HCM

High Speed Type High Energy Absorption Cylinder

ø20, ø25, ø32, ø40, ø50, ø63

HCM

HCA

CONTENTS

Cylinder
Switch
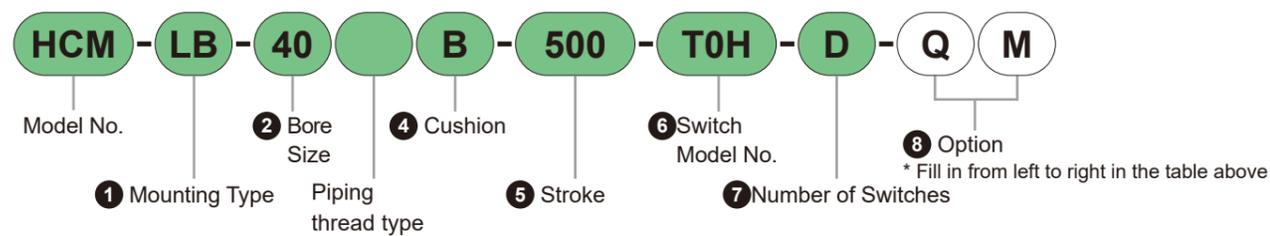
Ending

1182   CKD

Cylinder
Switch

Ending

CKD   1183

Variation and Option Item Combination Availability Table

◎ Mark : Option
○ Mark : Custom-made
△ Mark : Manufacturable depending on conditions (please consult)
× Mark : Not available

		Category	Variation	Piping thread		Option	
			Double Acting Basic Type	NPT	G	Shipped with Switch Rail Attached	Piston Rod Material (Stainless Steel)
		Code	None	N	G	Q	M
Variation	Double Acting Basic Type	Blank		○	○	○	◎
Piping thread	NPT	N			x	○	○
	G	G				○	○
Option	Shipped with Switch Rail Attached	Q					◎
	Piston Rod Material (Stainless Steel) *1	M					
Accessories	Cylinder Switch	Separately Shown	◎	○	○	◎	◎
	Single Knuckle	I	◎	○	○	◎	◎
	Double Knuckle	Y	◎	○	○	◎	◎

Note: For ø20, 25, Stainless Steel is the standard Piston Rod material. Optionally available for ø32 to ø63 only.

[Model No. Example]

HCM - LB - 40 - B - 500 - T0H - D - Q M

- ❶ Mounting Type
- Model No.
- ❷ Bore Size
- Piping thread type
- ❹ Cushion
- ❺ Stroke
- ❻ Switch Model No.
- ❼ Number of Switches
- ❽ Option
 * Fill in from left to right in the table above

Model No.: High Energy Absorption Cylinder
- ● Variation : Double Acting Basic Type
- ❶ mounting style : Axial Foot Type
- ❷ Bore Size : ø40 mm
- ❸ Port thread : Rc Thread
- ❹ Cushion : With Cushion on Both Sides
- ❺ stroke : 500 mm
- ❻ Switch model No. : Solid State TOH Switch, Lead Wire 1 m
- ❼ Switch quantity : With 2 pcs
- ❽ Option : Shipped with switch rail attached, Piston Rod material (Stainless Steel)

Cushion Operating Principle

① When the piston operates and the cushion ring rushes into the cushion packing, an airtight space is formed in the ▢. As the piston moves further, the air at ▢ is compressed and absorbs the kinetic energy in the operating direction.

● Before Cushion Engagement

Spring
Relief Valve
Cushion Packing
Cushion ring

1

② Simultaneously, the compressed air opens the relief valve, the compressed air is instantly exhausted, and the relief valve closes.

● Cushion Operation I

Relief Valve
Exhaust

2

③ After the relief valve closes, the remaining compressed air is exhausted from the slit orifice, the piston moves, and finally hits the cover, completing the energy absorption stroke.
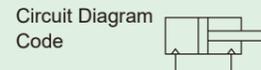
● Cushion Operation II

Exhaust

3

Slit orifice
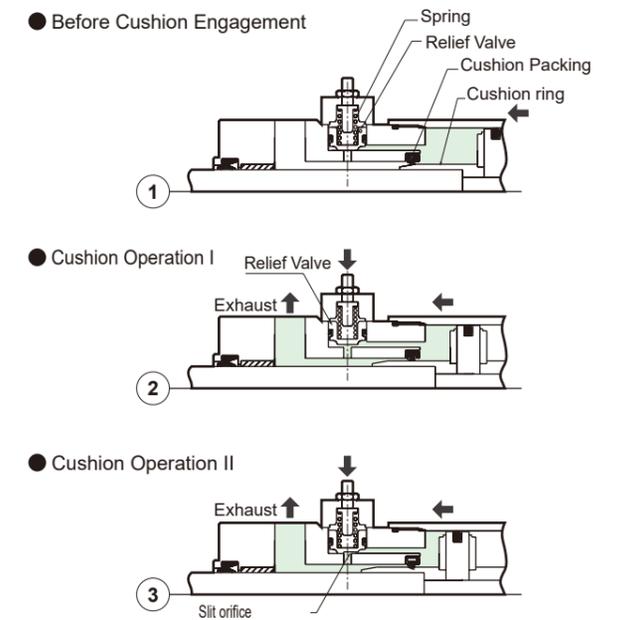
High Energy Absorption Cylinder Double Acting, Single Rod Type

HCM Series

● Bore Size: ø20, ø25, ø32, ø40, ø50, ø63

Circuit Diagram Code

RoHS

Model No. Notation

Without switch
(Built-in magnet for switch)

HCM - LB - 40 ( ) B - 500 ──────── I

Model No. ❶ ❷ ❸ ❹ ❺ ❾

With Switch
(Built-in magnet for switch)

HCM - LB - 40 ( ) B - 500 - T2H□ - D - Q I

Model No. ❷ Bore Size ❹ Cushion ❻ Switch Model No. ❽ Option

❶ Mounting type Piping thread type ❺ Stroke ❼ Number of Switches ❾ Accessories
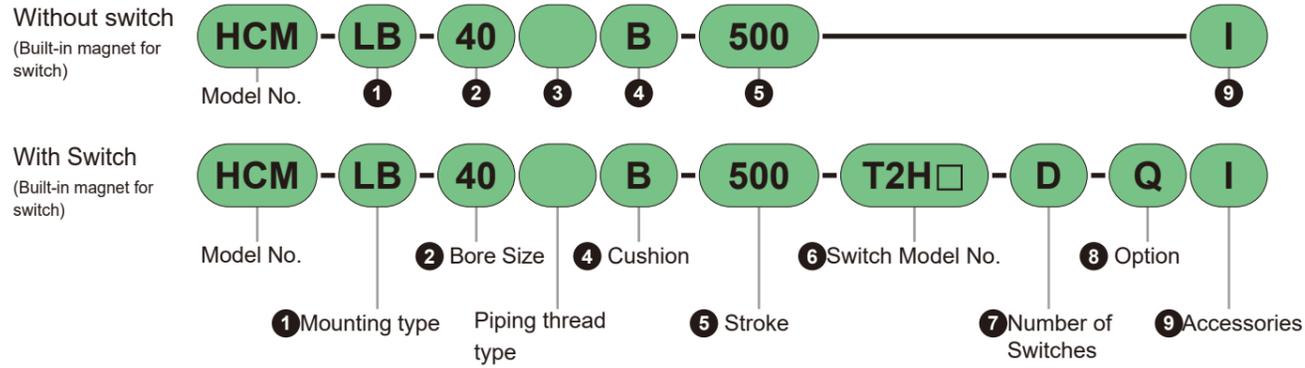
❶ Mounting type

Mounting bracket is included with the product.

Code	Content	
00	Basic type	
LB	Axial Foot Type (Double Side)	
FA	Rod side Flange Type	
FB	Head Side Flange Type	

❷ Bore Size (mm)

Code	Content
20	ø20
25	ø25
32	ø32
40	ø40
50	ø50
63	ø63

❸ Piping thread type

Code	Content
Blank	Rc Thread
NN	NPT Thread (Custom Order Product)
GN	G thread (Custom product)

❹ Cushion

Code	Content
B	With Cushion on Both Sides
R	With rod side cushion
H	With head side cushion
N	Without cushion

❺ Stroke (mm)

Bore Size	Stroke	Intermediate Stroke	Recommended Stroke
ø20 to ø32	150 to 700	in 1mm increments	300 mm or more
ø40 to ø63	150 to 1000		

Note: This product is designed with a longer cushion area than general cylinders to absorb high energy. Therefore, with short strokes, most of it becomes the cushion area, and the effect of high-speed use cannot be obtained.

High Speed Type

HCM

HCA

Cylinder Switch

Ending

1186 CKD

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❻ Switch Model No.

For switch details, refer to P. 1457. Switches are shipped with the product.

Contact	Indicator LED Special Function	Wiring (Output)	Load Voltage (V) AC	Load Voltage (V) DC	Load Current (mA) AC	Load Current (mA) DC	Lead wire *1 Straight	Lead wire *1 L-shape	
Solid State	1-Color	2-wire	85 to 265	—	5 to 100	—	T1H□	T1V□	
			—	10 to 30	—	5 to 20 *2	T2H□	T2V□	
		3-wire (NPN)	—	30 or less	—	100 or less	T3H□	T3V□	
		3-wire (PNP)	—		—		T3PH□	T3PV□	
	2-Color	2-wire	—	24 ± 10%	—	5 to 20	T2WH□	T2WV□	
		3-wire (NPN)	—	30 or less	—	50 or less	T3WH□	T3WV□	
	2-Color Improved Water Resistance		—	24 ± 10%	—	5 to 20	T2WLH□	T2WLV□	*3
	2-Color for AC Magnetic Field	2-wire	—	24 ± 10%	—		T2YD□	–	
			—	24 ± 10%	—		T2YDT□	–	
	1-Color Off-Delay Type		—	10 to 30	—	5 to 20 *2	T2JH□	T2JV□	
	1-Color Flexible Lead Wire Type		—	10 to 30	—		T2HR3	T2VR3	
Reed	1-Color	2-wire	110	12/24	7 to 20	5 to 50	T0H□	T0V□	
	Without Indicator Lamp		110	5/12/24	20 or less	50 or less	T5H□	T5V□	
	1-Color		110/220	12/24	7 to 20 / 7 to 10	5 to 50	T8H□	T8V□	

*1: For "□" in the switch Model No., enter the code selected from the "Lead wire length, connector specification" table.
*2: The maximum load current value above, 20 mA, is at 25°C. If the switch operating Ambient Temperature is higher than 25°C, it will be lower than 20 mA. (At 60°C, it will be 5 to 10 mA.)
*3: This does not guarantee the water resistance of the cylinder.
*4: Switches other than the Model No.s listed above are also available. (Custom Product) For details, refer to P. 1457.

*Lead wire length, connector specification

Code	Content
Blank	1 m (Standard)
3	3 m (Option)
5	5 m (Option)
W	M8 Connector, 1PIN (+) 4PIN (-) Lead Wire 0.3 m

*5

*5: Only T2WLH and T2WLV can be selected.

Example) Lead wire length
1 m T0H
3 m T0H3
5 m T0H5

❼ Number of Switches

Code	Content
R	With 1 pc on rod side
H	With 1 pc on head side
D	With 2 pcs

❽ Option

Code	Content
Q	Shipped with Switch Rail Attached
M	Piston Rod Material (Stainless Steel)

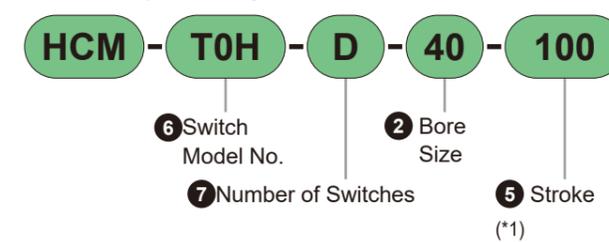*1: ø20, ø25 cannot be selected. (Stainless Steel is the standard Piston Rod material.)

❾ Accessories

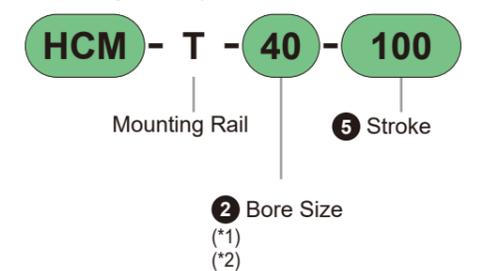| Code	Content	
I	Single Knuckle	
Y	Double Knuckle (Pin and Retaining Ring included)	

Note: "I" and "Y" cannot be selected at the same time.
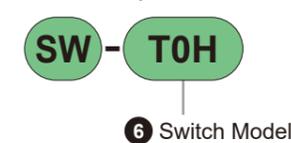
Switch Single Unit Model No. Notation

● Switch body + mounting rail set

HCM - T0H - D - 40 - 100

❻ Switch Model No.
❼ Number of Switches
❷ Bore Size
❺ Stroke (*1)

● Switch only

SW - T0H

❻ Switch Model

● Mounting Rail Only

HCM - T - 40 - 100

Mounting Rail
❷ Bore Size (*1) (*2)
❺ Stroke

*1: Indicate × if the stroke exceeds 300 mm. For strokes exceeding 300 mm, one short rail (switch adjustment travel distance 100 mm) is included per switch.
*2: When indicating x for mounting rail only, order the same number of rails as the number of switches used.

High Speed Type

HCM

HCA

Cylinder Switch

Ending

CKD 1187

Specifications

Item		HCM					
Bore Size	mm	ø20	ø25	ø32	ø40	ø50	ø63
Actuation method		Double Acting Type					
Operating Fluid		Compressed Air					
Max Operating Pressure	MPa	1.0					
Min Operating Pressure	MPa	0.15					
Proof Pressure	MPa	1.6					
Ambient Temperature	°C	-10 to 60 (No freezing)					
Port Size		Rc1/8	Rc1/8	Rc1/4	Rc1/4	Rc3/8	Rc3/8
Stroke Tolerance	mm	$^{+2.0}_{0}$					
Operating Piston Speed	mm/s	50 to 2000 (Use within the allowable absorption energy.)					
Cushion		With Air Cushion					
Lubrication		Not Required (When lubricating, use turbine oil Class 1 ISO VG32)					
Allowable Absorption Energy J *1	With air cushion	3	5	9	14	23	30
Effective air cushion length	mm	56.5	56.5	56.5	55.5	58.5	58.5

*1: If kinetic energy exceeds these values, consider using a separate shock absorber. For energy calculation and size selection, refer to P. 1196 to 1199.

Stroke

Bore Size (mm)	Standard Stroke (mm)	Maximum Stroke (mm)	Min Stroke (mm)	Recommended Stroke (mm)
ø20 to ø32	200 to 700	700	150	300 or more
ø40 to ø63	200 to 1000	1000		

*1: Intermediate strokes can be manufactured in 1 mm increments.
*2: This product is designed with a longer cushion area than general cylinders to absorb high energy. Therefore, with short strokes, most of it becomes the cushion area, and the effect of high-speed use cannot be obtained.

Cylinder Weight

(Unit: kg)

Bore Size	mm	ø20	ø25	ø32	ø40	ø50	ø63
Product Weight at 0 mm Stroke	Basic Type (00)	0.33	0.47	0.62	0.98	1.58	2.27
	Axial Foot Type (LB)	0.44	0.6	0.78	1.2	2.06	2.99
	Flange Type (FA/FB)	0.36	0.51	0.68	1.06	1.92	2.77
Switch Weight (per piece)		Refer to the weight listed in the switch specifications on P. 1457.					
Additional Weight per 100 mm Stroke without Switch Rail		0.012	0.016	0.017	0.027	0.040	0.044
Additional Weight per 100 mm Stroke with Switch Rail		0.014	0.018	0.019	0.029	0.042	0.046

Calculation Example
Product Weight of HCM-LB-40B-500-T2H-D

Product weight for 0 mm stroke   1.2 kg
Additional weight when 500 mm $0.029 \times \dfrac{500}{100} = 0.145$ kg

Weight of 2 switches   0.018×2 = 0.036 kg
Product weight   1.2+0.145+0.036=1.381 kg

Theoretical Thrust Table

(Unit: N)

Bore Size (mm)	Operating Direction	Operating Pressure MPa									
		0.15	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
ø20	Push	47.1	62.8	94.2	1.26×10^2	1.57×10^2	1.88×10^2	2.20×10^2	2.51×10^2	2.83×10^2	3.14×10^2
	Pull	35.3	47.1	70.7	94.2	1.18×10^2	1.41×10^2	1.65×10^2	1.88×10^2	2.12×10^2	2.36×10^2
ø25	Push	73.6	98.2	1.47×10^2	1.96×10^2	2.45×10^2	2.95×10^2	3.44×10^2	3.93×10^2	4.42×10^2	4.91×10^2
	Pull	56.7	75.6	1.13×10^2	1.51×10^2	1.89×10^2	2.27×10^2	2.64×10^2	3.02×10^2	3.40×10^2	3.78×10^2
ø32	Push	1.21×10^2	1.61×10^2	2.41×10^2	3.22×10^2	4.02×10^2	4.83×10^2	5.63×10^2	6.43×10^2	7.24×10^2	8.04×10^2
	Pull	1.04×10^2	1.38×10^2	2.07×10^2	2.76×10^2	3.46×10^2	4.15×10^2	4.84×10^2	5.53×10^2	6.22×10^2	6.91×10^2
ø40	Push	1.88×10^2	2.51×10^2	3.77×10^2	5.03×10^2	6.28×10^2	7.54×10^2	8.80×10^2	1.01×10^3	1.13×10^3	1.26×10^3
	Pull	1.58×10^2	2.11×10^2	3.17×10^2	4.22×10^2	5.28×10^2	6.33×10^2	7.39×10^2	8.44×10^2	9.50×10^2	1.06×10^3
ø50	Push	2.95×10^2	3.93×10^2	5.89×10^2	7.85×10^2	9.82×10^2	1.18×10^3	1.37×10^3	1.57×10^3	1.77×10^3	1.96×10^3
	Pull	2.47×10^2	3.30×10^2	4.95×10^2	6.60×10^2	8.25×10^2	9.90×10^2	1.15×10^3	1.32×10^3	1.48×10^3	1.65×10^3
ø63	Push	4.68×10^2	6.23×10^2	9.35×10^2	1.25×10^3	1.56×10^3	1.87×10^3	2.18×10^3	2.49×10^3	2.81×10^3	3.12×10^3
	Pull	4.20×10^2	5.61×10^2	8.41×10^2	1.12×10^3	1.40×10^3	1.68×10^3	1.96×10^3	2.24×10^3	2.52×10^3	2.80×10^3

Mounting Bracket Model No.

Bore Size / Mounting Style	Foot (LB)	Flange (FA/FB)
ø20	HCM-LB-20	HCM-FA-20
ø25	HCM-LB-25	HCM-FA-25
ø32	HCM-LB-32	HCM-FA-32
ø40	HCM-LB-40	HCM-FA-40
ø50	HCM-LB-50	HCM-FA-50
ø63	HCM-LB-63	HCM-FA-63

*1: Foot type mounting brackets are 2 pcs/set.
*2: Mounting bolts are included with each mounting bracket.

High Speed Type

HCM

HCA

Cylinder Switch

Ending

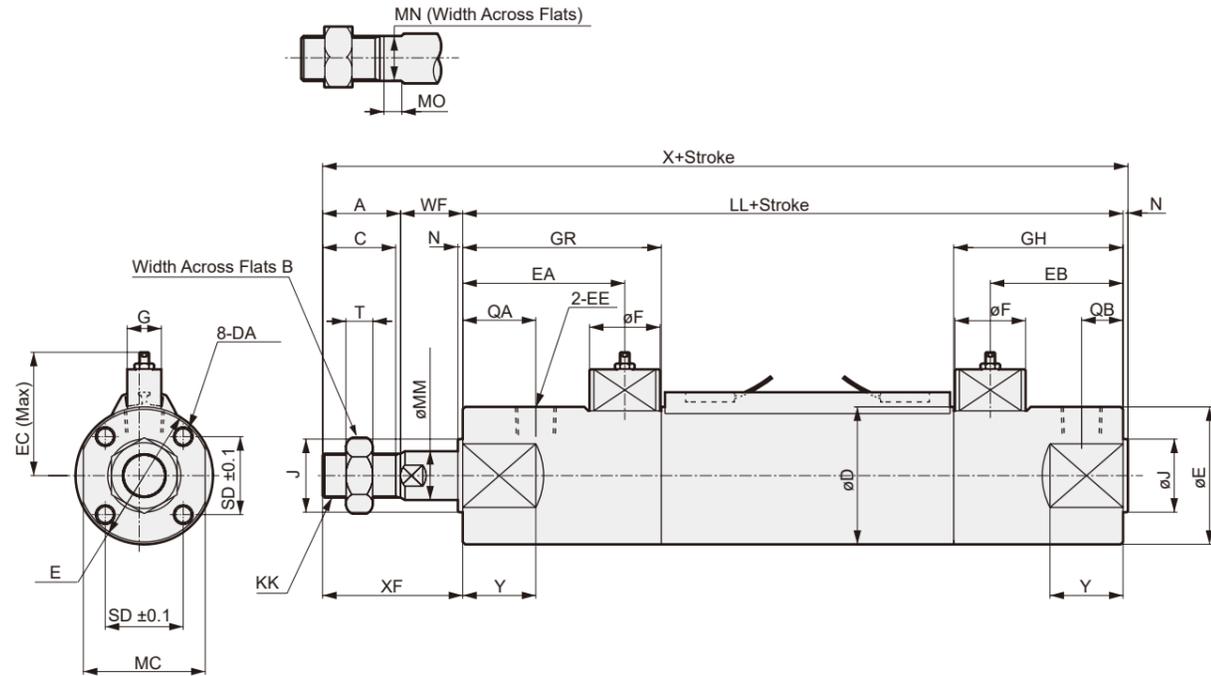## Dimensional Drawings

● Basic type (00)

Code Bore Size	A	B	C	D	DA	E	EA	EB	EC	EE	F	G	J	KK	LL
ø20	18	13	16	26	M4 Depth 8	28	52	43	32.7	Rc1/8	29	14	13	M8	164
ø25	20	17	18	31	M5 Depth 9	31	56.5	47.5	34.5	Rc1/8	29	14	15	M10X1.25	173
ø32	20	17	18	37	M5 Depth 9	37	56.5	47.5	37.8	Rc1/4	29	14	18	M10X1.25	173
ø40	26	22	24	46	M6 Depth 10	46	62	51	47.3	Rc1/4	29	14	25	M14X1.5	186
ø50	32	27	30	56.4	M8 Depth 12	56.4	66.5	54.5	52.6	Rc3/8	29	14	30	M18X1.5	196
ø63	32	27	30	69.4	M10 Depth 15	69.4	66.5	54.5	59.3	Rc3/8	29	14	32	M18X1.5	196

Code Bore Size	MC	MM	MN	MO	N	QA	QB	SD	T	WF	X	XF	Y	GR	GH
ø20	24	10	8	5	2	18	10	14	5	15.5	199.5	33.5	20	67	58
ø25	27	12	10	6	2	20	10	16.5	6	17	212	37	20	71.5	62.5
ø32	32	12	10	6	2	20	12	20	6	17	212	37	28	71.5	62.5
ø40	41	16	14	7	2	26	14	26	8	20.5	234.5	46.5	28	77	66
ø50	50	20	17	8	2	30	17	32	11	25.5	255.5	57.5	30	81.5	69.5
ø63	60	20	17	8	2	30	17	38	11	25.5	255.5	57.5	30	81.5	69.5

*1: For ø20 only, tube outer diameter øD and cover outer diameter øE are different.
*2: For outer dimensions diagram of accessories, refer to P. 1193.
*3: For dimensions of models with switches, see P. 1195.

Dimensional Drawings

● Axial Foot Type (LB)
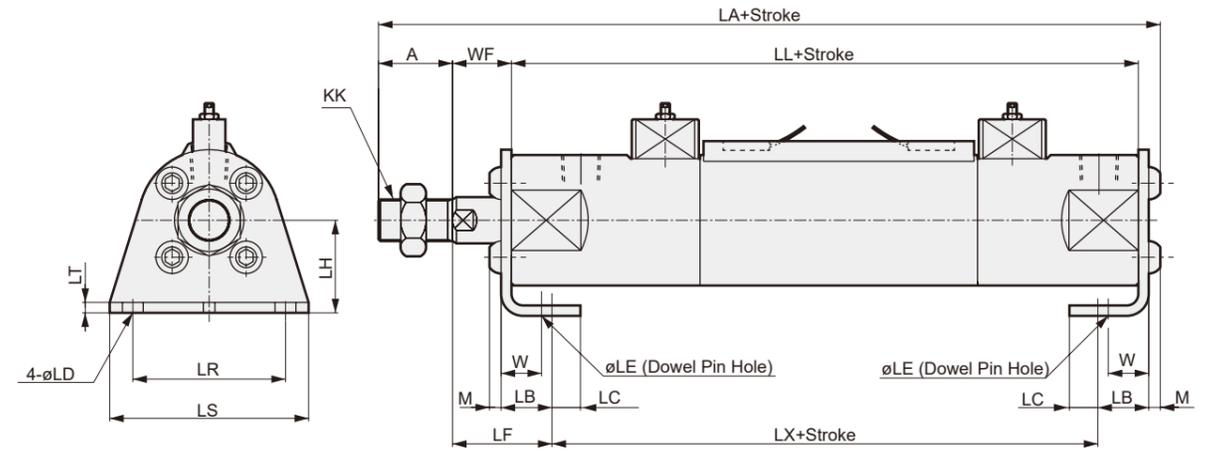
Code Bore Size	A	KK	LA	LB	LC	LD	LE	LF	LH	LL	LR	LS	LT	LX	M	W	WF
ø20	18	M8	203.3	15.1	7.1	5.7	4	27	20	164	32	44	3.2	140.2	2.6	10	15.5
ø25	20	M10X1.25	216.6	15.1	7.1	5.7	4	28.9	22	173	36	49	3.2	149.2	3.4	10	17
ø32	20	M10X1.25	216.6	16.1	8.1	6.8	4	29.9	25	173	44	58	3.2	147.2	3.4	10	17
ø40	26	M14X1.5	239.7	16.6	9.1	6.8	4	33.9	30	186	54	71	3.2	159.2	4	10	20.5
ø50	32	M18X1.5	263	22	11	9	5	43	40	196	66	86	4.5	161	5	17.5	25.5
ø63	32	M18X1.5	263	22	13	11	5	43	45	196	82	106	4.5	161	5	17.5	25.5

*1: For the external dimensions diagram of accessories, please refer to P. 1193.
*2: For dimensions of models with switches, see P. 1195.

● Rod Side Flange Type (FA)
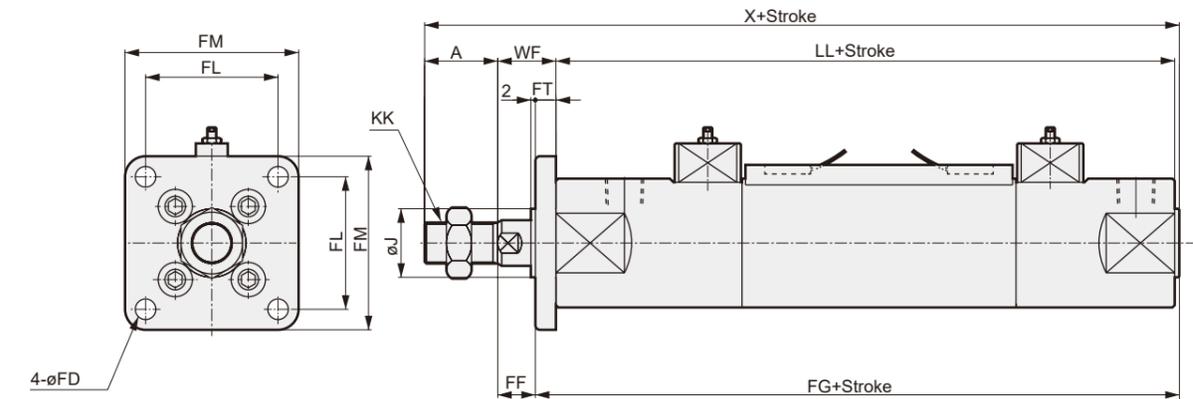
Code Bore Size	A	FD	FF	FG	FL	FM	FT	J	KK	LL	WF	X
ø20	18	5.5	9.5	172	28	40	6	13	M8	164	15.5	199.5
ø25	20	5.5	10	182	32	44	7	15	M10X1.25	173	17	212
ø32	20	6.6	10	182	38	53	7	18	M10X1.25	173	17	212
ø40	26	6.6	12.5	196	46	61	8	25	M14X1.5	186	20.5	234.5
ø50	32	9	16.5	207	58	76	9	30	M18X1.5	196	25.5	255.5
ø63	32	11	16.5	207	70	92	9	32	M18X1.5	196	25.5	255.5

*1: For ø20 only, tube outer diameter øD and cover outer diameter øE are different.
*2: For outer dimensions diagram of accessories, refer to P. 1193.
*3: For dimensions of models with switches, see P. 1195.

High Speed Type

HCM

HCA

Cylinder Switch

Ending

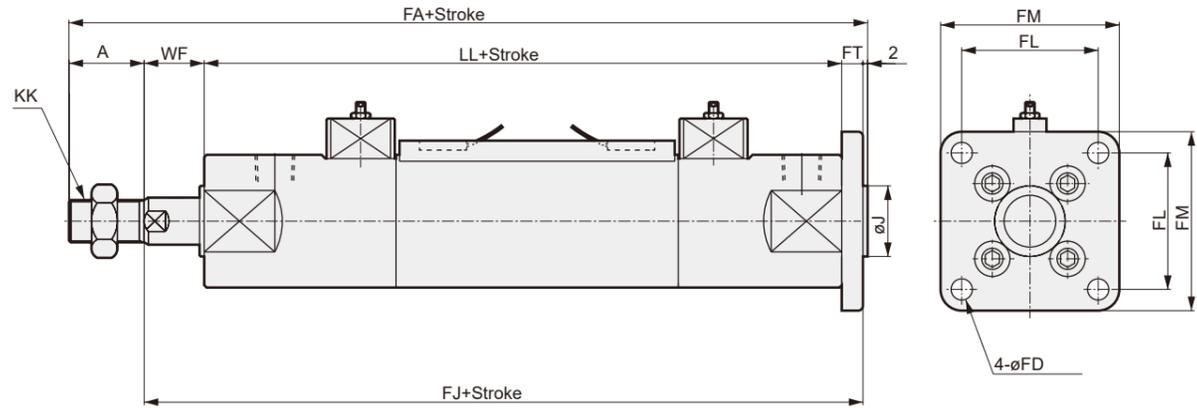## Dimensional Drawings

● Head Side Flange Type (FB)

Code Bore Size	A	FA	FD	FJ	FL	FM	FT	J	KK	LL	WF
ø20	18	205.5	5.5	185.5	28	40	6	13	M8	164	15.5
ø25	20	219	5.5	197	32	44	7	15	M10X1.25	173	17
ø32	20	219	6.6	197	38	53	7	18	M10X1.25	173	17
ø40	26	242.5	6.6	214.5	46	61	8	25	M14X1.5	186	20.5
ø50	32	264.5	9	230.5	58	76	9	30	M18X1.5	196	25.5
ø63	32	264.5	11	230.5	70	92	9	32	M18X1.5	196	25.5

*1: For ø20 only, tube outer diameter øD and cover outer diameter øE are different.
2: For the external dimensions diagram of accessories, please refer to P. 1193.
3: For dimensions of models with switches, see P. 1195.

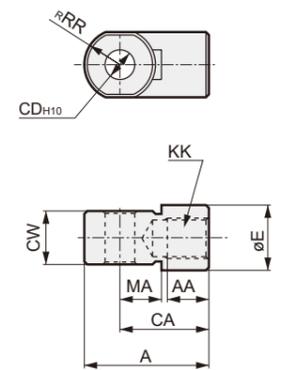## Accessory External Dimensions

Single Knuckle

● HCM-I-ø20 to ø25

Material: Steel, Zinc Chromate
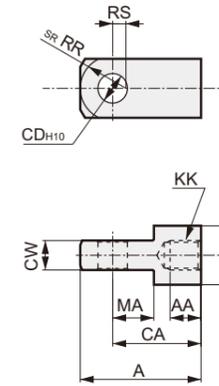
● HCM-I-ø40 to ø63

Material: Cast Iron

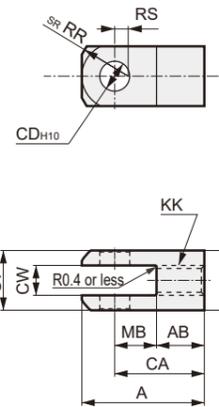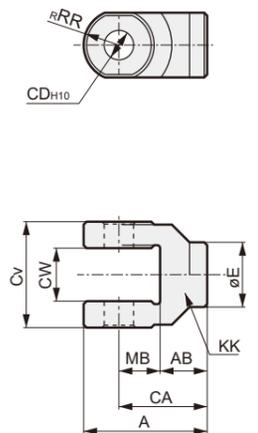| Model No.	Applicable Bore Size (mm)	A	AA	CA	CD	CW	E	KK	MA	RR	RS	Weight (g)
HCM-I-20	20	34	8.5	25	8	8 $^{-0.2}_{-0.4}$	16	M8	11.5	13.4	3.1	39
HCM-I-25	25/32	41	10.5	30	10	10 $^{-0.2}_{-0.4}$	20	M10×1.25	14	17.1	4.5	72
HCM-I-40	40	42	14	30	10	18 $^{-0.3}_{-0.5}$	22	M14×1.5	14	12	–	152
HCM-I-50	50, 63	56	18	40	14	22 $^{-0.3}_{-0.5}$	28	M18×1.5	20	16	–	158

Double Knuckle

● HCM-Y-ø20 to ø25

Material: Steel, Zinc Chromate

● HCM-Y-ø40 to ø63

Material: Cast Iron

Model No.	Applicable Bore Size (mm)	A	AB	CA	CD	Cv	CW	E	KK	MB	RR	RS	Weight (g)	Applicable Pin Model No.
HCM-Y-20	20	34	13.5	25	8	16	8 $^{+0.2}_{+0.4}$	16	M8	11.5	13.4	3.1	46	HCM-P-20
HCM-Y-25	25/32	41	16	30	10	20	10 $^{+0.2}_{+0.4}$	20	M10×1.25	14	17.1	4.5	85	HCM-P-25
HCM-Y-40	40	42	16	30	10	36	18 $^{+0.3}_{+0.5}$	22	M14×1.5	14	12	–	122	HCM-P-40
HCM-Y-50	50, 63	56	20	40	14	44	22 $^{+0.3}_{+0.5}$	28	M18×1.5	20	16	–	258	HCM-P-50

Note: Pin and snap ring are attached to the double knuckle.

Pin for Knuckle

Material: Steel, Zinc Chromate
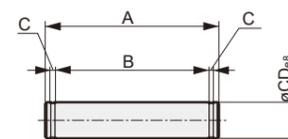
Model No.	Applicable Bore Size (mm)	A	B	C	CD	Weight (g)	Retaining Ring Used
HCM-P-20	20	21	16.2	0.9	8	9	Shaft C-type 8
HCM-P-25	25/32	25.6	20.2	1.15	10	16	C-type for Shaft 10
HCM-P-40	40	41.6	36.2	1.15	10	26	C-type for Shaft 10
HCM-P-50	50, 63	50.6	44.2	1.15	14	60	C-type 14 for Shaft

Note: Pin and snap ring are attached to the double knuckle.

High Speed Type

HCM

HCA

Cylinder Switch

Ending

Internal Structure Diagram/Material
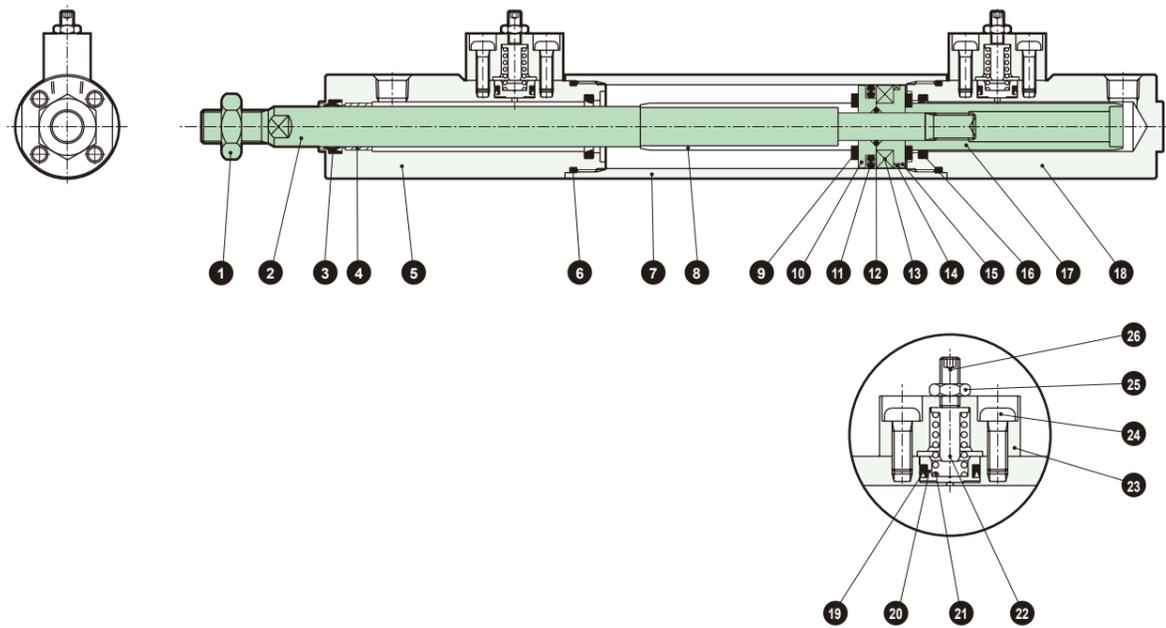
Part No.	Part Name	Material	Remarks
1	Rod Nut	Steel	Nickel Plating
2	Piston Rod	ø20, ø25: Stainless Steel ø32 to ø63: Steel	Industrial Hard Chrome Plating
3	Rod Packing	Nitrile Rubber	
4	Bushing	Oil-Impregnated Bearing Alloy	
5	Rod Cover	Aluminum Alloy	Black alumite
6	Cylinder Gasket	Nitrile Rubber	
7	Cylinder Tube	Aluminum Alloy	Hard Anodized
8	Cushion Ring (R)	Aluminum Alloy	Chromate
9	Cushion Rubber	Urethane Rubber	
10	Piston (R)	Aluminum Alloy	Chromate
11	Piston Packing	Nitrile Rubber	
12	Piston Gasket	Nitrile Rubber	ø25 to ø63 only
13	Magnet	Plastic	

Part No.	Part Name	Material	Remarks
14	Wear ring	Polyacetal	
15	Piston (H)	Aluminum Alloy	Chromate
16	Cushion Packing	ø20 to ø32: Urethane ø40 to ø63: Urethane, Steel	
17	Cushion Ring (H)	Aluminum Alloy	Chromate
18	Head Cover	Aluminum Alloy	Black alumite
19	Relief Valve Packing	Nitrile Rubber	
20	Relief Valve	Copper Alloy	
21	Spring	Piano Wire	Electrodeposition Coating
22	Spring Collar	Steel	Chromate
23	Relief Valve Retainer	Aluminum Alloy	Black alumite
24	Cross-Recessed Pan Head Screw	Steel	Zinc Chromate
25	Hexagon Nut	Steel	Black Oxide
26	Hexagon Socket Set Screw	Steel	Black Oxide

Mounting Bracket Material/Treatment

| Mounting Style	Material	Treatment
Foot (LB)	Steel	Zinc Chromate
Flange (FA, FB)	ø20 to ø40: Aluminum Alloy	ø20 to ø40: Black Alumite
	ø50, ø63: Steel	ø50, ø63: Zinc Chromate

HCM Series Outline Dimension Drawing with Switch

● T0H/V, T5H/V, T2H/V, T3H/V, T3PH/V, T2WH/V, T3WH/V, T2WLH/V, T2H/VR3
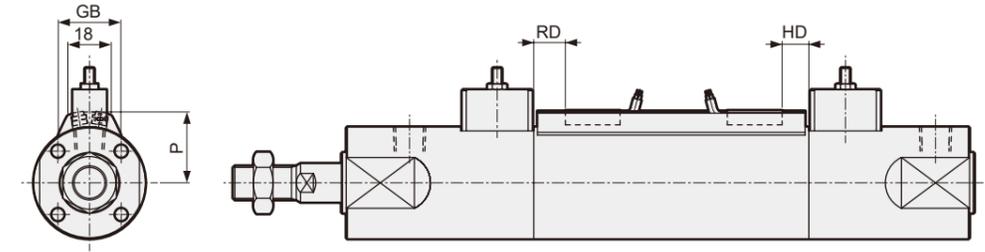
Code	GB	P	T0,T5,T2,T3,T3P		T2W, T3W, T2WL	
Bore Size			RD	HD	RD	HD
ø20	23	19.5	10	10	12	12
ø25	24.4	22	11	9	13	11
ø32	25	25	11	9	13	11
ø40	25.7	29.5	13	11	15	13
ø50	26.2	34.7	14	12	16	14
ø63	26.5	41.2	14	12	16	14

● T8H/V, T1H/V, T2JH/V, T2YD, T2YDT

[For T8H/V, T2JH/V]　　[For T1H/V, T2YD, T2YDT]
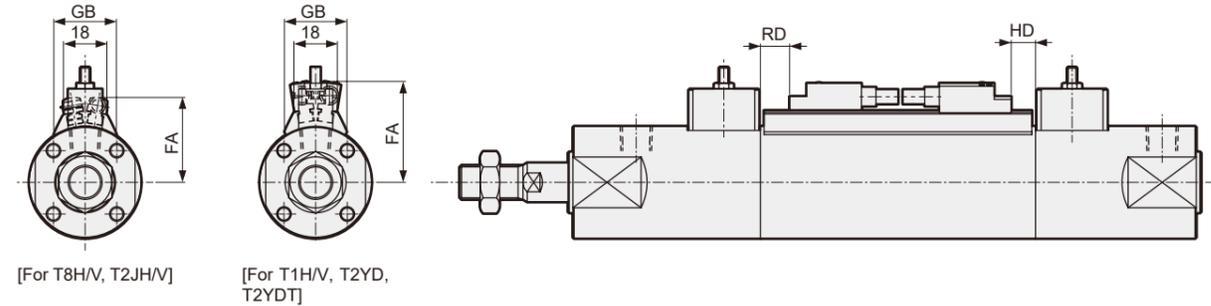
Code	GB	T8			T1,T2YD,T2YDT			T2J		
Bore Size		FA	RD	HD	FA	RD	HD	FA	RD	HD
ø20	23	24.0	4	4	29.5	9	9	24.0	9	9
ø25	24.4	26.5	5	3	32.0	10	8	26.5	10	8
ø32	25	29.5	5	3	35.0	10	8	29.5	10	8
ø40	25.7	34.0	7	5	39.5	12	10	34.0	12	10
ø50	26.2	39.2	8	6	44.7	13	11	39.2	13	11
ø63	26.5	45.7	8	6	51.2	13	11	45.7	13	11

Cylinder and System Model Selection Guide

This varies slightly depending on usage conditions, so please use it as a guideline only.

STEP-1   Confirmation of operating conditions

① Load weight   M (kg)
② Stroke   St (mm)
③ Travel time   T (s)
④ Cylinder average speed   V0 (m/s)
                      V0 = St / (T×1000)
⑤ Operating Pressure   P (MPa)
⑥ Mounting Method/Direction

A	B	C	D
Vertical Upward Push Operation	Vertical Downward Retraction Operation	Horizontal Push Operation	Horizontal Retraction Operation
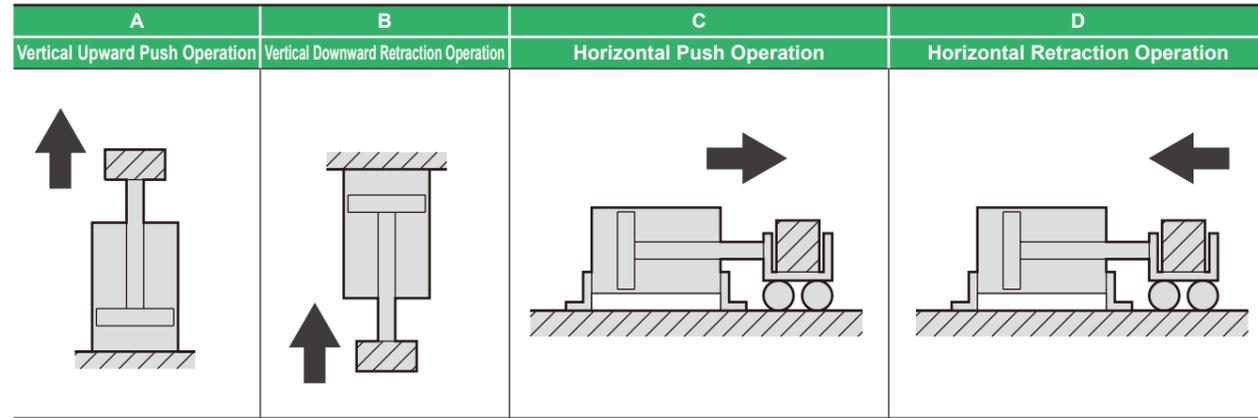
Note: In the case of vertical lowering, cylinder thrust is hardly required. Select the cylinder size on the rising side that requires thrust.

STEP-2   Approximate Cylinder Size Selection

① Set the load factor (α) according to the piston speed.
   For high speed operation (1 to 2 m/s) α=20%
   For medium speed operation (1 m/s or less) α=50%

② Calculate the required cylinder thrust (F).

$$F(N)= \frac{980×M×μ}{α}$$

M: Payload (kg)
α: Load factor (%)
μ: Coefficient of friction
   Mounting Method C/D Horizontal Rolling = 0.1
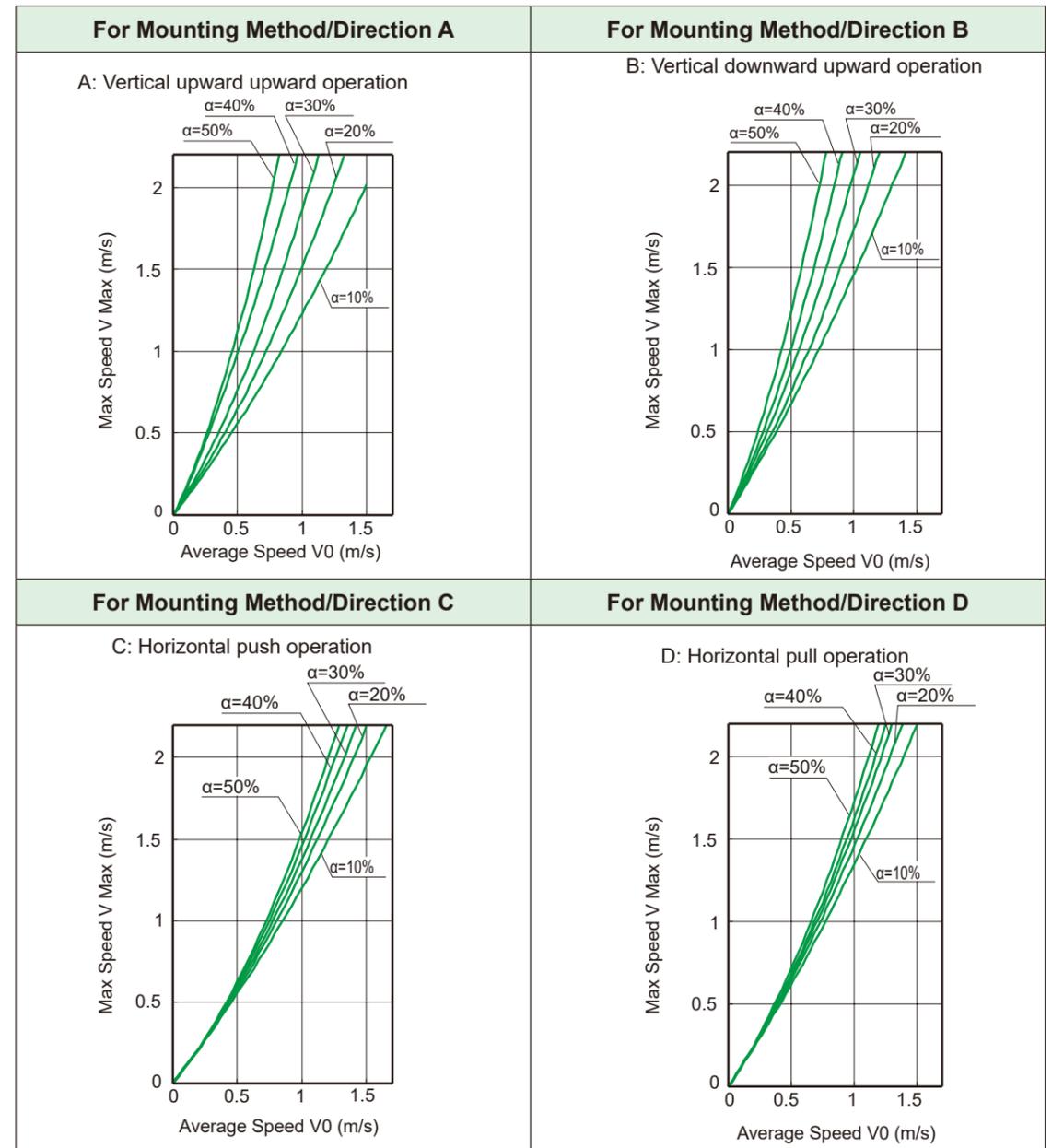   Mounting Method A/B Vertical Up/Down = 1

③ Determine the cylinder Bore Size (D).

$$D (mm)= \sqrt{\frac{F}{0.25×P×π}}$$

P: Operating Pressure (MPa)
F: Required cylinder thrust (N)

④ Select a size larger than the value obtained in "③".

Size	Cylinder Bore Size (mm)
ø20	20
ø25	25
ø32	32
ø40	40
ø50	50
ø63	63

STEP-3   Calculation of Max Speed

● [Step 1] working conditions (average speed V0/mounting method/direction) and [Step 2] Find maximum speed (Vmax) in Graph 1 according to load factor α of . If the Max speed (Vmax) exceeds 2 m/s, return to [Step 1] and lower the average speed V0.

[Graph-1]

For Mounting Method/Direction A	For Mounting Method/Direction B
A: Vertical upward upward operation	B: Vertical downward upward operation

For Mounting Method/Direction C	For Mounting Method/Direction D
C: Horizontal push operation	D: Horizontal pull operation

This is for when Operating Pressure P = 0.5 MPa and piping length is Approx. 2 m.
Please use as a guideline if using under other conditions.

High Speed Type

HCM

HCA

High Speed Type

HCM

HCA

Cylinder Switch

Ending

Cylinder Switch

Ending

1196   CKD

CKD   1197

STEP-4 Confirmation of cushion capacity

● Check if the kinetic energy generated by movement of load is absorbed by the cylinder cushion.

Calculate the kinetic energy (E1) from the load weight M in [Step 1] and the Max speed Vmax obtained in [Step 3].

$E1(J) = 0.5 \times (Vmax)^2 \times M$

• E1 must be less than or equal to the allowable absorption energy E2 in Table 1. When E1>E2, decrease average speed V_0 or install an external shock absorber (Shock Absorbers).
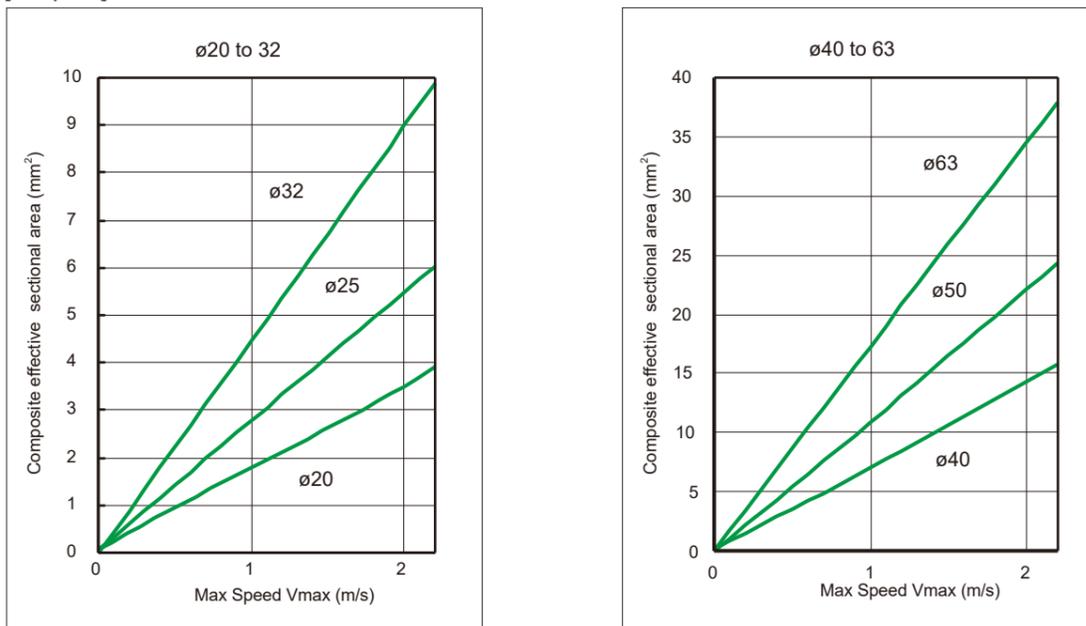
[Table 1]

Bore Size	Allowable Absorption Energy E2 (J)
ø20	3
ø25	5
ø32	9
ø40	14
ø50	23
ø63	30

Note: Energy is absorbed during vertical upward retraction operation and vertical downward push operation, but smooth stopping is not possible. If smooth stopping (no bouncing, etc.) is required, use a load factor of 10% or less and a maximum speed of 1 m/s or less as a guide.

STEP-5 Calculation of Required Combined Effective Cross-sectional Area

Determine the required effective cross-sectional area S given the Max speed Vmax obtained in [Step 3] and the cylinder Bore Size obtained in [Step 2].

[Graph 2]

ø20 to 32

ø40 to 63

STEP-6 System Circuit Selection

● Select the system circuit using [Table 2]] from the required combined effective cross-sectional area obtained in <Step 5>.

[Table 2]   The code S in the table represents the individual effective cross-sectional area (mm²).

Combined Effective Cross-sectional Area (mm²)	Solenoid Valve								Speed Controller		Silencer		Piping (Piping Length 2 m)	
	Direct Type				Sub-plate Type									
	Single solenoid	S	Double Solenoid	S	Single solenoid	S	Double Solenoid	S		S		S		S
1.2	4KA110-M5 4GA110R-M5	3	4KA120-M5 4GA120R-M5	3	4KB110-06 4GB110R-06	4	4KB120-06 4GB120R-06	4	SC3W-6-4	2.8	SLW-6A	10	ø4×ø2.5	
2	4KA110-M5 4GA110R-M5	3	4KA120-M5 4GA120R-M5	3					SC3W-6-6	3.6	SLW-6A	10	ø6×ø4	
2.3					4KB110-06 4GB110R-06	4	4KB120-06 4GB120R-06	4	SC3W-6-6	3.6	SLW-6A	10	ø6×ø4	
3.1	4KA210-06 4GA210R-06	13	4KA220-06 4GA220R-06	12.5					SC3W-6-8	3.6	SLW-6A	10	ø8×ø5.7	
3.2					4KB210-06 4GB210R-06	14	4KB220-06 4GB220R-06	14	SC3W-6-8	3.6	SLW-6A	10	ø8×ø5.7	
3.6	4KA210-06 4GA210R-06	13	4KA220-06 4GA220R-06	12.5					SC1-6	8	SLW-6A	10	ø6×ø4	
3.7					4KB210-06 4GB210R-06	14	4KB220-06 4GB220R-06	14	SC1-6	8	SLW-6A	10	ø6×ø4	
5	4KA210-06 4GA210R-06	13	4KA220-06 4GA220R-06	12.5	4KB210-06 4GB210R-06	14	4KB220-06 4GB220R-06	14	SC1-6	8	SLW-6A	10	ø8×ø5.7	
5.3					4KB210-08 4GB210R-08	14	4KB220-08 4GB220R-08	14	SC3W-8-8	7	SLW-8A	20	ø8×ø5.7	
5.9					4KB210-08 4GB210R-08	14	4KB220-08 4GB220R-08	14	SC3W-8-10	7	SLW-8A	20	ø10×ø7.2	
6.1	4F210-08	18	4F220-08	18					SC3W-8-10	7	SLW-8A	20	ø10×ø7.2	
6.4	4KA310-08 4GA310R-08	25	4KA320-08 4GA320R-08	25	4KB310-08 4GB310R-08	28	4KB320-08 4GB320R-08	28	SC3W-8-10	7	SLW-8A	20	ø10×ø7.2	
6.5	4KA210-06 4GA210R-06	13	4KA220-06 4GA220R-06	12.5					SC1-8	13	SLW-6A	10	ø10×ø7.2	
6.9					4KB210-08 4GB210R-08	14	4KB220-08 4GB220R-08	14	SC1-8	13	SLW-8A	20	ø8×ø5.7	
8.5					4F210-08	18	4F220-08	18	SC1-8	13	SLW-8A	20	ø10×ø7.2	
9	4KA310-08 4GA310R-08	25	4KA320-08 4GA320R-08	25	4KB310-08 4GB310R-08	28	4KB320-08 4GB320R-08	28	SC1-8	13	SLW-8A	20	ø10×ø7.2	
9.9	4F310-10	32	4F320-10	32					SC3W-10-10	15	SLW-8A	20	ø10×ø7.2	
10	4KA410-10 4GA410-10	50	4KA420-10 4GA420-10	50	4KB410-10 4GB410-10	60	4KB420-10 4GB420-10	60	SC3W-10-10	15	SLW-8A	20	ø12×ø8.9	
11	4KA410-10 4GA410-10	50	4KA420-10 4GA420-10	50	4KB410-10 4GB410-10	60	4KB420-10 4GB420-10	60	SC3W-10-12	15	SLW-8A	20	ø12×ø8.9	
13					4F410-10	32	4F420-10	32	SC1-10	25	SLW-8A	20	ø12×ø8.9	
15.8					4F510-10	47	4F520-10	47	SC1-10	25	SLW-10A	30	ø12×ø8.9	
17					4F510-10	47	4F520-10	47	SC1-10	25	SLW-10A	30	ø15×ø11.5	
19.6					4F510-10	47	4F520-10	47	SC1-15	36	SLW-10A	30	ø15×ø11.5	
20					4F610-15	90	4F620-15	90	SC1-15	36	SLW-15A	40	ø12×ø8.9	
24					4F610-15	90	4F620-15	90	SC1-15	36	SLW-15A	40	ø15×ø11.5	
30					4F610-15	90	4F620-15	90	SC-20A	110	SLW-15A	40	ø15×ø11.5	
41					4F610-15	90	4F620-15	90	SC-20A	110	SL-15A	92	ø15×ø11.5	
45					4F610-15	90	4F620-15	90	SC-20A	110	SL-20A	160	ø15×ø11.5	

[Circuit Diagram]

1. Speed Controller
2. Piping
3. Solenoid Valve
4. Silencer
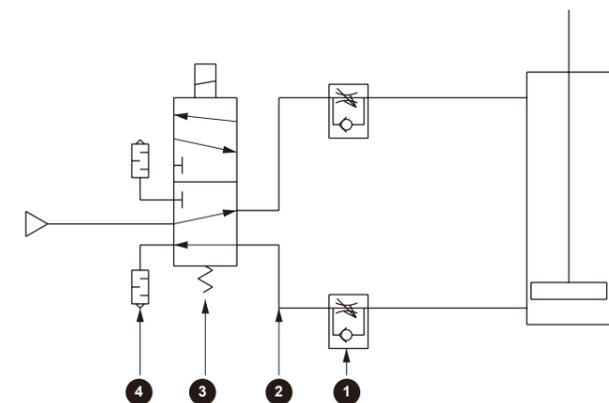
High Speed Type

HCM

HCA

Cylinder Switch

Ending

High Speed Type

HCM

HCA

Cylinder Switch

Ending

1198 **CKD**

CKD 1199

To Use This Product Safely

Be sure to read this before use. For general cylinder information, see Intro 41, and for Cylinder Switches, see P. 1512.

Individual Precautions: High Energy Absorption Cylinder HCM Series

Design / Selection

⚠ CAUTION

■ Although the cylinder port is designed to achieve speeds of 2000 mm/s or more, be sure to mount a speed controller in order to use it within the specified range.

■ The Max speed for the working piston is 2000 mm/s, which is not the average speed.

■ Avoid using the product so as to apply lateral load to the Piston Rod of the cylinder. If a lateral load is applied, the desired speed cannot be obtained, and the bearing part will wear unevenly, significantly reducing performance.

■ Cushion
The air cushion absorbs kinetic energy that the piston generates by using air compressibility and prevents the piston and cover from colliding at the stroke end. Therefore, note that it is not a function for reducing the piston speed near the stroke end.

■ Consider the system selection guide of the cylinder only as a guideline, as it may vary depending on the operating conditions (Operating Pressure, travel method and direction of the load and piping length).

■ Operating the cylinder at high speed increases the instantaneous flow rate of the air, allowing drainage to accumulate more easily. Install an air tank to prevent drain from entering the cylinder and prevent pressure loss when passing through the oil mist filter.

■ Install the speed controller near the cylinder piping port. If installed far away, speed control will not be possible.

■ If the cushion specifications (allowable absorption energy) are exceeded, install a separate shock absorbing device.

During Use

⚠ CAUTION

■ When adjusting speed with the speed controller, gradually open the needle from the closed state and increase speed. Adjusting from the open state is dangerous as the Piston Rod may suddenly fly out.

■ If operation is started while the exhaust side is at atmospheric pressure, the rod could pop out and cause a dangerous situation. Apply pressure to the exhaust side at startup.

■ Since the switch rail is joined with industrial adhesive tape, use in an atmosphere of inorganic/organic solventsand steam will cause rail peeling, so do not use.
Main Inorganic/Organic Solvents
Inorganic/Organic Solvents: Sodium Hydroxide, Hydrochloric Acid, etc.
Organic Solvents: Toluene, ethanol, hexane, Gasoline, kerosene, etc.

■ Remove all oil, water, dust, etc., from the body (tube) before laying adhesive tape for switch rails. (Adhere by referring to the instruction manual included with the parts.)

■ When disassembling the cylinder, grip the tang portion of either of the head cover or the rod cover with a vice, etc., apply a wrench or an adjustable wrench to the tang portion of the other cover and loosen it to remove the cover.

When retightening the cover with the "LB" Foot Bracket, tighten so brackets on both sides have no play. When using other than an "LB" Foot Bracket, retighten from the position set before disassembly.

For precautions during mounting, installation, adjustment, use, and maintenance, please see "Precautions for Use" in this catalog and the CKD Components product site (https://www.ckd.co.jp/kiki/en/) → "Model No." → Instruction Manual .

High Speed Type

HCM
HCA

High Speed Type

HCM
HCA

Cylinder Switch

Ending

Cylinder Switch

Ending