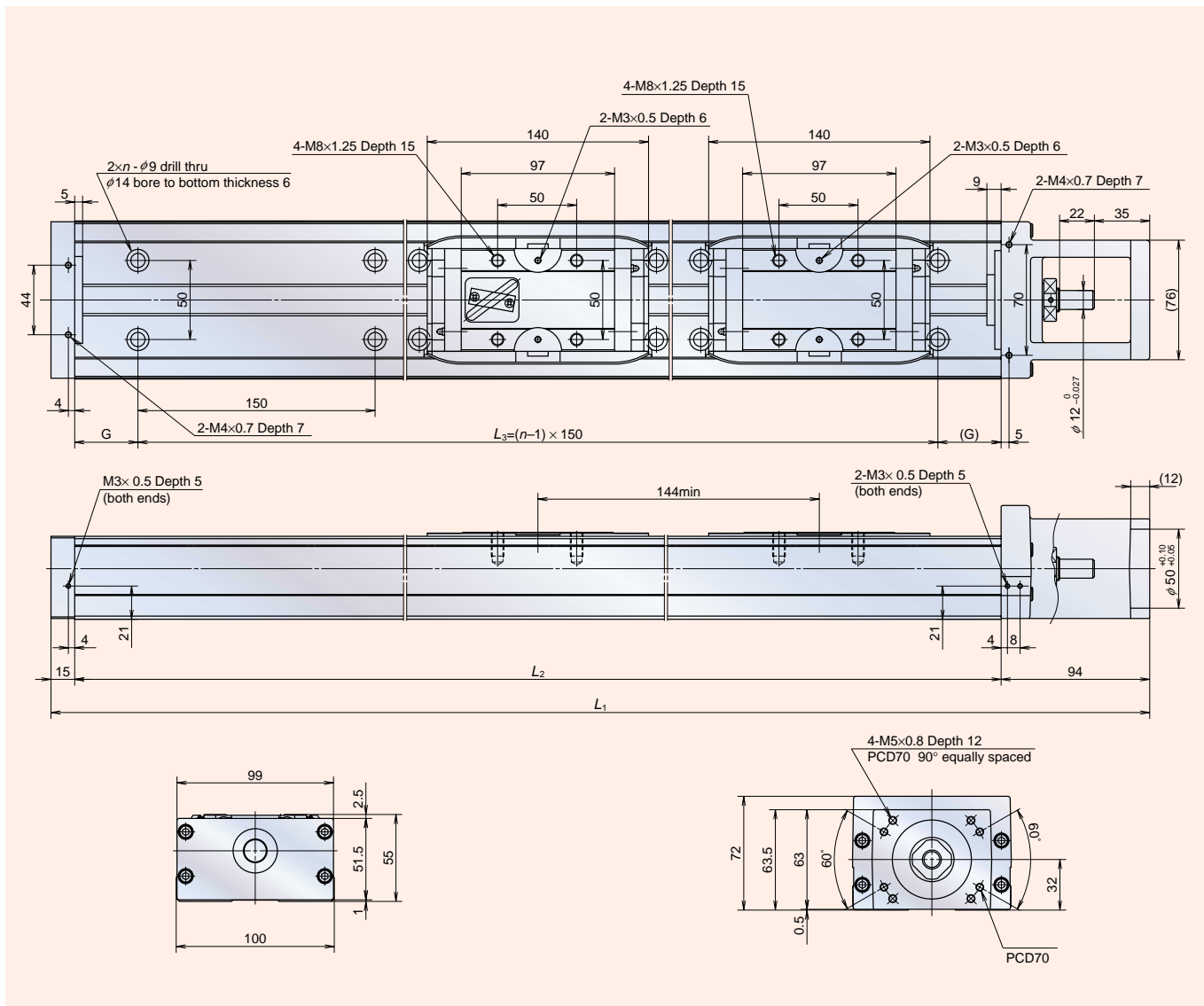


MCH10 Single slider dimensions

Reference number	Nominal stroke (mm)	Stroke limit (mm) (without NSK K1)	Ball screw lead (mm)	Body length (mm)					Inertia $\times 10^{-6}$ (kg·m ²)	Mass (kg)
				L_1	L_2	G	L_3	n		
MCH10040H10K	400	426 (442)	10	689	580	65	450	4	62.4	14
MCH10050H10K	500	526	10	789	680	40	600	5	74.7	16
MCH10050H20K		(542)	20						82.3	
MCH10060H10K	600	626	10	889	780	15	750	6	84.9	19
MCH10060H20K		(642)	20						92.5	
MCH10070H10K	700	726	10	989	880	65	750	6	95.1	21
MCH10070H20K		(742)	20						103	
MCH10080H10K	800	826	10	1 089	980	40	900	7	105	23
MCH10080H20K		(842)	20						113	
MCH10090H20K	900	926 (942)	20	1 189	1 080	15	1 050	8	123	25
MCH10100H20K	1 000	1 026 (1042)	20	1 289	1 180	65	1 050	8	133	27
MCH10110H20K	1 100	1 126 (1142)	20	1 389	1 280	40	1 200	9	143	29
MCH10120H20K	1 200	1 226 (821)	20	1 489	1 380	15	1 350	10	154	32

Dimensions of Standard Specification for MCH10

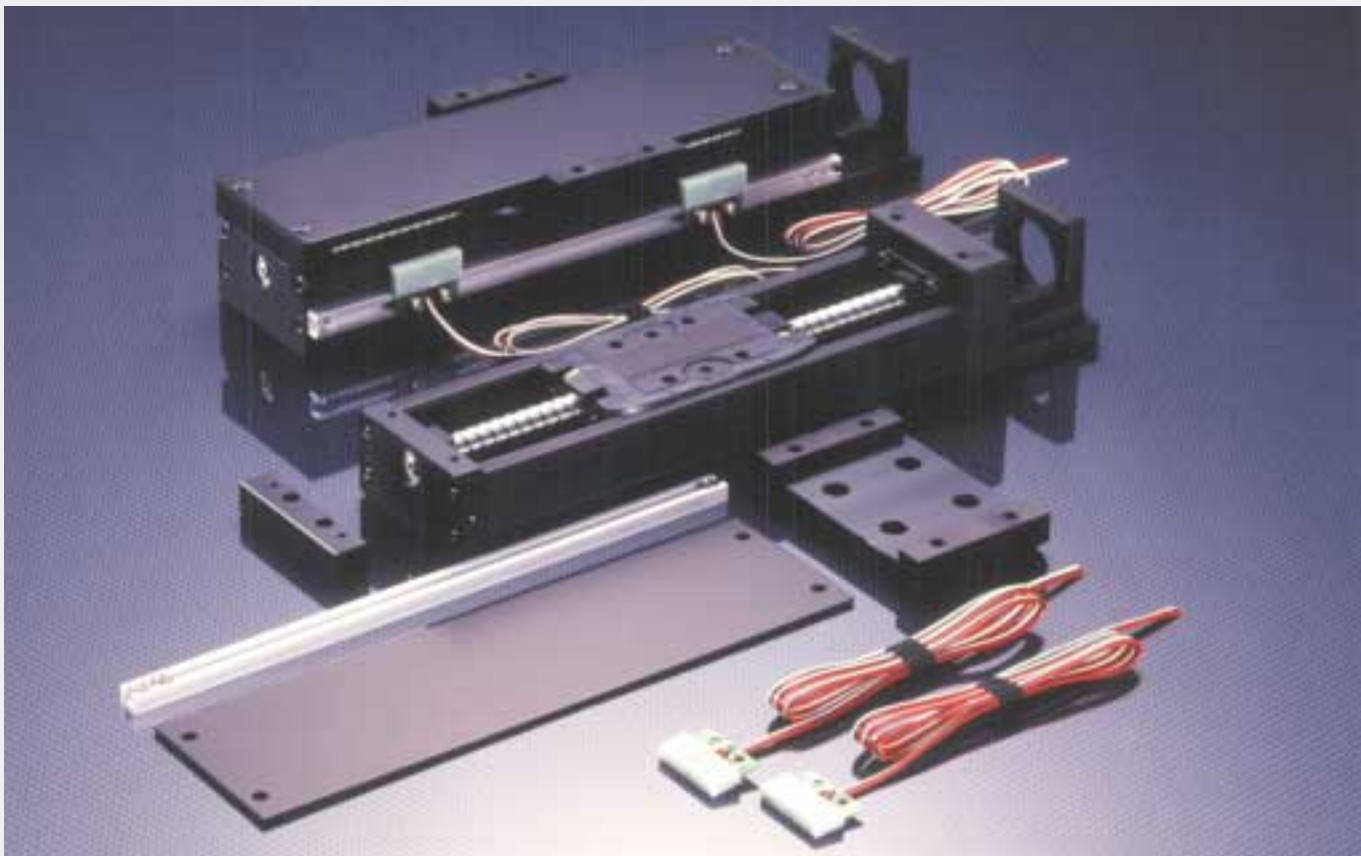
MCH10 Double slider specification



MCH10 Double slider dimensions

Reference number	Nominal stroke (mm)	Stroke limit (mm) (without NSK K1)	Ball screw lead (mm)	Body length (mm)					Inertia $\times 10^{-6}$ (kg·m ²)	Mass (kg)
				L_1	L_2	G	L_3	n		
MCH10025H10D	250	282 (314)	10	689	580	65	450	4	67.1	15
MCH10035H10D	350	382	10	789	680	40	600	5	77.3	17
MCH10035H20D		(414)	20						92.5	
MCH10045H10D	450	482	10	889	780	15	750	6	87.5	20
MCH10045H20D		(514)	20						103	
MCH10055H10D	550	582	10	989	880	65	750	6	97.7	22
MCH10055H20D		(614)	20						113	
MCH10065H10D	650	682	10	1 089	980	40	900	7	108	24
MCH10065H20D		(614)	20						123	
MCH10075H20D	750	782 (814)	20	1 189	1 080	15	1 050	8	133	26
MCH10085H20D	850	882 (914)	20	1 289	1 180	65	1 050	8	143	28
MCH10095H20D	950	982 (1 014)	20	1 389	1 280	40	1 200	9	154	30
MCH10105H20D	1 050	1 082 (1 114)	20	1 489	1 380	15	1 350	10	164	33

III. Dimensions of Optional Components

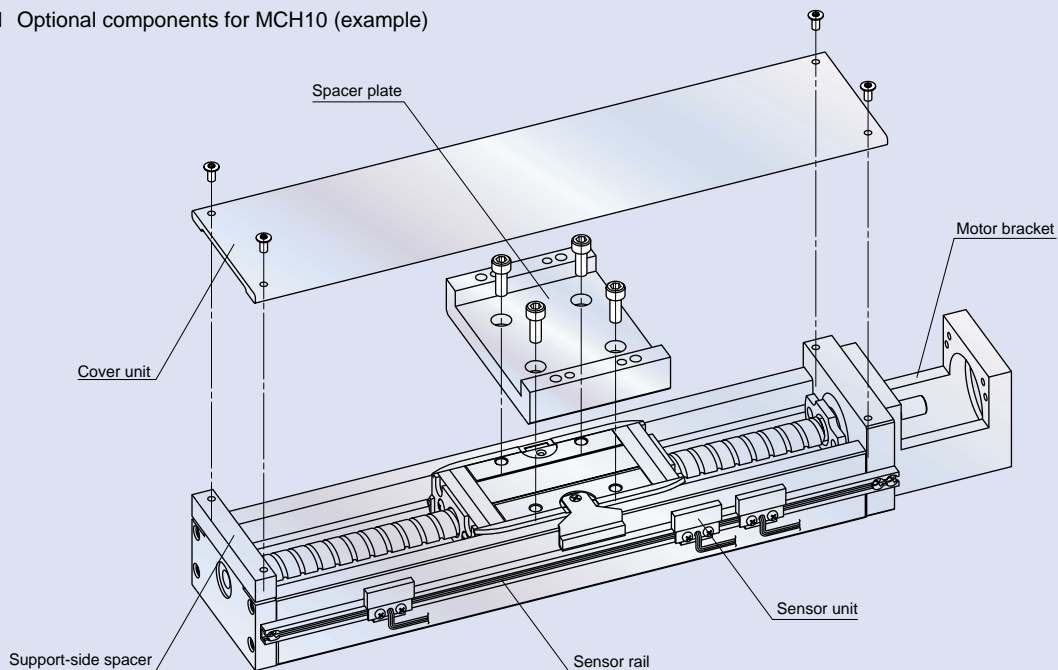


Optional Components

MCH Monocarriers maintain optional components as standard inventory.

Note: Optional components are sold separately from the main unit.

Fig. III-1 Optional components for MCH10 (example)



1. Sensor unit: sensors and sensor-mounting parts are available. (P.13~14)
2. Cover unit: top covers are available. (P.15)
3. Motor bracket: Intermediate Plate for mounting motors are available. (P.16~18)

1. Sensor Unit Specifications

- Non-LED equipped sensors for conventional MCM Series are applicable, although LED-equipped sensors are included as standard specification.
- Sensors are applicable for all model numbers.

(1) Sensor specification

Table III-1.1 Sensor rating and performance

Item	Specification	
Power source voltage	DC12-24V	
Electric current consumption	15 mA TYP	
Operating distance characteristics	Standard value	3 mm (in case of 1.0 mm of gap from magnet)
	Product dispersion	±2 mm of standard value
	Repeatability	±20 μm
	Temperature characteristics	With ±1 mm at 20°C between 0 and 50°C
Hysteresis	0.4 mm TYP	
Operating ambient conditions	0°C~50°C 20%~85% (no condensation)	
Signal output	a- and b-contact points (output transistor switches ON/OFF by magnetic flux sensor)	
Max. switching current	100 mA	
Operating principle	Use of Hall effect S-pole unidirectional magnetic field actuation type	
Magnet	Ferrite BH Max. 4MGOe-equivalent	

Note: Above values are calculated at 25°C unless otherwise noted.

Fig. III-1.2 Reference: circuit diagram and sample of connection (in case of b-contact point specification)

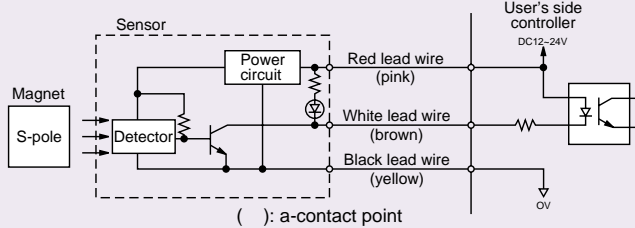


Fig. III-1.3 Characteristics (representative sample 1)

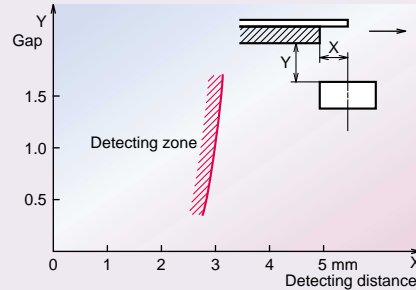
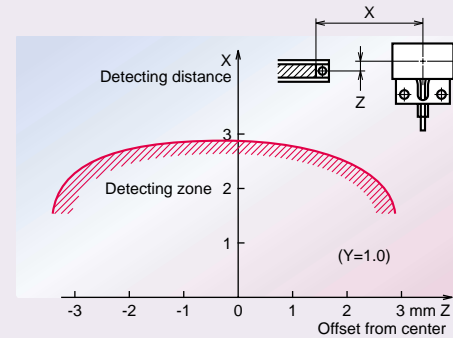


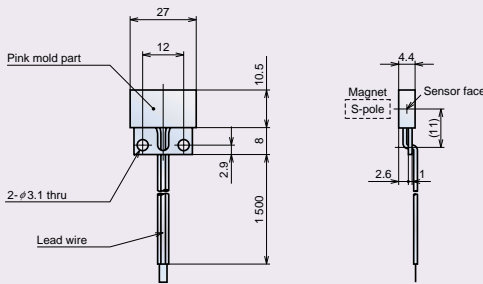
Fig. III-1.4 Characteristics (representative sample 2)



- Install sensor face opposing with magnets (S-pole). Reverse side does not react to S-pole.
- Add surge suppressor for driving inductive load. Sensor is not provided with surge protection and is therefore vulnerable to damage.

(2) Sensor

Reference number (model number) MC-SR-HHA



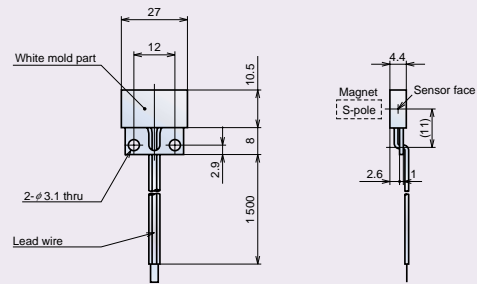
① Sensor

No.	Part name	Quantity	Notes
①	Sensor	1	NSK-made b-contact point
②	Flat washer built-in cross-recessed pan-head machine screw	2	M3×0.5×8
③	Sensor-mounting nut	1	M3
④	Sensor spacer	1	

Sensor specification

Method	Hall element, S-pole unidirectional magnetic field actuation type
Power source voltage	DC12-24V
Electric current consumption	15 mA TYP
Contact form	a-contact open collector output
Max. switching current	100 mA
Operating ambient temperature	0°C~50°C

Reference number (model number) MC-SR-HHB



① Sensor

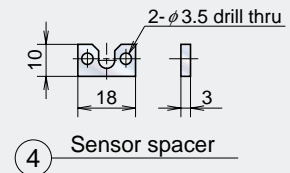
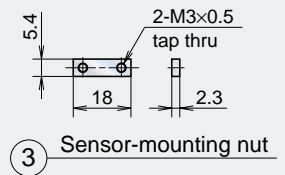
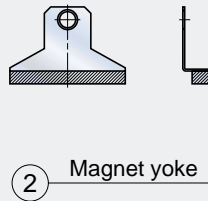
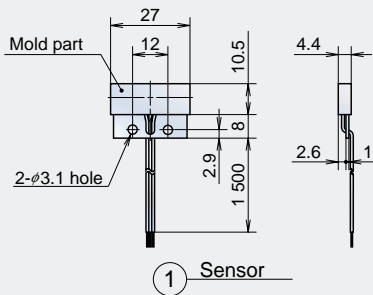
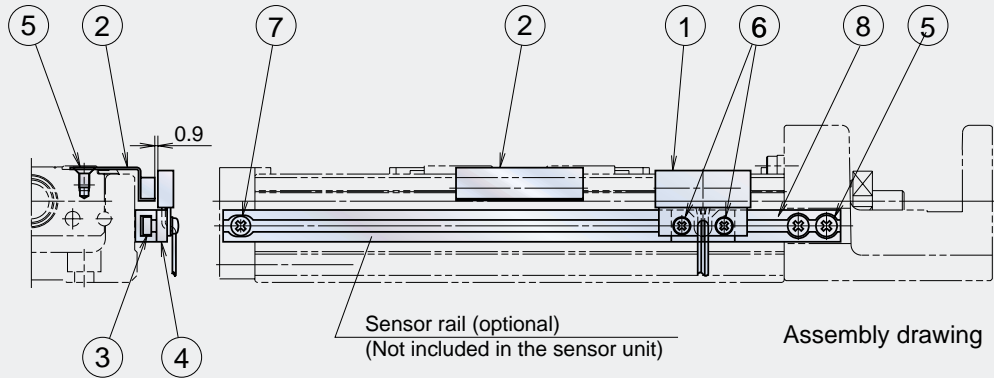
No.	Part name	Quantity	Notes
①	Sensor	1	NSK-made b-contact point
②	Flat washer built-in cross-recessed pan-head machine screw	2	M3×0.5×8
③	Sensor-mounting nut	1	M3
④	Sensor spacer	1	

Sensor specification

Method	Hall element, S-pole unidirectional magnetic field actuation type
Power source voltage	DC12-24V
Electric current consumption	15 mA TYP
Contact form	b-contact open collector output
Max. switching current	100 mA
Operating ambient temperature	0°C~50°C

(3) Sensor unit structure

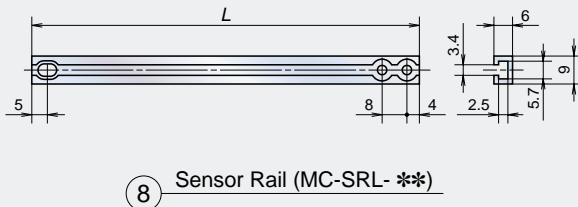
1. Unit



No.	Part name	Quantity			Notes
		MC-SRH06-00	MC-SRH06-01	MC-SRH06-02	
		MC-SRH09-00	MC-SRH09-01	MC-SRH09-02	
		MC-SRH10-00	MC-SRH10-01	MC-SRH10-02	
①	Sensor (a-contact point)	–	3	1	
	Sensor (b-contact point)	3	–	2	
②	Magnet yoke	1	1	1	
③	Sensor-mounting nut	3	3	3	M3
④	Sensor spacer	3	3	3	
⑤	Cross-recessed countersunk-head machine screw	1	1	1	M3x5
⑥	Flat washer built-in cross-recessed pan-head machine screw	6	6	6	M3x8

1. Figures ① ~ ⑥ above are included in the sensor unit.
 2. Sensor rails required for mounting sensors are optional as they differ according to stroke. Please specify rail length L2 of the main unit reference number.

2. Sensor rail



Reference number: MC-SRL-**

(** indicates unit rail length L2: mm. For example, the sensor rail reference number for MCH06010H05K is MC-SRL-0200 since L2 = 200.)

No.	Part name	Quantity	Notes
		MC-SRL-**	
⑧	Sensor rail	1	
⑤	Cross-recessed countersunk-head machine screw	2	M3x5
⑦	Cross-recessed pan-head machine screw	1	M3x5

2. Cover Unit Specifications

Cover Unit for MCH06 and MCL06

Strokes		Reference numbers	L
Single	Double		
50	–	MC-HV06005-00	170
100	–	MC-HV06010-00	220
200	100	MC-HV06020-00	320
300	200	MC-HV06030-00	420
400	300	MC-HV06040-00	520
500	400	MC-HV06050-00	620

Composition: ① 1 top cover ② 1 spacer plate ③ 1 support-side spacer ④ 4 hexagon socket head cap bolts ⑤ 4 thin head screw ⑥ 2 hexagon socket cap bolts

Cover Unit for MCH09

Strokes		Reference numbers	L
Single	Double		
200	–	MC-HV09020-00	364
300	150	MC-HV09030-00	464
400	250	MC-HV09040-00	564
500	350	MC-HV09050-00	664
600	450	MC-HV09060-00	764
600	650	MC-HV09080-00	964

Cover Unit for MCH10

Strokes		Reference numbers	L
Single	Double		
400	250	MC-HV10040-00	610
500	350	MC-HV10050-00	710
600	450	MC-HV10060-00	810
700	550	MC-HV10070-00	910
800	650	MC-HV10080-00	1 010
900	750	MC-HV10090-00	1 110
1 000	850	MC-HV10100-00	1 210
1 100	950	MC-HV10110-00	1 310
1 200	1 050	MC-HV10120-00	1 410

The small projection on some top covers is for processing convenience and has no impact on quality.

3. Intermediate Plate Specifications

- Please contact NSK for motors not included on the compatible motor list.
- Please contact us for installing Monocarriers on side mounting motors.

Motor Bracket for MCH06 and MCL06

Reference No.: MC-BKH06-145-00

Compatible motors

Makers	Motor models
Matsushita Electric Industrial Co., Ltd.	MSMA3A (30W), MSMA5A (50W), MSMA01 (100W)

Reference No.: MC-BKH06-146-00

Compatible motors

Makers	Motor models
Yaskawa Electric Corp.	SGMAH-A3 (30W) SGMAH-A5 (50W) SGMAH-01 (100W)
Mitsubishi Electric Corp.	HC-KFS053, HC-MFS053 (50W) HC-KFS13, HC-MFS13 (100W)

Reference No.: MC-BKH06-231-00

Compatible motors

Makers	Motor models
Oriental Motor Co., Ltd.	AS46, ASC46, UPK54□, PK54□, CSK54□, CFK54□, UMK24□, CSK24□, PK24□, AIP030 (30W)
Matsushita Electric Industrial Co., Ltd.	MUMS3A (30W), MUMS5A (50W), MUMS01 (100W)

Reference No.: MC-BKH06-250-00

Compatible motors

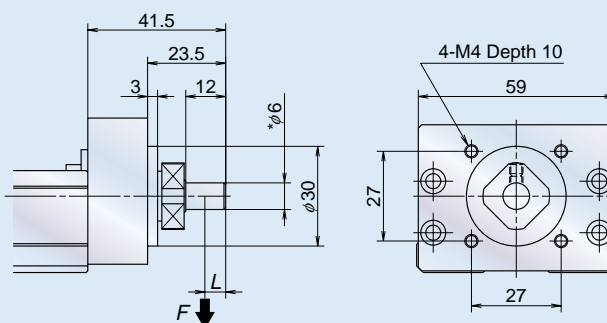
Makers	Motor models
Oriental Motor Co., Ltd.	AS66, ASC66, UPK56□, UFK54□, PK56□, CSK56□, CFK56□, AIP275 (75W)
Matsushita Electric Industrial Co., Ltd.	MUMS02 (200W), MUMS04 (400W)

Specifications of MCH06 shaft-ends for reversed motor mount

Permissible belt tension for reversed motor mount

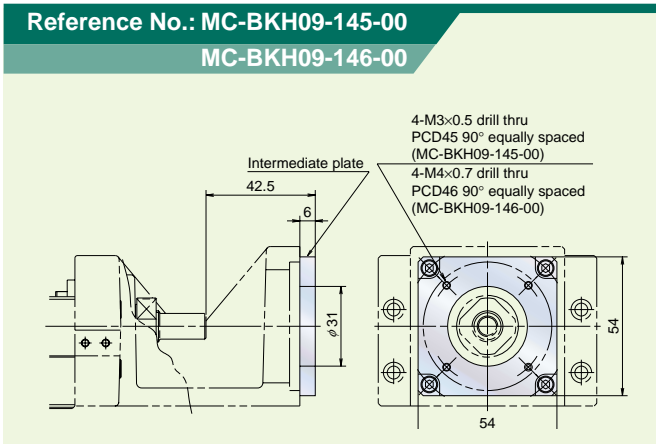
$L=5, F=60N$

*The MCH06 shaft-ends of $\phi 8$ for reversed motor mount ($L=5, F=90N$) are also available (for precision class only). Please contact NSK for details.

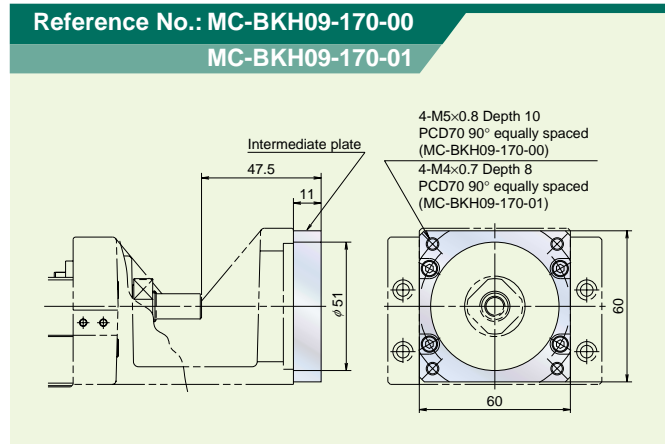


3. Intermediate Plate Specifications

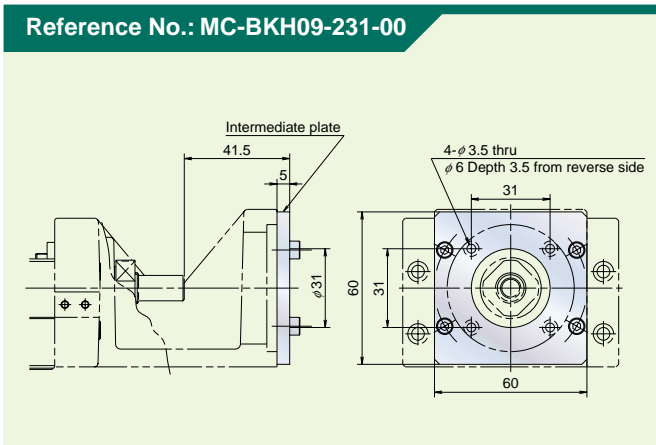
Motor bracket for MCH09



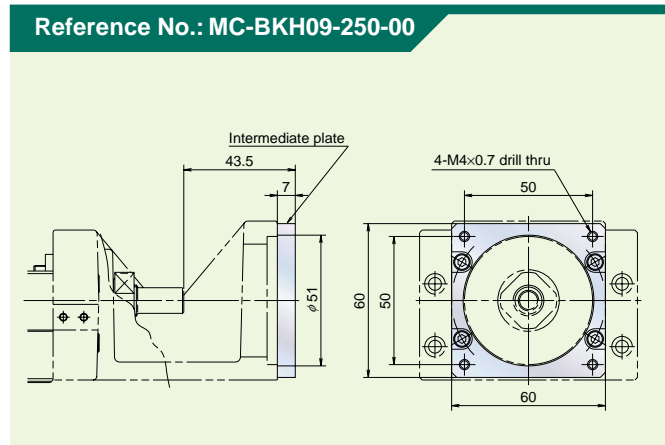
Reference Numbers	Compatible motors	
	Makers	Motor models
MC-BKH09-145-00	Matsushita Electric Industrial Co., Ltd.	MSMA3A (30W), MSMA5A (50W), MSMA01 (100W)
MC-BKH09-146-00	Yaskawa Electric Corp.	SGMAH-A3 (30W), MSMA-A5 (50W), SGMAH-01 (100W)
	Mitsubishi Electric Corp.	HC-KFS053, HC-MFS53 (100W), HC-KFS13, HC-MFS13 (100W)



Reference Numbers	Compatible motors	
	Makers	Motor models
MC-BKH09-170-00	Yaskawa Electric Corp.	SGMAH-02 (200W), SGMAH-04 (400W)
	Mitsubishi Electric Corp.	HC-KMS23, HC-MFS23 (200W), HC-KFS43, HC-MFS43(400W)
MC-BKH09-170-01	Matsushita Electric Industrial Co., Ltd.	MSMA02 (200W), MSMA04 (400W)



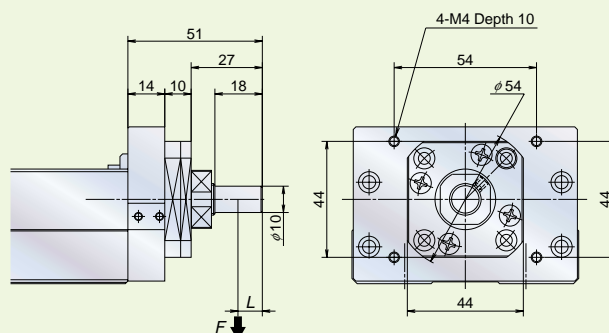
Compatible motors	
Makers	Motor models
Oriental Motor Co., Ltd.	AS46, ASC46, UPK54□, PK54□, CSK54□, CFK54□, UMK24□, CSK24□, PK24□
Matsushita Electric Industrial Co., Ltd.	MUMS3A (30W), MUMS5A (50W), MUMS01 (100W)



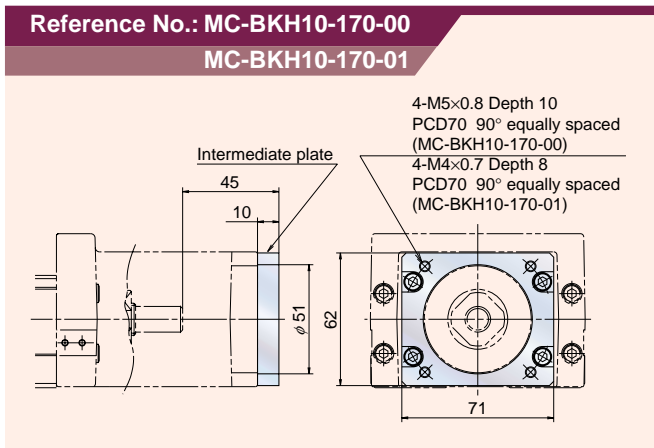
Compatible motors	
Makers	Motor models
Oriental Motor Co., Ltd.	AS66, ASC66, UPK56□, UFK56□, PK56□, CSK56□, CFK56□, AIP275 (75W)
Matsushita Electric Industrial Co., Ltd.	MUMS02 (200W), MUMS04 (400W)

Specifications of reversed motor mount shaft-ends for MCH09

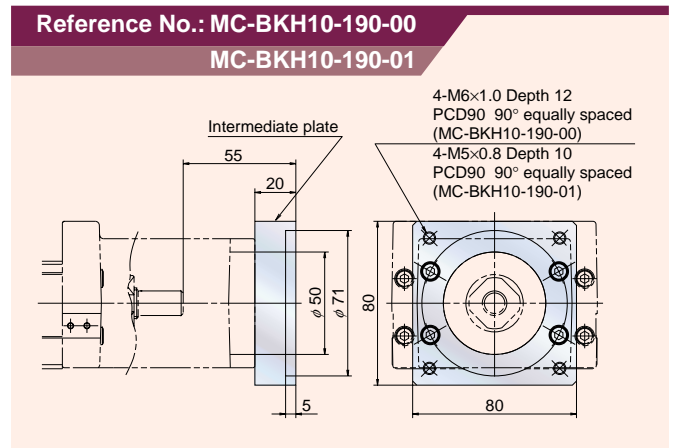
Permissible belt tension for reversed motor mount
 $L = 5, F = 125N$



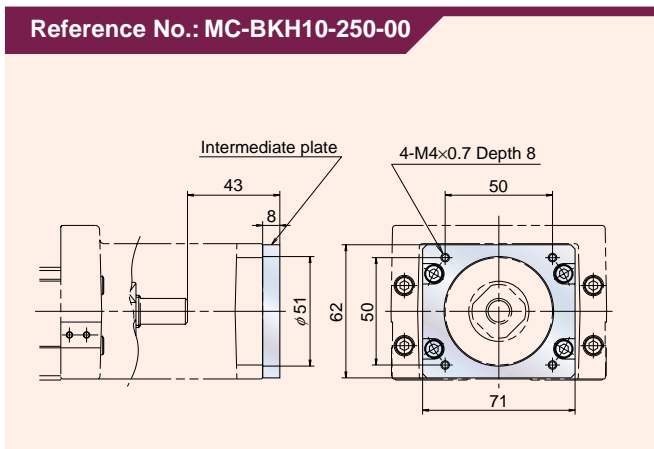
Motor bracket for MCH10



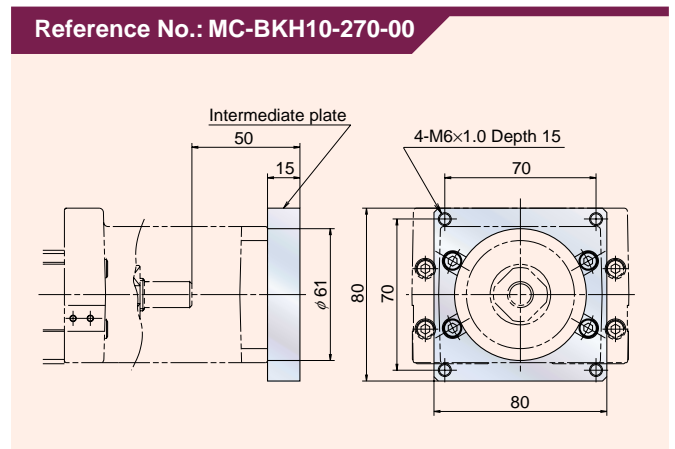
Reference Numbers	Compatible motors	
	Makers	Motor models
MC-BKH10-170-00	Yaskawa Electric Corp.	SGMAH-02 (200W), SGMAH-04 (400W)
	Mitsubishi Electric Corp.	HC-KFS23, HC-MFS23 (200W), HC-KFS43, HC-MFS43 (400W)
MC-BKH10-170-01	Matsushita Electric Industrial Co., Ltd.	MSMA02 (200W), MSMA04 (400W)



Reference Numbers	Compatible motors	
	Makers	Motor models
MC-BKH10-190-00	Yaskawa Electric Corp.	SGMAH-08 (750W)
	Mitsubishi Electric Corp.	HC-KFS73, HC-MFS73 (750W)
MC-BKH10-190-01	Matsushita Electric Industrial Co., Ltd.	MQMA02 (200W), MQMA04 (400W), MSMA08 (750W)

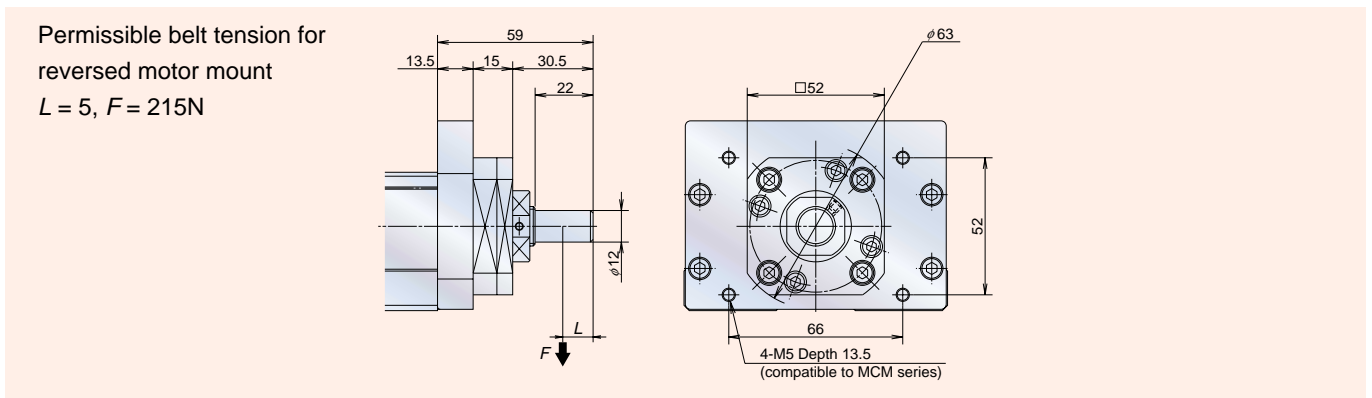


Compatible motors	
Makers	Motor models
Oriental Motor Co., Ltd.	AS66, ASC66, UPK56□, UFK56□, PK56□, CSK56□, CFK56□, AIP275 (75W)
	Matsushita Electric Industrial Co., Ltd.



Compatible motors	
Makers	Motor models
Oriental Motor Co., Ltd.	AS98, UPK59□, UFK59□, PK59□, CSK59□, AIP4151 (150W)
	Matsushita Electric Industrial Co., Ltd.

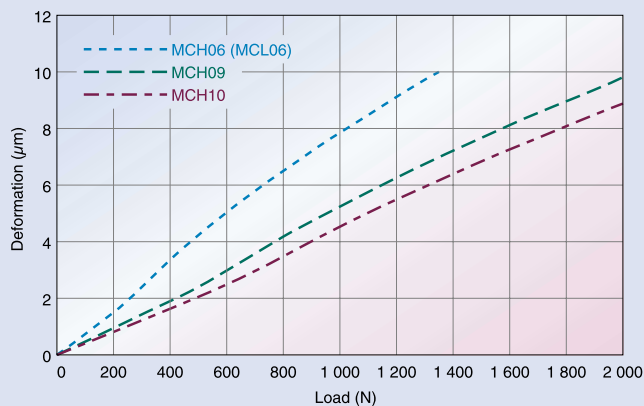
Specifications of reversed motor mount shaft-ends for MCH10



IV. Technical Information

1. Variation of Monocarriers

Fig. IV-1.1 Monocarrier's rigidity in radial direction



2.1 Rail material rigidity

Fig. IV-2.1

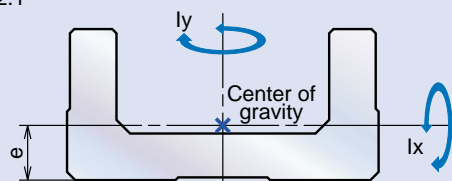


Table IV-2.1 Rail material rigidity

	MCH06	MCL06	MCH09	MCH10
I_x (mm ⁴)	6.5×10^4	2.58×10^4	2.87×10^5	5.40×10^5
I_y (mm ⁴)	3.82×10^5	2.96×10^5	1.72×10^6	3.07×10^6
I_p (mm ⁴ /rad)	2.00×10^4	1.71×10^4	1.10×10^5	1.70×10^5
e (mm)	10.8	7.8	15.5	18
W (kg/100mm)	0.67	0.56	1.48	1.93

2. How to select Monocarriers

Study strokes and space rigidity (refer to Fig. IV-1.1 of Section 2.1 for information on rigidity) and select Monocarrier models accordingly.



Determine the ball screw lead that enables a Monocarrier to run within the permissible speed stated in Section 2.2.



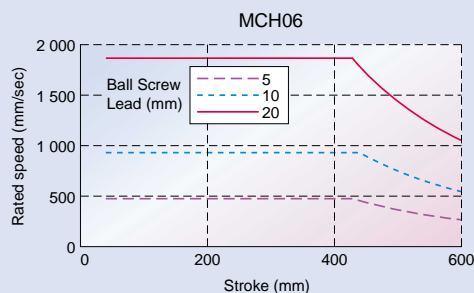
Obtain the working load on linear guides and enter the load values in equations (1) and (2) to the equivalent load F_e and to calculate linear guide life.



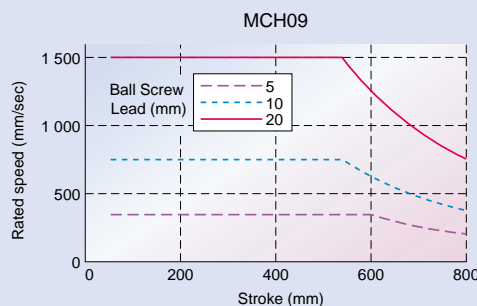
Obtain the mean loads from axial loads to calculate the rated life of ball screw and support bearing.

2.2 Permissible speed

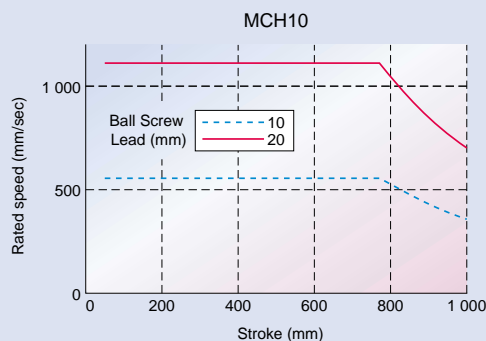
Permissible speed for MCH06



Permissible speed for MCH09



Permissible speed for MCH10



2.3 Life calculation of linear guides

Study the working load on the linear guide (Fig. IV-2.2) and enter the load values of a single slider in equation (1) (and those of double slider in the equation (2)) to acquire the equivalent load F_e .

● **For a single slider**

$$F_e = Y_H F_H + Y_V F_V + Y_R \epsilon_R M_R + Y_P \epsilon_P M_P + Y_Y \epsilon_Y M_Y \dots \dots \dots (1)$$

● **For a double slider**

$$F_e = \frac{Y_H F_H}{2} + \frac{Y_V F_V}{2} + Y_R \epsilon_{Rd} M_R + Y_P \epsilon_{Pd} M_P + Y_Y \epsilon_{Yd} M_Y \dots \dots \dots (2)$$

$\epsilon_R, \epsilon_P, \epsilon_Y, \epsilon_{Rd}, \epsilon_{Pd}, \epsilon_{Yd}$: Refer to Table IV-2.2 about the values.

F_H, F_V : Moment load (N) working on a slider.

M_R, M_P, M_Y : Moment load (N•m) working on a slider.

Y_V, Y_H, Y_R, Y_P, Y_Y : Set 1.0 to the greatest value among $F_V,$

$F_H, \epsilon_R M_R, \epsilon_P M_P, \epsilon_Y M_Y$ and set 0.5 to the others.

When slider working load varies (in general, $M_P,$ and M_Y vary with acceleration of slider speeds), use equation (3) to obtain average load.

Running distance F_1 when applying equivalent load L_1

Running distance F_2 when applying equivalent load L_2

⋮

Running distance F_n when applying equivalent load L_n

$$F_m = \sqrt[3]{\frac{1}{L} (F_1^3 L_1 + F_2^3 L_2 + \dots + F_n^3 L_n)} \dots \dots \dots (3)$$

F_m : Mean load of varying loads

L : Total running distance

Linear guide life is acceptable as long as the calculated average load is less than 10% of the dynamic load rating for Monocarrier's linear guides.

The life of Monocarrier's linear guides is calculated according to equation (4).

$$L = L_a \times \left[\frac{C}{f_w \cdot F_m} \right]^3 \dots \dots \dots (4)$$

L : Linear guide life

L_a : Running distance (km)

C : Load rating of a linear guide

f_w : Load coefficient (refer to Table IV-2.3)

F_m : Mean load of a linear guide (N)

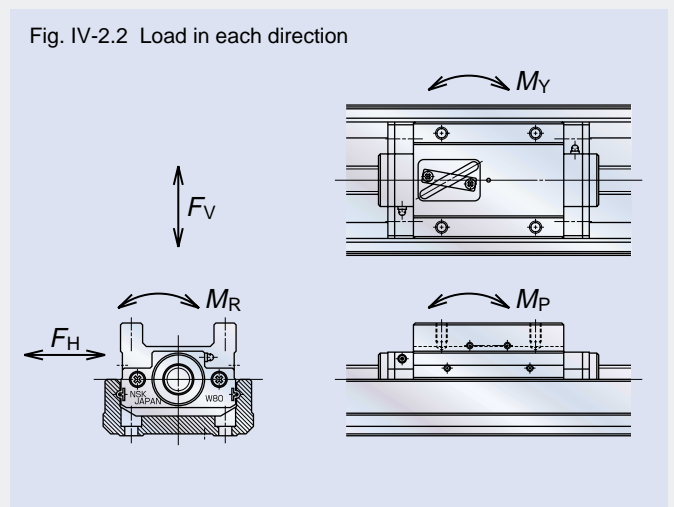


Table IV-2.2 Load constants

Model numbers	MCH06	MCH09	MCH10
Leads	5, 10, 20	5, 10, 20	10, 20
ϵ_R	48.3 (48.3)	34.5 (32.5)	28.6 (27.8)
ϵ_P	75.1 (75.1)	47.9 (48.8)	41.0 (45.2)
ϵ_Y	75.1 (75.1)	47.9 (48.8)	41.0 (45.2)
ϵ_{Rd}	24.2 (24.2)	17.2 (17.2)	14.3 (14.3)
ϵ_{Pd}	11.4 (13.2)	8.11 (9.10)	6.98 (7.82)
ϵ_{Yd}	11.4 (13.2)	8.11 (9.10)	6.98 (7.82)

Values within the parenthesis are the double slider-contact specifications.

Table IV-2.3 Load factor f_w

Operating conditions	Load factor f_w
Smooth operation with no shock	1.0~1.2
Normal operation	1.2~1.5
Operation with shock and vibration	1.5~3.0

When the calculated average load exceeds 10% of the load rating for linear guides, take the following measures and calculate again the mean load of the linear guide.

1. Change specifications from single slider to double slider.
2. Select the higher numbers of the Monocarrier models.

2.4 Calculating ball screw (or support bearings) life

Obtain the average axial load using equation (3). Life of ball screws (or support unit) and average load can be calculated using equation (5).

$$L = L_a \times \left[\frac{C}{f_w \cdot F_m} \right]^3 \dots \dots \dots (5)$$

- L: Life of ball screws (or support units)
- L_a: Running distance (km)
- C: Load rating of ball screws (or support units) (N) (refer to Table IV-2.4 for the load rating of support units).
- f_w: Load coefficient (refer to Table IV-2.3)
- F_m: Mean load on ball screws (or support units) (N)

Select higher numbered Monocarrier models unless the calculated life of ball screws and support units meets service life requirements.

This section has introduced a variety of calculation methods for selecting Monocarriers. All methods are approximate. Please contact NSK for detailed information (especially when calculated linear guide life falls short of service life requirements).

Table IV-2.4 Load rating of support units

Reference numbers	Support units	Dynamic load rating (N)
MCH06	WBK08	4 400
MCH09	WBK12	7 100
MCH10	WBK15	7 600

3. Performance of NSK K1® Lubrication Unit

NSK K1 exhibits outstanding features, confirmed through experimental data, along with the proven performance of NSK K1 Equipped Linear Guides and NSK K1 Equipped Ball Screws.

3.1 High-speed durability test of linear guides without lubricant

Results of high-speed durability testing of linear guides without lubricant are shown in Fig. IV-3.1. While linear guides cannot be operated without lubricant for even short periods without damage, the installation of NSK K1 permits linear guides to run over 25 000 km without any problems.

Conditions	Test piece: LH30AN (Preload Z1)
	Speed: 3.3 m/s
	Stroke: 1 800 mm
No lubricant	All grease removed
NSK K1	All grease removed + NSK K1

3.2 High-speed durability test of ball screws without lubricant

Results of high-speed durability testing of ball screws without lubricant are shown in Figure IV-3.2. While ball screws cannot be operated without lubricant at 8.5 km without damage, installation of NSK K1 permits ball screws to run over 21 000 km without any problems.

Conditions	Test piece: RBS2020 (ball screws)
	Shaft diameter: 20 mm
	Lead: 20 mm
	Load: None
	Speed: 4 000 r/min (1.3 m/s)
	Stroke: 600 mm
No lubricant	All grease removed
NSK K1	All grease removed + NSK K1

Fig. IV-3.1 Results of high-speed durability test of linear guides without lubricant

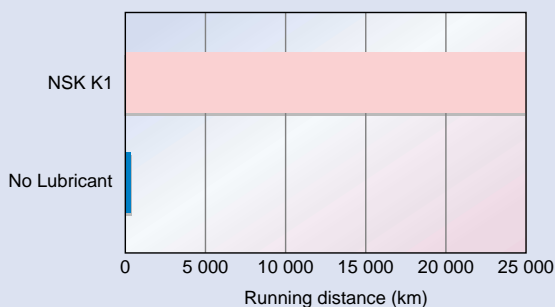
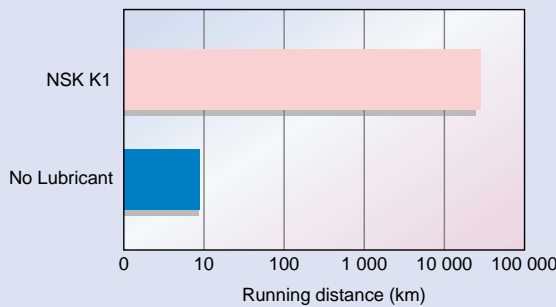


Fig. IV-3.2 Results of high-speed durability test of ball screws without lubricant



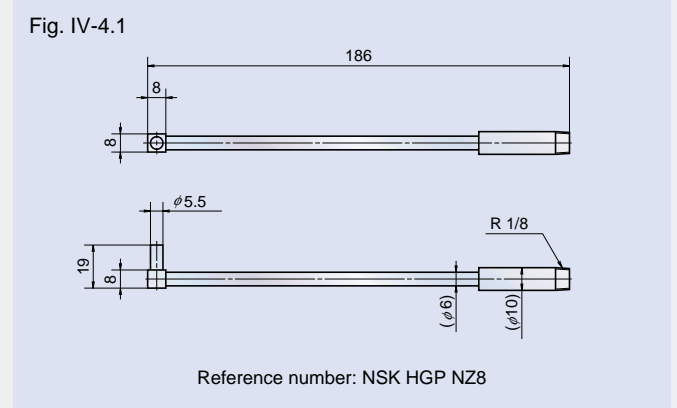
3.3 Availability of NSK K1 for food and medical equipment

Availability of FDA compliant NSK K1 enables Monocarriers to be used for food and medical equipment. Please refer to information describing the standard NSK K1 for dimensions and handling instructions.

4. Maintenance

- 4.1 For standard units, Shell AV2 is pre-packed in sliders, linear guides, and ball screws, and Maltemp PS2 of Kyodo Yushi Co., Ltd. is pre-packed in bearings.
- 4.2 Lubrication unit NSK K1, installed as a standard option, allows maintenance-free operation up to 5 years or running over 10 000 km under ordinary operating conditions. Application of grease listed in Section 4.1 further extends operating life.
- 4.3 NSK K1 exhibits its high performance even in environments where lubrication dust is generated, but such environments will reduce operating life to less than the period of time indicated in Section 4.2. Some countermeasures, such as frequent addition of grease, will be required in order to improve operating life.

4.4 MCH-specific grease gun nozzles are also available. (Fig. IV-4.1)



Handling Instructions

1. When Monocarriers are installed to a reversed motor mount, permissible moment on the shaft-ends should be considered. Please contact NSK for details.
2. To maintain the high efficiency of NSK K1 over a long period of time, please follow these instructions.

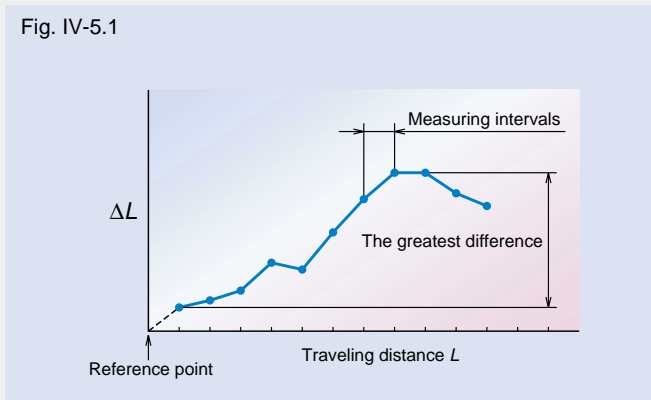
1. **Permissible temperature range.** . . . Max. operating temperature: 50°C
 Max. peak temperature: 80°C
2. **Use of chemicals** Do not leave the Monocarrier in close proximity to grease-removing organic solvents such as hexane, thinners, etc.

Note: Other oils present no problems: water-based cutting oil, oil-based cutting oil, and grease (mineral oil-AV2, ester-PS2).

5. Characteristics and Evaluation Methods

5.1 Positioning accuracy

A sequential positioning test is performed in a specified direction starting from the reference point to measure the difference between actual and calculated distances at specified intervals. Measurements are repeated 7 times and results are averaged. Measurements are taken over the entire traveling distance with intervals specified in accordance with model types; the measured value is defined as the greatest difference of the average values.



5.2 Repeatability

Positioning tests are performed at a specified point in the same direction 7 times to measure the stop points, and one-second of the greatest value among the measured results is obtained. Measurements are taken across the entire travel distance with intervals specified in accordance with model types, and the measured value is defined as the greatest difference of the average values. The values of one-second of the greatest difference at each point are expressed with ±.

