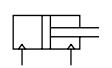


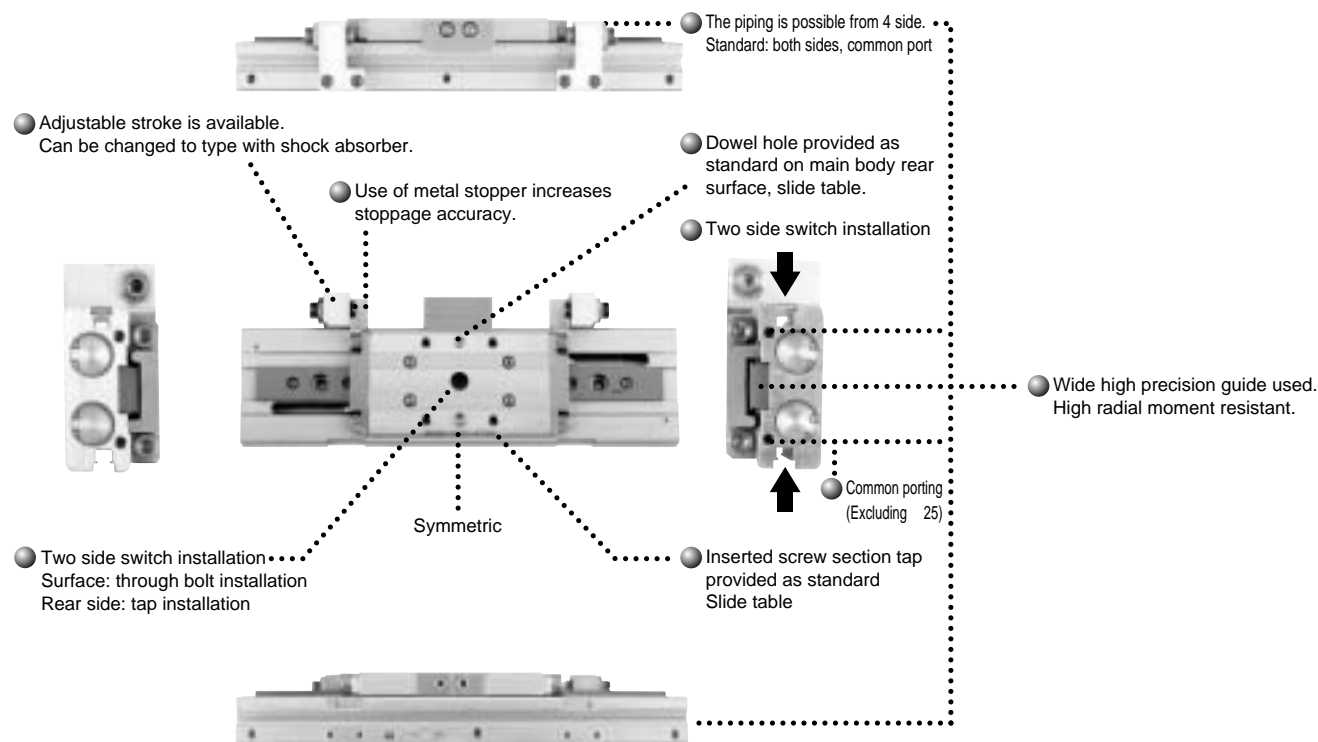
● : Standard, ◎ : Option, ■ : Not available

SCP*2
CMK2
CMA2
SCM
SCG
SCA2
SCS
CKV2
CA/OV2
SSD
CAT
MDC2
MVC
SMD2
MSD*
FC*
STK
ULK*
JSK/M2
JSG
JSC3
USSD
USC
JSB3
LMB
STG
STS/L
LCS
LCG
LCM
LCT
LCY
STR2
UCA2
HCM
HCA
SRL2
SRG
SRM
SRT
MRL2
MRG2
SM-25
CAC3
UCAC
RCC2
MFC
SHC
GLC
Ending

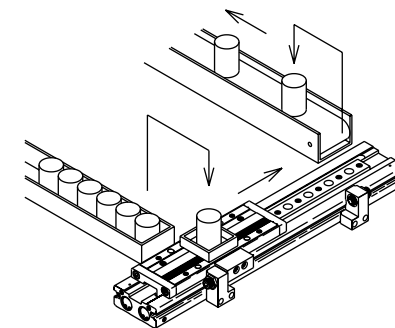
SCP*2
CMK2
CMA2
SCM
SCG
SCA2
SCS
CKV2
CA/OV2
SSD
CAT
MDC2
MVC
SMD2
MSD*
FC*
STK
ULK*
JSK/M2
JSG
JSC3
USSD
USC
JSB3
LMB
STG
STS/L
LCS
LCG
LCM
LCT
LCY
STR2
UCA2
HCM
HCA
SRL2
SRG
SRM
SRT
MRL2
MRG2
SM-25
CAC3
UCAC
RCC2
MFC
SHC
GLC
Ending

Variation	Model no. JIS symbol	Bore size (mm)	Standard stroke length (mm)						Stroke length (mm)			Option Shock absorber type Stopper A*	Switch availability	Page
			50	75	100	125	150	175	Min. stroke length	Max. stroke length				
									(mm)	(mm)				
Double acting single rod type	LCT 	φ8	●	●	■	■	■	■	■	50	75		Permissible	1824
		φ12	■	●	●	■	■	■	75	100				
		φ16	■	●	●	■	●	●	75	175	◎			
		φ20	■	●	●	■	●	●	75	175				
		φ25	■	●	●	■	●	●	75	175				

Highly accurate actuator



Applications



Linear slide cylinder
Combined functions



Pneumatic components

Safety precautions

Always read this section before starting use.

Refer to Intro 71 for general precautions of the cylinder, and to Intro 78 for general precautions of the cylinder switch.

Linear slide cylinder LCT Series

Design & Selection

WARNING

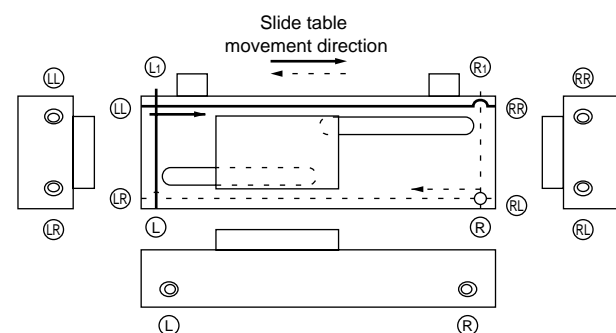
Select the cylinder based on the "LCT selection guide" on pages 1838 to 1841.

Installation & Adjustment

WARNING

Piping

Piping port position and operational direction



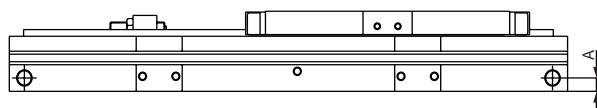
Ⓐ, Ⓑ, Ⓒ, Ⓓ are connected internally. If these ports are pressurized, the slide table will move in the direction of the → arrow.

Ⓔ, Ⓕ, Ⓖ, Ⓗ are connected internally. If these ports are pressurized, the slide table will move in the direction of the ← - - arrow.

When changing the piping position, use adhesive on M3 and M5 plugs (hexagon socket set screw). Use a low-strength adhesive such as LOCTITE 222/221, or ThreeBond 1344.

Precautions for piping joint

Install a speed control valve when piping. The applicable joints are shown as below.



Descriptions	Port size	Port dimension A	Applicable joints	Joint O.D. A
φ 8	M5x0.8	5.5	SC3W-M5-4	φ 11 or less
			SC3W-M5-6	
φ 12	M5x0.8	5.5	GWS4-M5-S	φ 11 or less
			GWS4-M5	
φ 16	M5x0.8	6.5	SC3W-M5-4	φ 13 or less
			SC3W-M5-6	
			GWS4-M5-S	
			GWS4-M5	
			GWL4-M5	
φ 20	Rc1/8	8	GWS6-M5	φ 15 or less
			GWL6-M5	
			SC3W-6-4, 6, 8	
			GWS4-6	
φ 25	Rc1/8	9	GWS8-6	φ 15 or less
			GWL6-6	
			GWS6-6	
			GWL4-6	

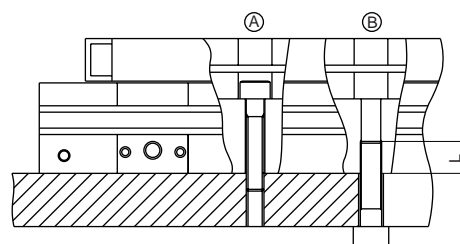
Installation

Check that no dents or scratches occur on main tubing installation or slide table that may adversely affect flatness.

The flatness of the counterpart onto which the slide table is installed must be 0.05 mm or less.

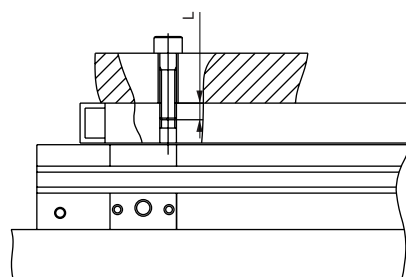
Observe the following values for the bolt insertion length and tightening torque when installing this product.

Use three or more mounting bolts.



Descriptions	A		B		
	Applicable bolts	Tightening torque (N·m)	Applicable bolts	Tightening torque (N·m)	Screw-in length L (mm)
LCT-8	M3 x 0.5	0.6 to 1.1	M4 x 0.7	1.4 to 2.4	4 to 6
LCT-12	M4 x 0.7	1.4 to 2.4	M5 x 0.8	2.9 to 5.1	5 to 8
LCT-16	M4 x 0.7	1.4 to 2.4	M6 x 1.0	4.8 to 8.6	6 to 9
LCT-20	M5 x 0.8	2.9 to 5.1	M6 x 1.0	4.8 to 8.6	6 to 9
LCT-25	M6 x 1.0	4.8 to 8.6	M8 x 1.25	12.0 to 21.6	8 to 12

Observe the following bolt insertion lengths and tightening torque when installing the jig on the slide table or end plate.

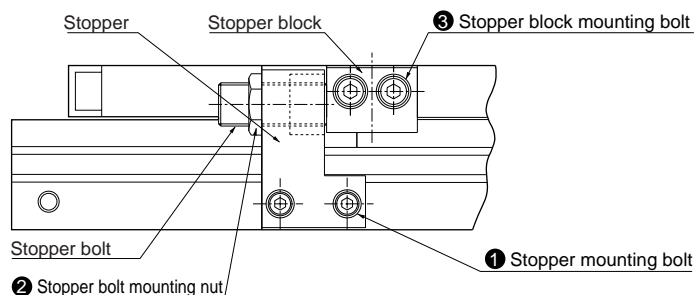


Descriptions	Slide table and end plate		
	Applicable bolts	Tightening torque (N·m)	Screw-in length L (mm)
LCT-8	M3 x 0.5	0.6 to 1.1	3 to 4.5
LCT-12	M4 x 0.7	1.4 to 2.4	4 to 6
LCT-16	M4 x 0.7	1.4 to 2.4	5 to 7.5
LCT-20	M5 x 0.8	2.9 to 5.1	5 to 7.5
LCT-25	M6 x 1.0	4.8 to 8.6	6 to 9

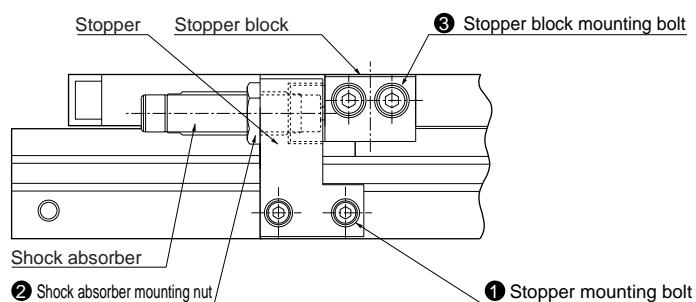
Installation & Adjustment

⚠ WARNING

- Observe the following values for bolts at the stopper and in nut tightening torque.



Stopper for adjustable stroke



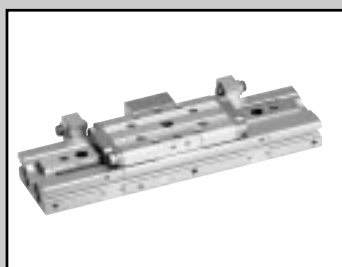
Shock absorber type stopper

Model	① Stopper mounting bolt (N·m)	② Stopper bolt mounting nut / ② Shock absorber mounting nut (N·m)	③ Stopper block mounting bolt (N·m)
LCT-8	0.4 to 0.5	1.2 to 2.0	0.6 to 0.8
LCT-12	0.6 to 0.8	1.2 to 2.0	0.6 to 0.8
LCT-16	0.6 to 0.8	3.0 to 4.0	1.4 to 1.8
LCT-20	2.9 to 3.5	4.5 to 6.0	1.4 to 1.8
LCT-25	2.9 to 3.5	4.5 to 6.0	2.9 to 3.5

- SCP*2
- CMK2
- CMA2
- SCM
- SCG
- SCA2
- SCS
- CKV2
- CA/OV2
- SSD
- CAT
- MDC2
- MVC
- SMD2
- MSD*
- FC*
- STK
- ULK*
- JSK/M2
- JSG
- JSC3
- USSD
- USC
- JSB3
- LMB
- STG
- STS/L
- LCS
- LCG
- LCM
- LCT**
- LCY
- STR2
- UCA2
- HCM
- HCA
- SRL2
- SRG
- SRM
- SRT
- MRL2
- MRG2
- SM-25
- CAC3
- UCAC
- RCC2
- MFC
- SHC
- GLC

Ending


Linear slide cylinder
Combined functions



Linear slide cylinder

LCT Series

● Bore size: $\phi 8$, $\phi 12$, $\phi 16$, $\phi 20$, $\phi 25$

JIS symbol 



Specifications

Descriptions		Linear slide cylinder LCT Series				
Bore size	mm	$\phi 8$	$\phi 12$	$\phi 16$	$\phi 20$	$\phi 25$
Actuation		Double acting single rod type				
Working fluid		Compressed air				
Max. working pressure	MPa	0.7				
Min. working pressure	MPa	0.15 (Note 1)				
Withstanding pressure	MPa	1.0				
Ambient temperature	°C	-10 to 60 (no freezing)				
Port size	Body side surface port	M5			Rc 1/8	
	Common port	M3	M5		-	
Working piston speed	mm/s	50 to 500 ($\phi 8$, $\phi 12$ is 75 to 500.)				
Cushion		Rubber cushioned				
Lubrication		Not required (when lubricating, use turbine oil Class 1 ISOVG 32.)				

Note 1: 0.3MPa for $\phi 8$ shock absorber. (Usable at 0.2MPa, but it will take time to absorb shock absorber's energy.)

If using a stroke adjustment stopper, use $\phi 8$ (0.35MPa), $\phi 12$, $\phi 16$ (0.45MPa), $\phi 20$ or $\phi 25$ (0.45MPa) to touch the metal with the rubber cushion pressed in.

Stroke length

Bore size (mm)	Standard stroke length (mm)
$\phi 18$	50, 75
$\phi 12$	75, 100
$\phi 16$	75, 100, 125, 150, 175
$\phi 20$	75, 100, 125, 150, 175
$\phi 25$	75, 100, 125, 150, 175

Note: Stroke length other than above is not available.

SCP*2
CMK2
CMA2
SCM
SCG
SCA2
SCS
CKV2
CA/OV2
SSD
CAT
MDC2
MVC
SMD2
MSD*
FC*
STK
ULK*
JSK/M2
JSG
JSC3
USSD
USC
JSB3
LMB
STG
STS/L
LCS
LCG
LCM
LCT
LCY
STR2
UCA2
HCM
HCA
SRL2
SRG
SRM
SRT
MRL2
MRG2
SM-25
CAC3
UCAC
RCC2
MFC
SHC
GLC
Ending

Switch specifications

● 1 color/2 color indicator

* The T0/T5 switch can be used with 220 VAC.
Consult with CKD for working conditions.

Descriptions	Proximity 2 wire		Proximity 3 wire		Reed 2 wire			
	T2H/T2V		T3H/T3V		TOH/TOV		T5H/T5V	
Applications	Programmable controller		Programmable controller, relay		Programmable controller, relay		Programmable controller, relay IC circuit (without indicator light), serial connection	
Output method	-		NPN output		-			
Power voltage	-		10 to 28 VDC		-			
Load voltage	10 to 30 VDC		30 VDC or less		12/24 VDC	110 VAC	5/12/24 VDC	110 VAC
Load current	5 to 20mA (Note 1)		100mA or less	50mA or less	5 to 50mA	7 to 20mA	50mA or less	20mA or less
Light	LED (ON lighting)		LED (ON lighting)		LED (ON lighting)		-	
Leakage current	1mA or less		10 μA or less		0mA			

Note 1: Maximum load current above: 20mA applies at 25°C. When ambient temperature around a switch is higher than 25°C, the value is lower than 20mA.
(5 to 10mA at 60°C)

Cylinder weight

Unit: g

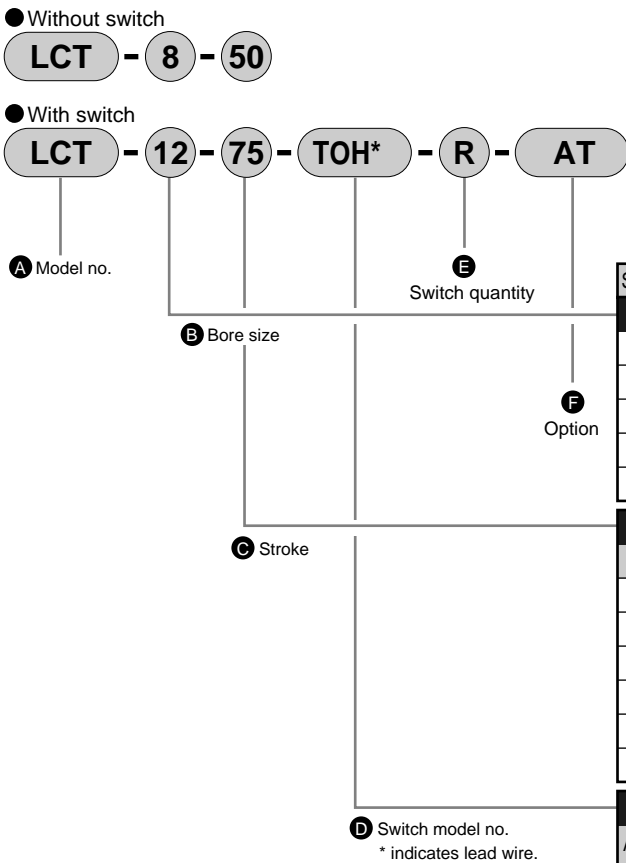
Bore size (mm)	Stroke length mm					
	50	75	100	125	150	175
LCT-8	440	540	-	-	-	-
LCT-12	-	810	970	-	-	-
LCT-16	-	1220	1410	1690	1880	2070
LCT-20	-	2050	2350	2650	3090	3400
LCT-25	-	4360	5010	5650	6680	7330

SCP*2
CMK2
CMA2
SCM
SCG
SCA2
SCS
CKV2
CA/OV2
SSD
CAT
MDC2
MVC
SMD2
MSD*
FC*
STK
ULK*
JSK/M2
JSG
JSC3
USSD
USC
JSB3
LMB
STG
STS/L
LCS
LCG
LCM
LCT
LCY
STR2
UCA2
HCM
HCA
SRL2
SRG
SRM
SRT
MRL2
MRG2
SM-25
CAC3
UCAC
RCC2
MFC
SHC
GLC

Ending
Linear slide cylinder
Combined functions

- SCP*2
- CMK2
- CMA2
- SCM
- SCG
- SCA2
- SCS
- CKV2
- CA/OV2
- SSD
- CAT
- MDC2
- MVC
- SMD2
- MSD*
- FC*
- STK
- ULK*
- JSK/M2
- JSG
- JSC3
- USSD
- USC
- JSB3
- LMB
- STG
- STS/L
- LCS
- LCG
- LCM
- LCT**
- LCY
- STR2
- UCA2
- HCM
- HCA
- SRL2
- SRG
- SRM
- SRT
- MRL2
- MRG2
- SM-25
- CAC3
- UCAC
- RCC2
- MFC
- SHC
- GLC
- Ending

How to order



A Model no.
LCT

Symbol	Descriptions
B Bore size (mm)	
8	φ 18
12	φ 12
16	φ 16
20	φ 20
25	φ 25

C Stroke (mm)		Bore size (φ)				
		8	12	16	20	25
50	50	●				
75	75	●	●	●	●	●
100	100		●	●	●	●
125	125			●	●	●
150	150				●	●
175	175				●	●

D Switch model no.									
Axial lead wire	Radial lead wire	Contact	Indicator	Lead wire	Bore size (φ)				
					8	12	16	20	25
T0H*	T0V*	Reed	1 color indicator type	2-wire			●		
T5H*	T5V*		Without indicator light				●		
T2H*	T2V*	Reed	1 color indicator type	2-wire			●		
T3H*	T3V*				3-wire			●	

Lead wire length	
Blank	1m (standard)
3	3m (option)
5	5m (option)

E Switch quantity	
R	One on R side
H	One on L side
D	Two

F Option	
Blank *	Stopper for adjustable stroke (Note)
A*	Shock absorber type stopper
*	
Blank	Stopper block material: Rolled steel
T	Stopper block material: Equivalent to quenched material

⚠ Cautions for model No. selection

Note: When changing adjustable stroke range, use a discrete stopper for adjustable stroke listed on Page 1827.

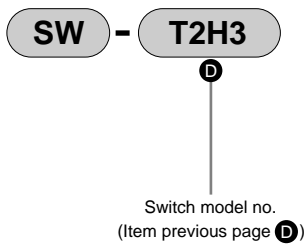
<Example of model number>

LCT-12-75-T0H*-R-AT

Double acting single rod type

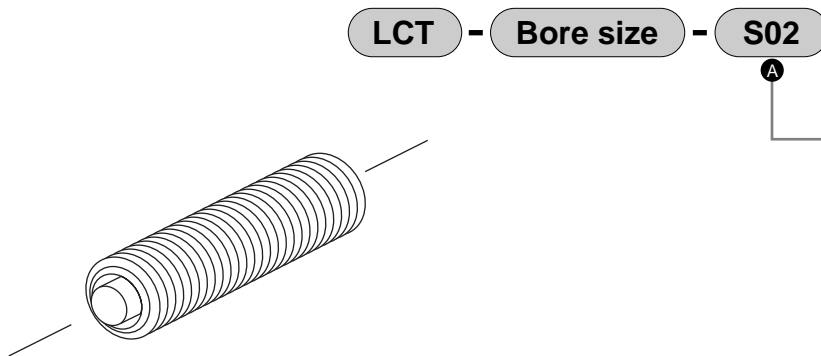
- A** Model : Standard type LCT
- B** Bore size : φ12
- C** Stroke : 75mm
- D** Switch model no. : Reed, 2 wire
Axial lead wire
- E** Switch quantity : One on R side
- F** Other options : Shock absorber type stopper
Stopper block material and equivalent to quenched material

How to order switch model no.



How to order the discrete stopper for adjustable stroke

- Hexagon socket set screw with urethane
- Used during change in adjustable stroke range



A Stopper type	
S01	Single standard dimension
S02	Single standard dimension + 10mm
S03	Single standard dimension + 20mm

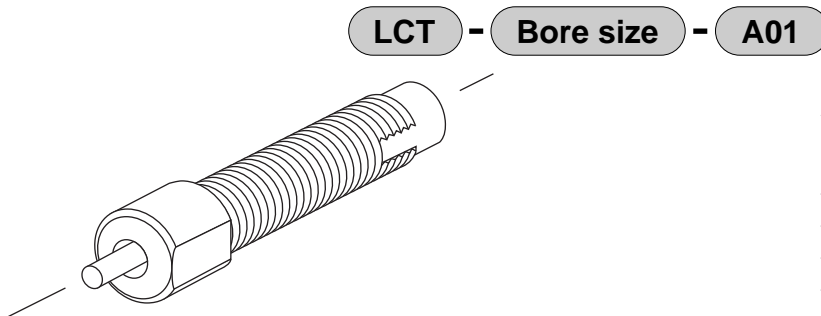
Indicate S01, S02 or S03 for **A**.

Note: S03 is not available for $\phi 8$.

Refer to dimensions on Page 1829 to 1837 for standard dimension.

How to order the discrete shock absorber stopper

- Sets of shock absorber and stopper cap
- Use for changing from stopper for adjustable stroke to shock absorber type stopper

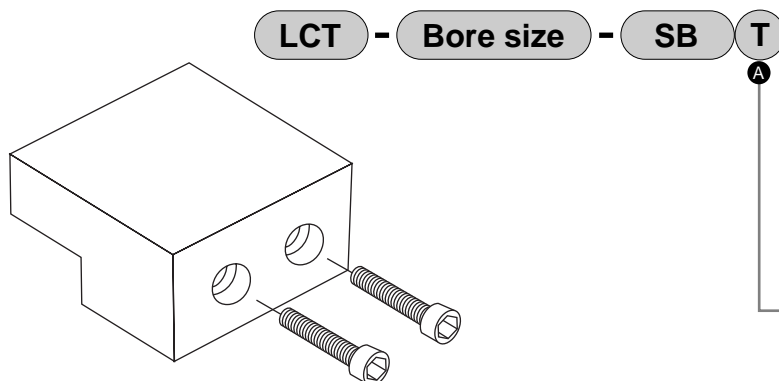


Applicable shock absorber model no.

Model	Shock absorber model no.
LCT- 8	NCK-00-0.3
LCT-12	NCK-00-0.3
LCT-16	NCK-00-0.7
LCT-20	NCK-00-1.2
LCT-25	NCK-00-1.2

Note: A stopper cap is not available for $\phi 8$.

How to order stopper block discrete part



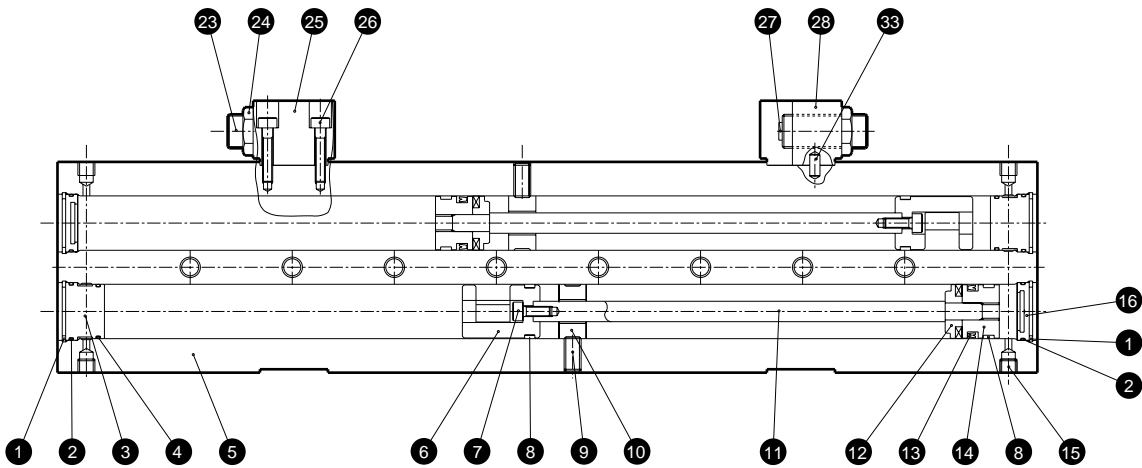
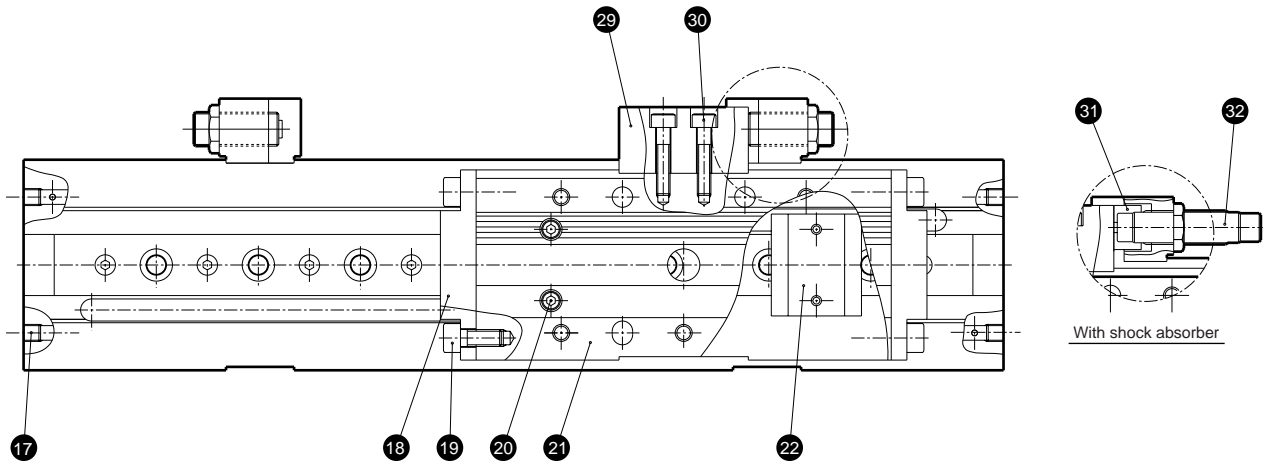
A Stopper block material	
Blank	Rolled steel
T	Equivalent to quenched material

- SCP*2
- CMK2
- CMA2
- SCM
- SCG
- SCA2
- SCS
- CKV2
- CA/OV2
- SSD
- CAT
- MDC2
- MVC
- SMD2
- MSD*
- FC*
- STK
- ULK*
- JSK/M2
- JSG
- JSC3
- USSD
- USC
- JSB3
- LMB
- STG
- STS/L
- LCS
- LCG
- LCM
- LCT
- LCY
- STR2
- UCA2
- HCM
- HCA
- SRL2
- SRG
- SRM
- SRT
- MRL2
- MRG2
- SM-25
- CAC3
- UCAC
- RCC2
- MFC
- SHC
- GLC

Ending

Linear slide cylinder
Combined functions

Internal structure and parts list

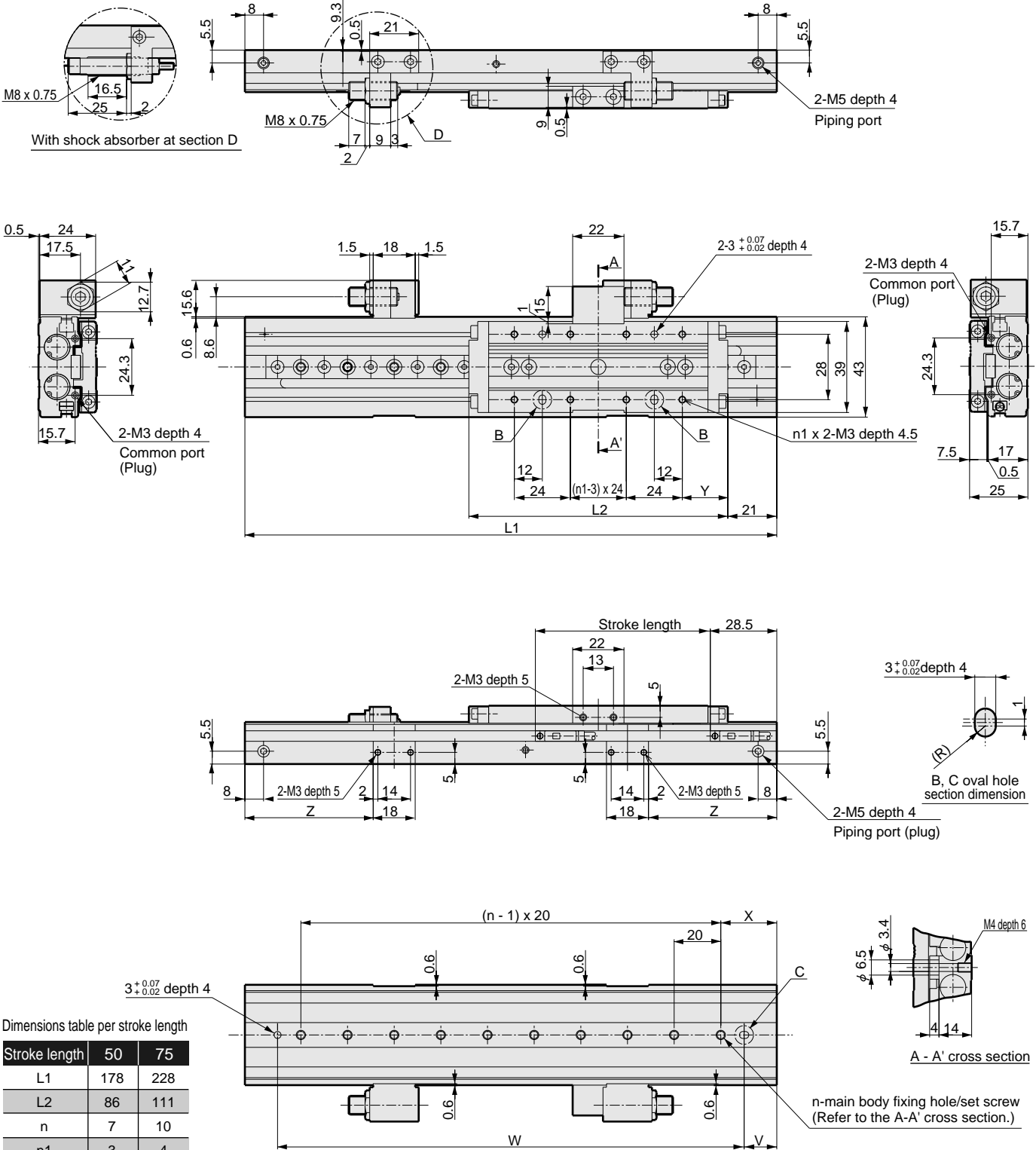


No.	Parts name	Material	Remarks	No.	Parts name	Material	Remarks
1	C type snap ring	Stainless steel		19	Hexagon socket head cap bolt	Stainless steel	
2	O ring	Nitrile rubber		20	Hexagon socket head cap bolt	Stainless steel	
3	Guard A	Aluminum alloy	Chromate	21	Slide table	Aluminum alloy	Alumite
4	O ring	Nitrile rubber		22	Linear guide	Stainless steel	
5	Cylinder body	Aluminum alloy	Hard alumite	23	Stopper bolt	Alloy steel	Nickeling
6	Floating joint	Stainless steel		24	Hexagon nut	Steel	Nickeling
7	Hexagon socket head cap bolt	Stainless steel		25	Stopper A	Aluminum alloy	Alumite
8	Wear ring	Polyacetal		26	Hexagon socket head set screw	Stainless steel	
9	Hexagon socket head set screw	Stainless steel		27	Cushion rubber	Urethane rubber	
10	Intermediate guard	Stainless steel	Chromate	28	Stopper B	Aluminum alloy	Alumite
11	Piston rod	Stainless steel		29	Stopper block	Steel	Nickeling
12	Spacer	Aluminum alloy	Chromate	30	Hexagon socket head cap bolt	Stainless steel	
13	Piston packing seal	Nitrile rubber		31	Stopper cap	Stainless steel	Excluding ϕ 8
14	Piston	Aluminum alloy	Chromate	32	Shock absorber		ϕ 18: NCK-00-0.3
15	Plug	Stainless steel	ϕ 12: NCK-00-0.3				
16	Guard	Aluminum alloy	Chromate				ϕ 16: NCK-00-0.7
17	Plug	Stainless steel					ϕ 20/25: NCK-00-1.2
18	End plate	Stainless steel		33	Parallel pin	Stainless steel	Only ϕ 16, ϕ 20, ϕ 25

Dimensions



- LCT-8
- Stroke length 50, 75



Dimensions table per stroke length

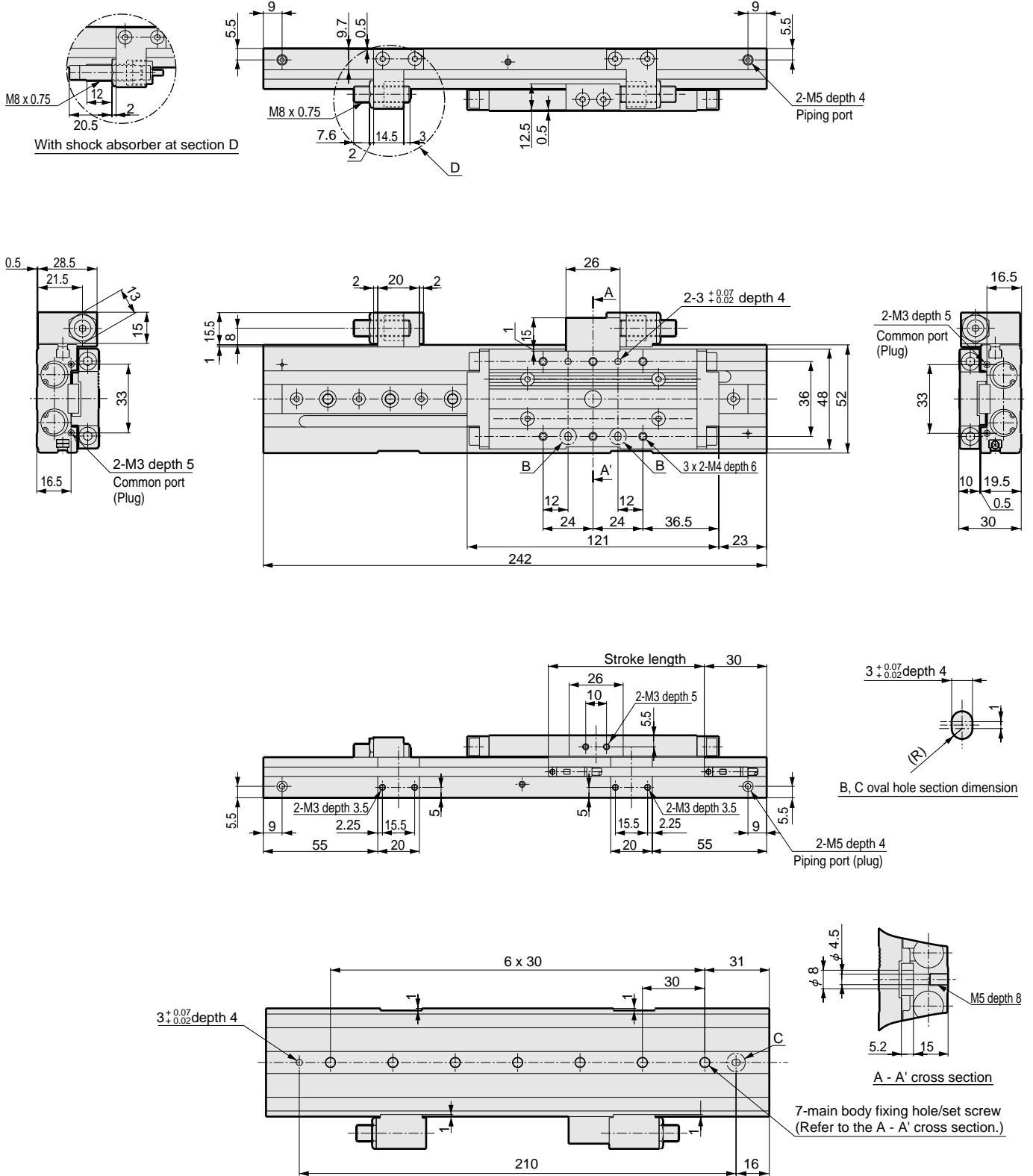
Stroke length	50	75
L1	178	228
L2	86	111
n	7	10
n1	3	4
V	19	14
W	140	200
X	29	24
Y	19	19.5
Z	42.5	55

- SCP*2
- CMK2
- CMA2
- SCM
- SCG
- SCA2
- SCS
- CKV2
- CA/OV2
- SSD
- CAT
- MDC2
- MVC
- SMD2
- MSD*
- FC*
- STK
- ULK*
- JSK/M2
- JSG
- JSC3
- USSD
- USC
- JSB3
- LMB
- STG
- STS/L
- LCS
- LCG
- LCM
- LCT**
- LCY
- STR2
- UCA2
- HCM
- HCA
- SRL2
- SRG
- SRM
- SRT
- MRL2
- MRG2
- SM-25
- CAC3
- UCAC
- RCC2
- MFC
- SHC
- GLC
- Ending
- Linear slide cylinder
- Combined functions



Dimensions

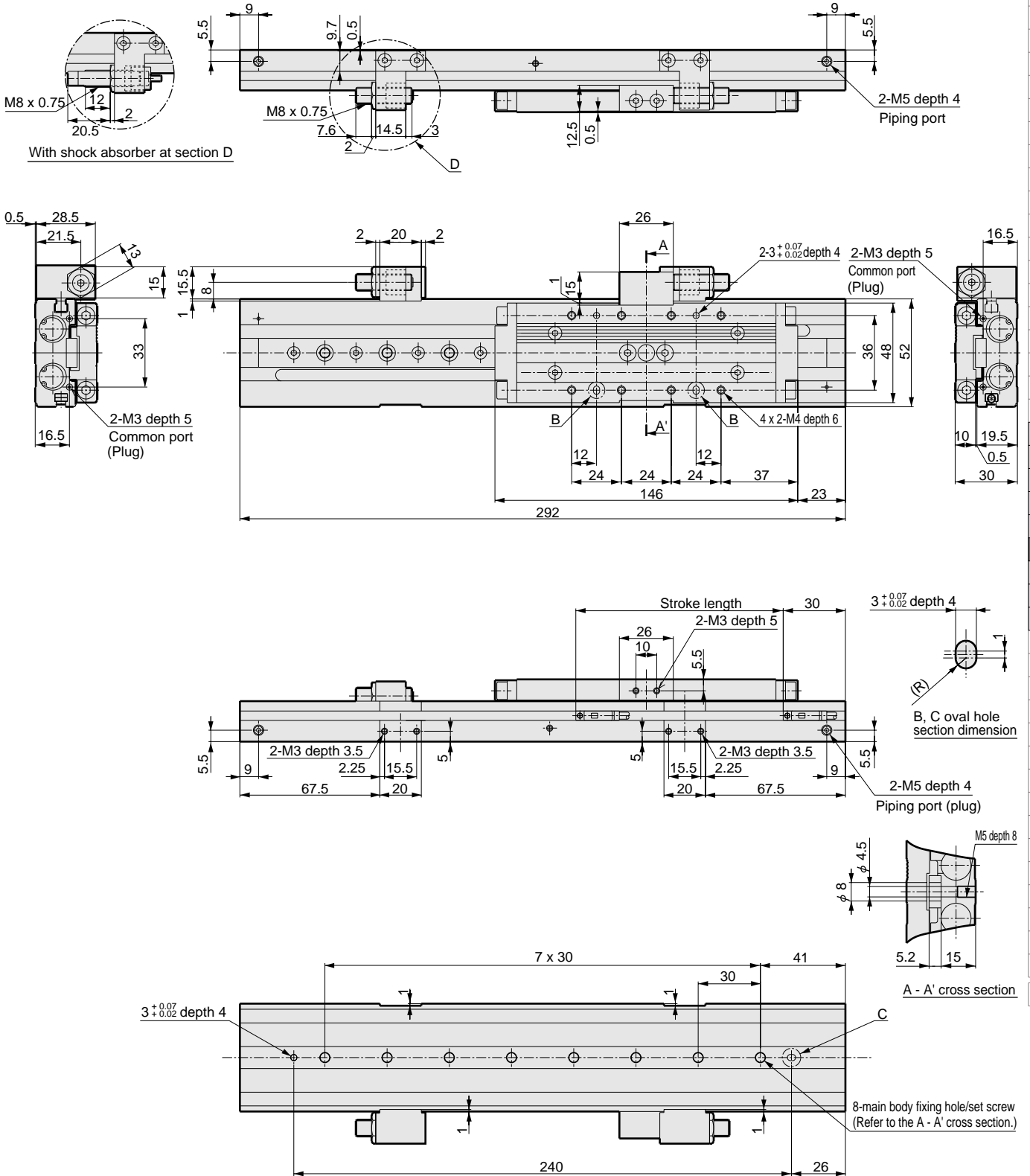
- LCT-12
- For stroke length 75



Dimensions



- LCT-12
For stroke length 100



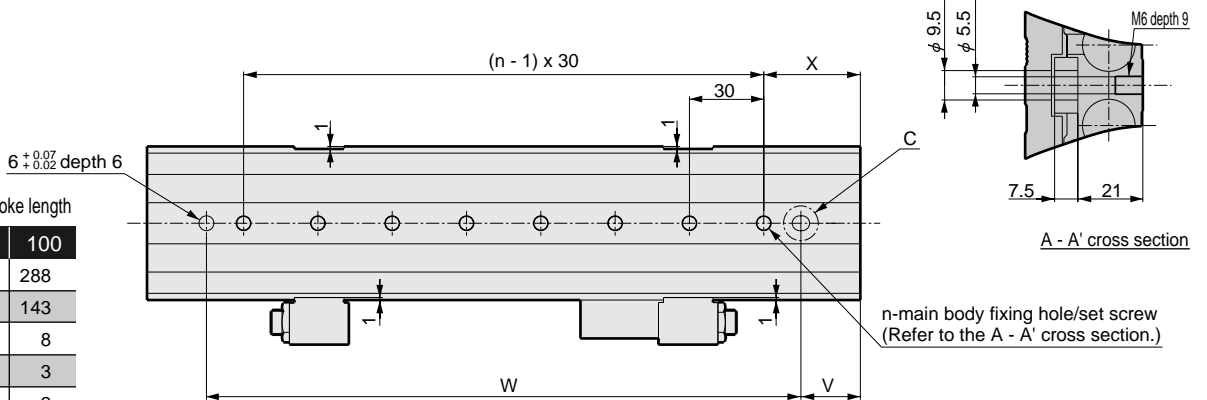
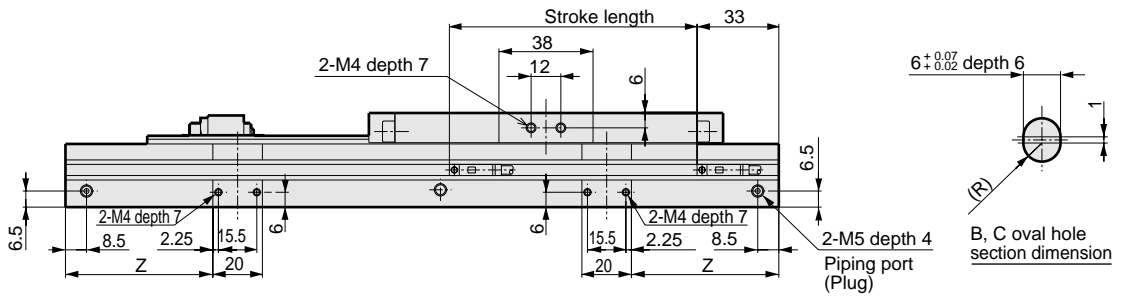
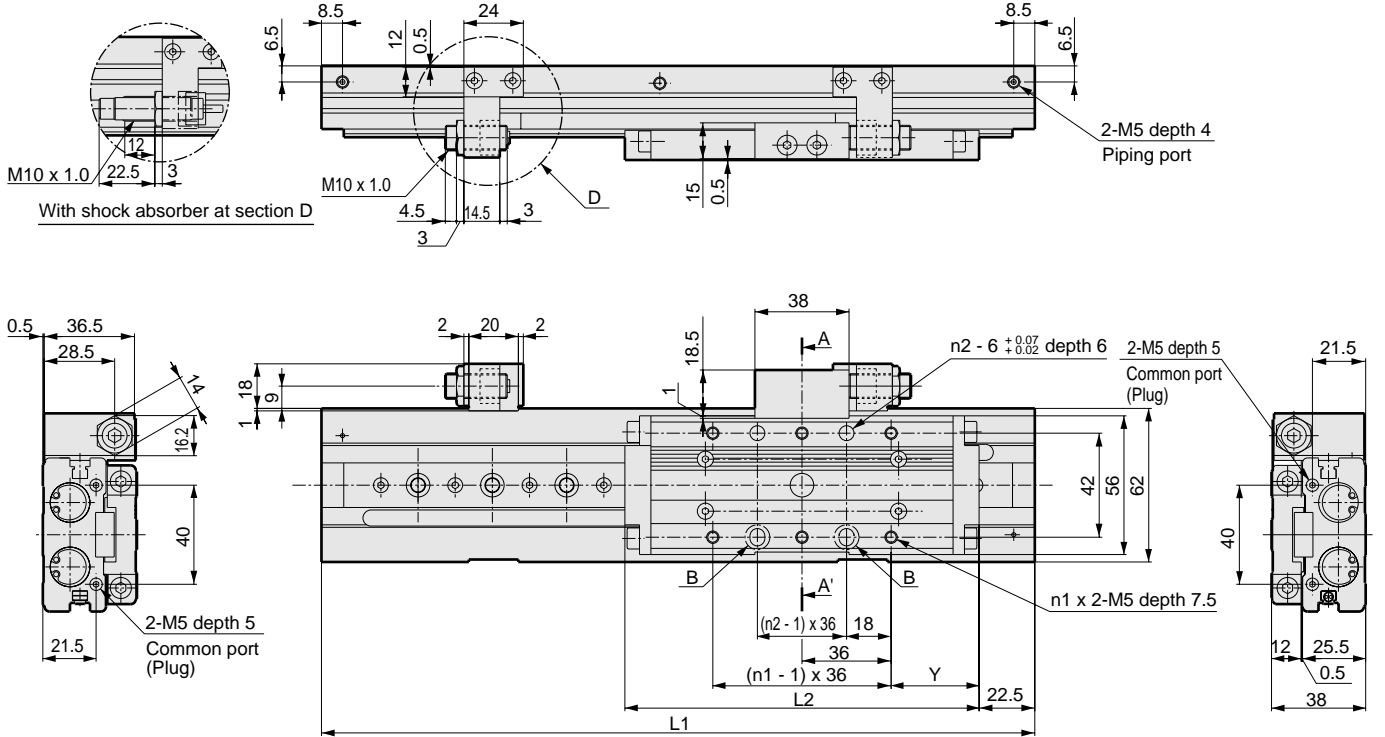
SCP*2
CMK2
CMA2
SCM
SCG
SCA2
SCS
CKV2
CA/OV2
SSD
CAT
MDC2
MVC
SMD2
MSD*
FC*
STK
ULK*
JSK/M2
JSG
JSC3
USSD
USC
JSB3
LMB
STG
STS/L
LCS
LCG
LCM
LCT
LCY
STR2
UCA2
HCM
HCA
SRL2
SRG
SRM
SRT
MRL2
MRG2
SM-25
CAC3
UCAC
RCC2
MFC
SHC
GLC
Ending

Linear slide cylinder
Combined functions

Dimensions



● LCT-16
For stroke length 75, 100

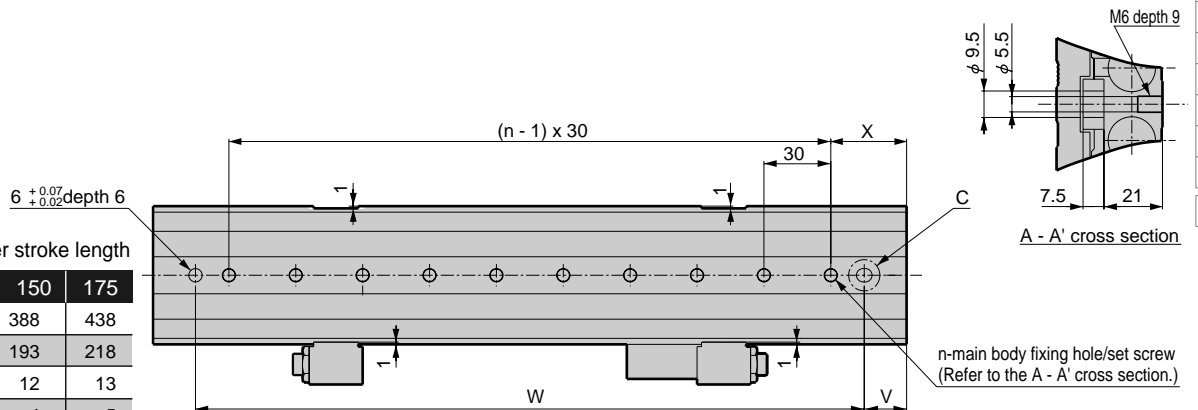
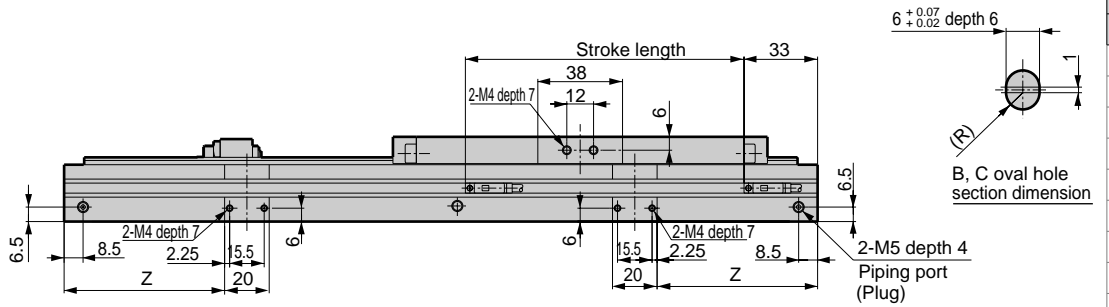
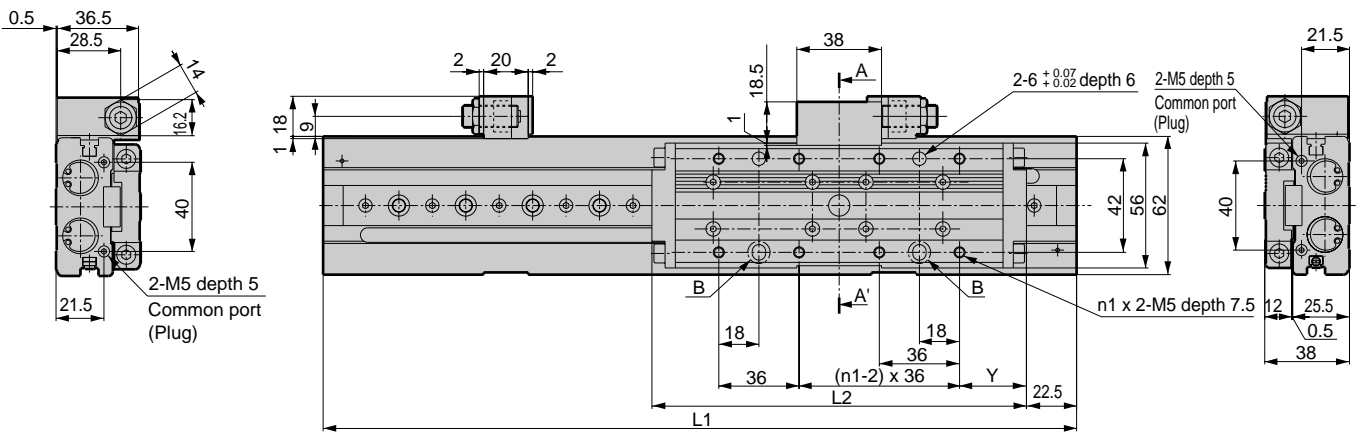
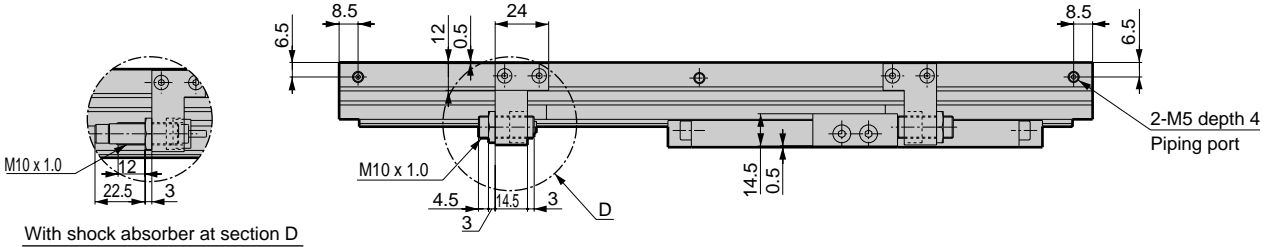


Dimensions table per stroke length

Stroke length	75	100
L1	238	288
L2	118	143
n	6	8
n1	2	3
n2	1	2
V	29	24
W	180	240
X	44	39
Y	41	35.5
Z	47	59.5

Dimensions

- LCT-16
For stroke length 125, 150, 175



Dimensions table per stroke length

Stroke length	125	150	175
L1	338	388	438
L2	168	193	218
n	10	12	13
n1	3	4	5
V	19	14	24
W	300	360	390
X	34	29	39
Y	48	42.5	37
Z	72	84.5	97

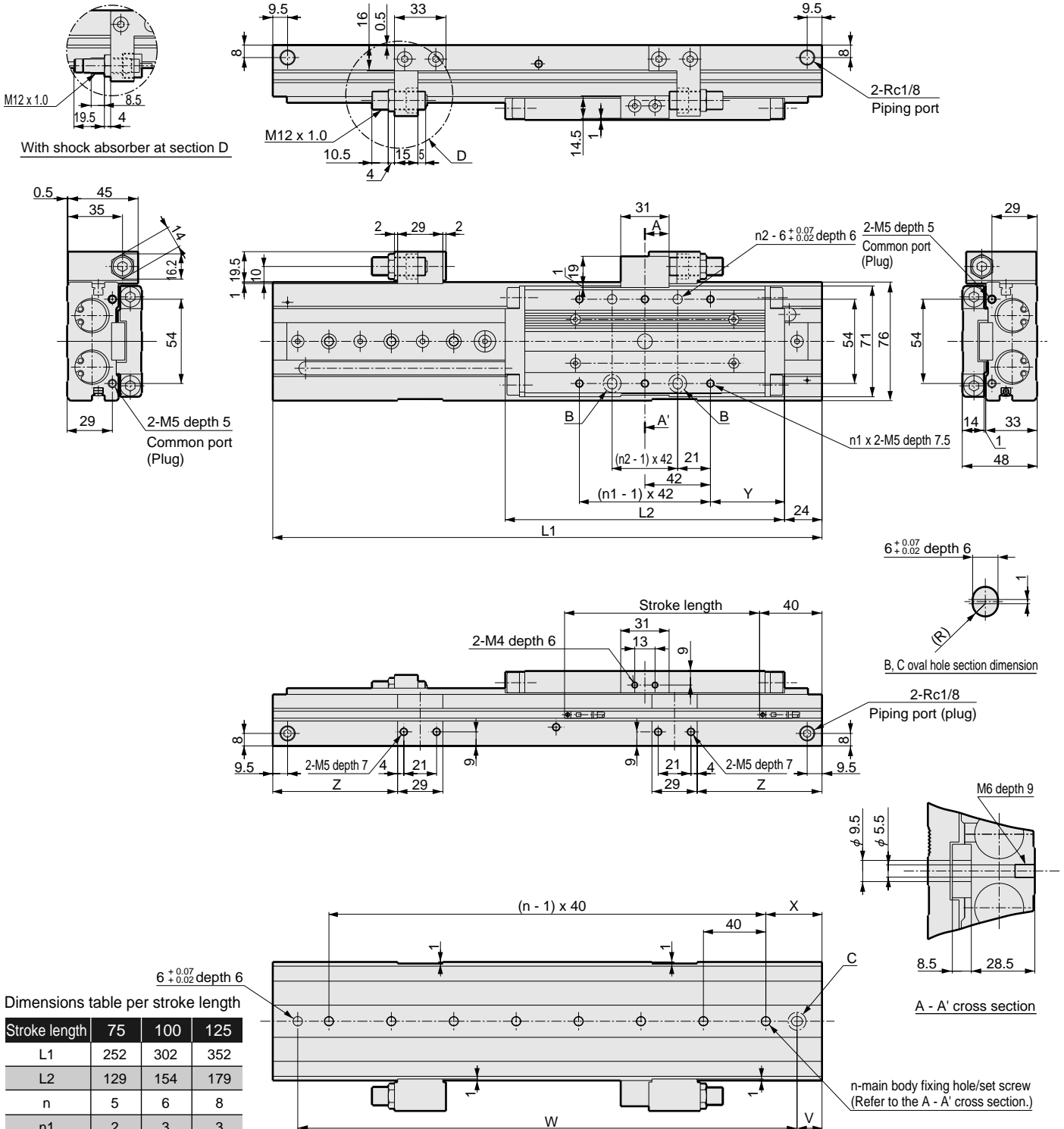
- SCP*2
- CMK2
- CMA2
- SCM
- SCG
- SCA2
- SCS
- CKV2
- CA/OV2
- SSD
- CAT
- MDC2
- MVC
- SMD2
- MSD*
- FC*
- STK
- ULK*
- JSK/M2
- JSG
- JSC3
- USSD
- USC
- JSB3
- LMB
- STG
- STS/L
- LCS
- LCG
- LCM
- LCT**
- LCY
- STR2
- UCA2
- HCM
- HCA
- SRL2
- SRG
- SRM
- SRT
- MRL2
- MRG2
- SM-25
- CAC3
- UCAC
- RCC2
- MFC
- SHC
- GLC
- Ending

Linear slide cylinder
Combined functions



Dimensions

- LCT-20
- For stroke length 75, 100, 125



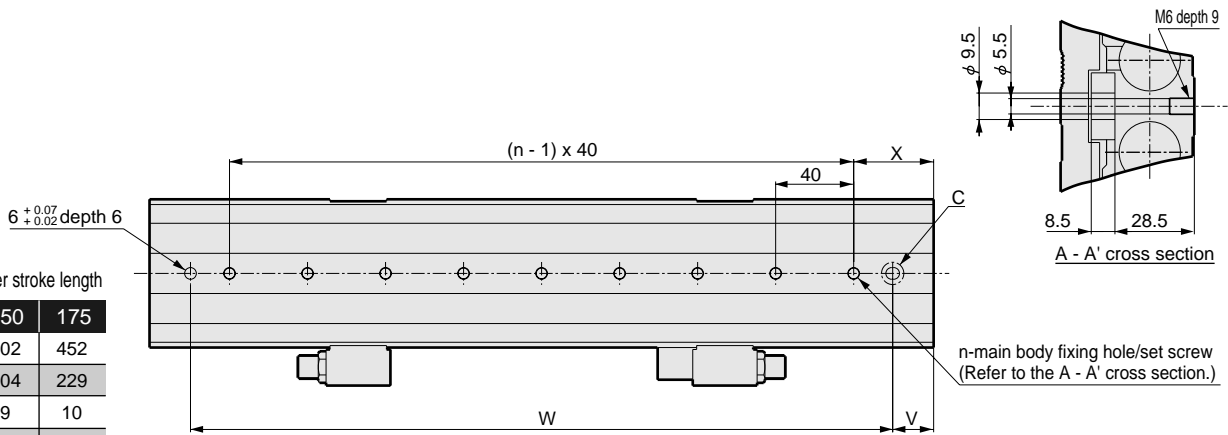
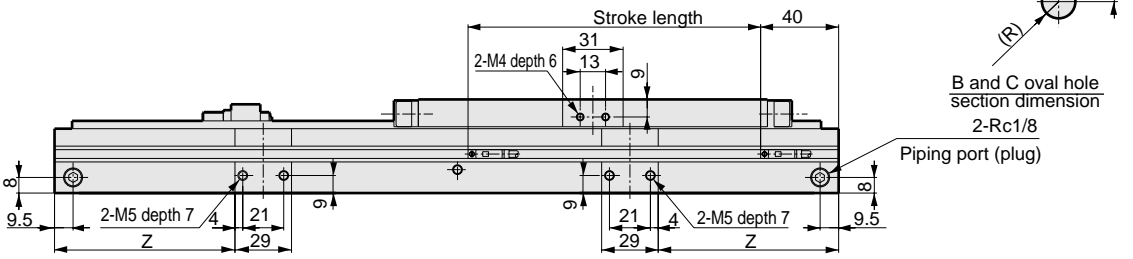
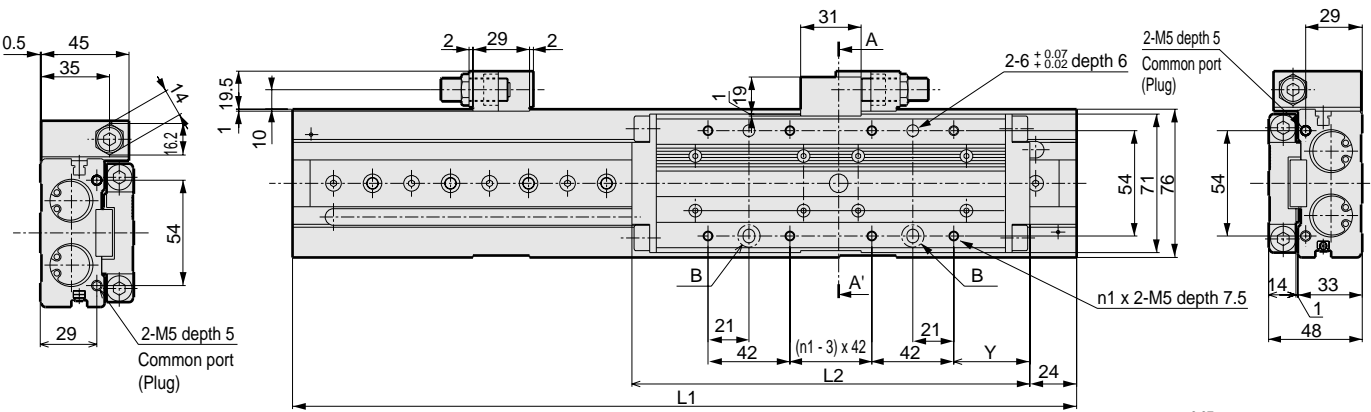
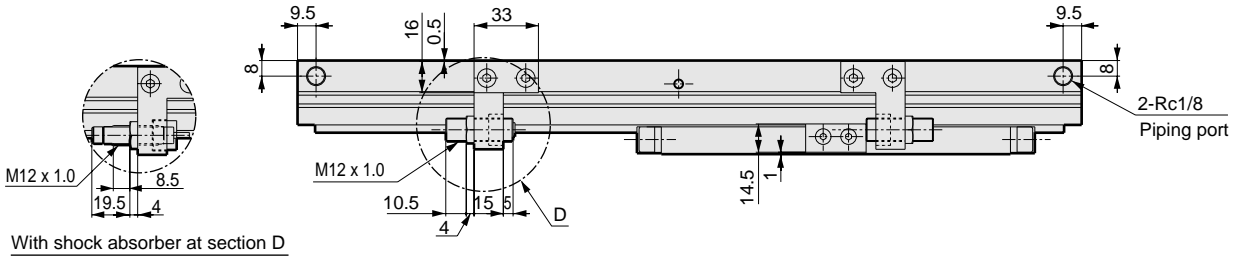
Dimensions table per stroke length

Stroke length	75	100	125
L1	252	302	352
L2	129	154	179
n	5	6	8
n1	2	3	3
n2	1	2	2
V	26	31	16
W	200	240	320
X	46	51	36
Y	43.5	35	47.5
Z	55	67.5	80

Dimensions



● LCT-20
For stroke length 150, 175



Dimensions table per stroke length

Stroke length	150	175
L1	402	452
L2	204	229
n	9	10
n1	4	4
n2	-	-
V	21	26
W	360	400
X	41	46
Y	39	51.5
Z	92.5	105

- SCP*2
- CMK2
- CMA2
- SCM
- SCG
- SCA2
- SCS
- CKV2
- CA/OV2
- SSD
- CAT
- MDC2
- MVC
- SMD2
- MSD*
- FC*
- STK
- ULK*
- JSK/M2
- JSG
- JSC3
- USSD
- USC
- JSB3
- LMB
- STG
- STS/L
- LCS
- LCG
- LCM
- LCT**
- LCY
- STR2
- UCA2
- HCM
- HCA
- SRL2
- SRG
- SRM
- SRT
- MRL2
- MRG2
- SM-25
- CAC3
- UCAC
- RCC2
- MFC
- SHC
- GLC
- Ending

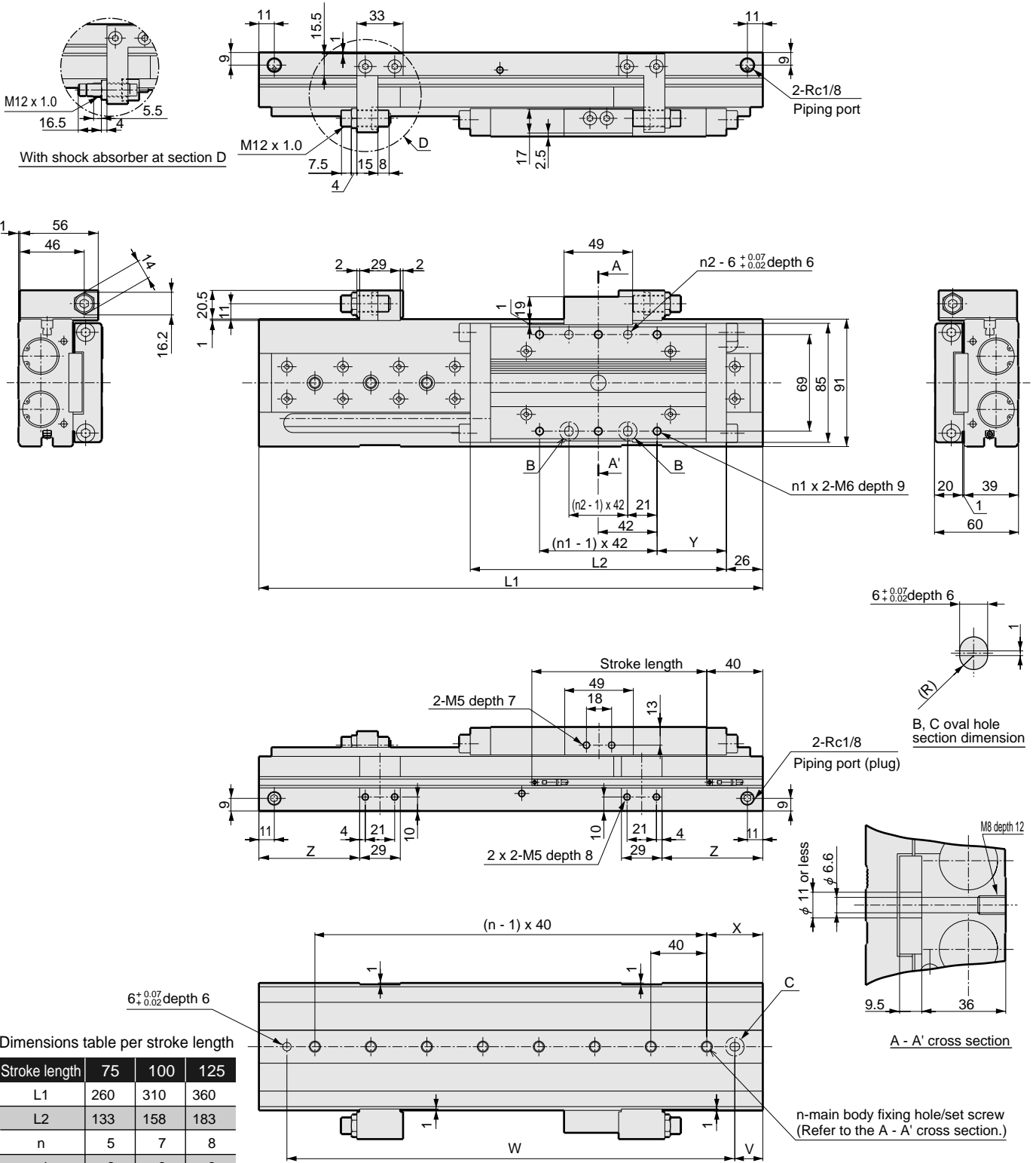
Linear slide cylinder
Combined functions



Dimensions

● LCT-25

For stroke length 75, 100, 125



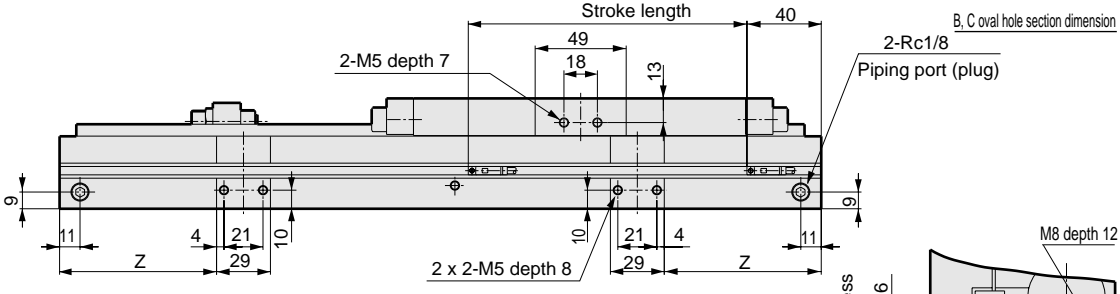
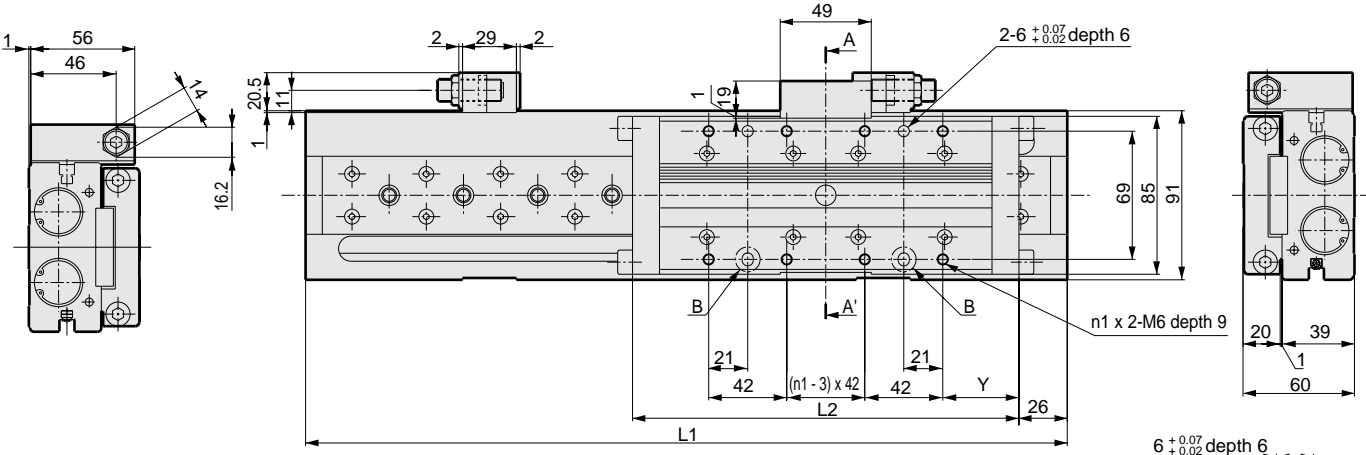
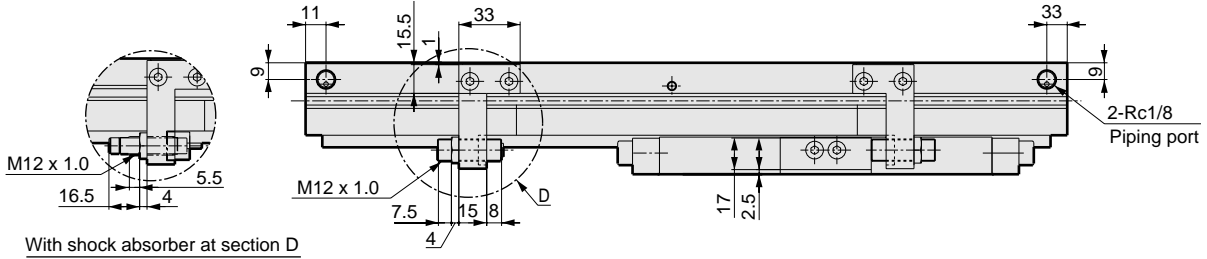
Dimensions table per stroke length

Stroke length	75	100	125
L1	260	310	360
L2	133	158	183
n	5	7	8
n1	2	3	3
n2	1	2	2
V	30	15	20
W	200	280	320
X	50	35	40
Y	45.5	37	49.5
Z	47	59.5	72

- SCP*2
- CMK2
- CMA2
- SCM
- SCG
- SCA2
- SCS
- CKV2
- CA/OV2
- SSD
- CAT
- MDC2
- MVC
- SMD2
- MSD*
- FC*
- STK
- ULK*
- JSK/M2
- JSG
- JSC3
- USSD
- USC
- JSB3
- LMB
- STG
- STS/L
- LCS
- LCG
- LCM
- LCT**
- LCY
- STR2
- UCA2
- HCM
- HCA
- SRL2
- SRG
- SRM
- SRT
- MRL2
- MRG2
- SM-25
- CAC3
- UCAC
- RCC2
- MFC
- SHC
- GLC
- Ending

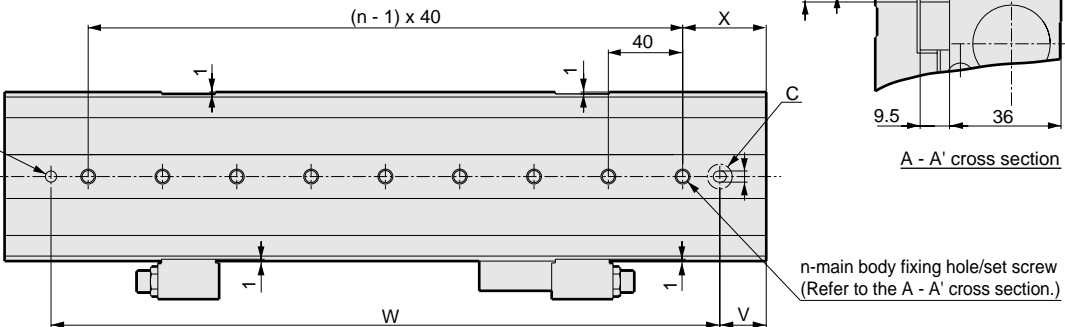
Dimensions 

● LCT-25
For stroke length 150, 175



Dimensions table per stroke length

Stroke length	150	175
L1	410	460
L2	208	233
n	9	10
n1	4	5
n2	-	-
V	25	30
W	360	400
X	45	50
Y	41	32.5
Z	84.5	97

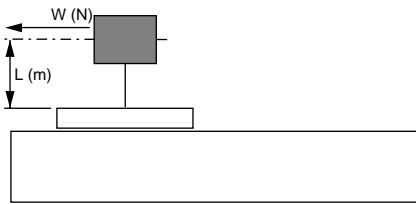


- SCP*2
- CMK2
- CMA2
- SCM
- SCG
- SCA2
- SCS
- CKV2
- CA/OV2
- SSD
- CAT
- MDC2
- MVC
- SMD2
- MSD*
- FC*
- STK
- ULK*
- JSK/M2
- JSG
- JSC3
- USSD
- USC
- JSB3
- LMB
- STG
- STS/L
- LCS
- LCG
- LCM
- LCT**
- LCY
- STR2
- UCA2
- HCM
- HCA
- SRL2
- SRG
- SRM
- SRT
- MRL2
- MRG2
- SM-25
- CAC3
- UCAC
- RCC2
- MFC
- SHC
- GLC
- Ending

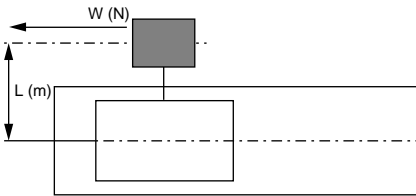
Linear slide cylinder
Combined functions

STEP-1

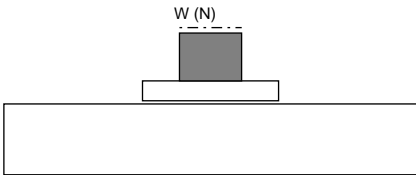
① Obtain the load and impact moment generated in each direction at the stroke end.



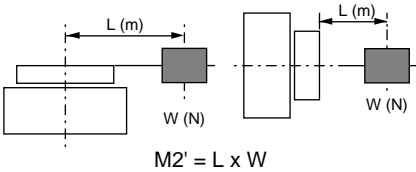
$$M1' = L \times W$$



$$M3' = L \times W$$



$$W' = W$$



$$M2' = L \times W$$

Find rough value of G coefficient from Table 1.

$$V_a \text{ (average speed)} = \frac{\text{Moving distance}}{\text{Moving time}} \text{ (m/s)}$$

Table 1

V _a average speed (m/s)	V _m Stroke end speed (m/s)	G coefficient
To 0.07	To 0.1	5
To 0.2	To 0.3	14
To 0.27	To 0.4	19
To 0.35	To 0.5	24

G coefficient =

$$M1' \times G = \text{[] (N-m)}$$

$$M2' = \text{[] (N-m)}$$

$$M3' \times G = \text{[] (N-m)}$$

$$W' = \text{[] (N)}$$

$$E' = \frac{1}{2} \times m \times V_m^2 = \text{[] (J)}$$

$$(m \doteq \frac{W}{9.8})$$

② Temporarily select a bore size that satisfies the following formula:

$$M'_T = \frac{M1' \times G}{M1'_{\text{max.}}} + \frac{M2'}{M2'_{\text{max.}}} + \frac{M3' \times G}{M3'_{\text{max.}}} + \frac{W'}{W'_{\text{max.}}} < 1$$

$E' < E_{\text{max.}}$

M'_T : Composite moment (should be smaller than 1.)

G : G coefficient

$W'_{\text{max.}}$: Max. allowable value of W' (from table 2)

$M1'_{\text{max.}}$: Max. allowable value of $M1'$ (from table 2)

$M2'_{\text{max.}}$: Max. allowable value of $M2'$ (from table 2)

$M3'_{\text{max.}}$: Max. allowable value of $M3'$ (from table 2)

$E_{\text{max.}}$: Max. allowable value of E_0 (from table 3)

Table 2 Allowable static load

Vertical load $W'_{\text{max.}}$ (N)

Stroke length	50	75	100	125	150	175
φ 8	194	-	-	-	-	-
φ 12	-	292	619	-	-	-
φ 16	-	400		950		
φ 20	-	580			1370	
φ 25	-	1020			2350	

Bending moment $M1'_{\text{max.}}$ (N-m), oscillating moment $M3'_{\text{max.}}$ (N-m)

Stroke length	50	75	100	125	150	175
φ 8	11.6	23.8	-	-	-	-
φ 12	-	37.1	55.3	-	-	-
φ 16	-	39.0	64.0	89.0	114.0	139.0
φ 20	-	92.1	128.3	164.6	200.8	237.1
φ 25	-	135.2	198.9	262.7	326.4	390.2

Radial moment $M2'_{\text{max.}}$ (N-m)

Stroke length	50	75	100	125	150	175
φ 8	4.9	-	-	-	-	-
φ 12	-	10.4	22.1	-	-	-
φ 16	-	16.3		38.6		
φ 20	-	32.3			76.1	
φ 25	-	102.0			235.0	

Table 3 Allowable energy absorption of LCS (E_0)

Bore size (mm)	Standard (J)	Shock absorber type with stopper (J)
φ 8	0.0032	0.6
φ 12	0.014	2.1
φ 16	0.043	5.4
φ 20	0.055	9.7
φ 25	0.14	9.7

STEP-2

Then, increase accuracy of load factor, effective thrust, speed at stroke end and composite moment.

● Find the load factor.

$$\alpha = \frac{F_o}{F} \times 100 (\%)$$

α : Load factor

F_o : Required force to move a work piece (N).

F : Cylinder theoretical thrust (N) Table 4.

Table 4 Theoretical thrust table

(Unit: N)

Bore size (mm)	Working pressure MPa						
	0.15	0.2	0.3	0.4	0.5	0.6	0.7
φ 18	7	10	15	20	25	30	34
φ 12	17	22	33	44	55	67	78
φ 16	30	39	59	79	99	118	138
φ 20	46	62	92	123	154	185	216
φ 25	72	96	144	192	240	289	337

Table 5 Reference of load factor

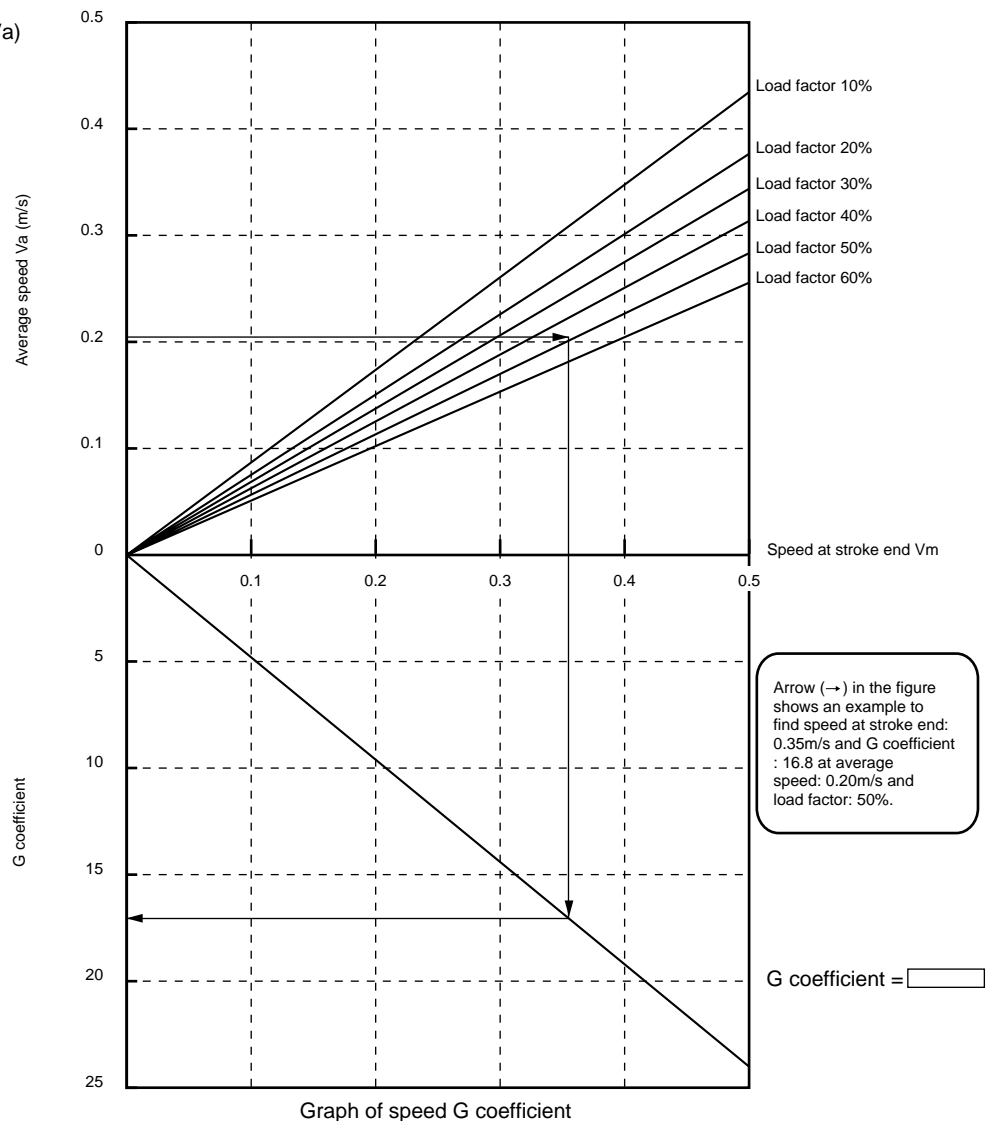
At horizontal operation	At vertical operation
$F_o = F_w$	$F_o = W + F_w$
$F_w: W \times 0.2$ note (N)	
$W: \text{Load (N)}$	

Working pressure MPa	Load factor (%)
0.2 to 0.3	$\alpha \leq 40$
0.3 to 0.6	$\alpha \leq 50$
0.6 to 0.7	$\alpha \leq 60$

Note: Coefficient of friction

STEP-3

Find the speed at stroke end (V_m) and G coefficient with average speed (V_a) and load factor found at STEP-2.



Arrow (→) in the figure shows an example to find speed at stroke end: 0.35m/s and G coefficient : 16.8 at average speed: 0.20m/s and load factor: 50%.

G coefficient =

- SCP*2
- CMK2
- CMA2
- SCM
- SCG
- SCA2
- SCS
- CKV2
- CA/OV2
- SSD
- CAT
- MDC2
- MVC
- SMD2
- MSD*
- FC*
- STK
- ULK*
- JSK/M2
- JSG
- JSC3
- USSD
- USC
- JSB3
- LMB
- STG
- STS/L
- LCS
- LCG
- LCM
- LCT**
- LCY
- STR2
- UCA2
- HCM
- HCA
- SRL2
- SRG
- SRM
- SRT
- MRL2
- MRG2
- SM-25
- CAC3
- UCAC
- RCC2
- MFC
- SHC
- GLC

Ending
Linear slide cylinder
Combined functions

STEP-4

Confirm the composite moment (M_T) with G coefficient and speed at stroke end (V_m) found at STEP-3.

$$M1' \times G = \boxed{} \text{ (N-m)}$$

$$M2' = \boxed{} \text{ (N-m)}$$

$$M1' \times G = \boxed{} \text{ (N-m)}$$

$$W' = \boxed{} \text{ (N)}$$

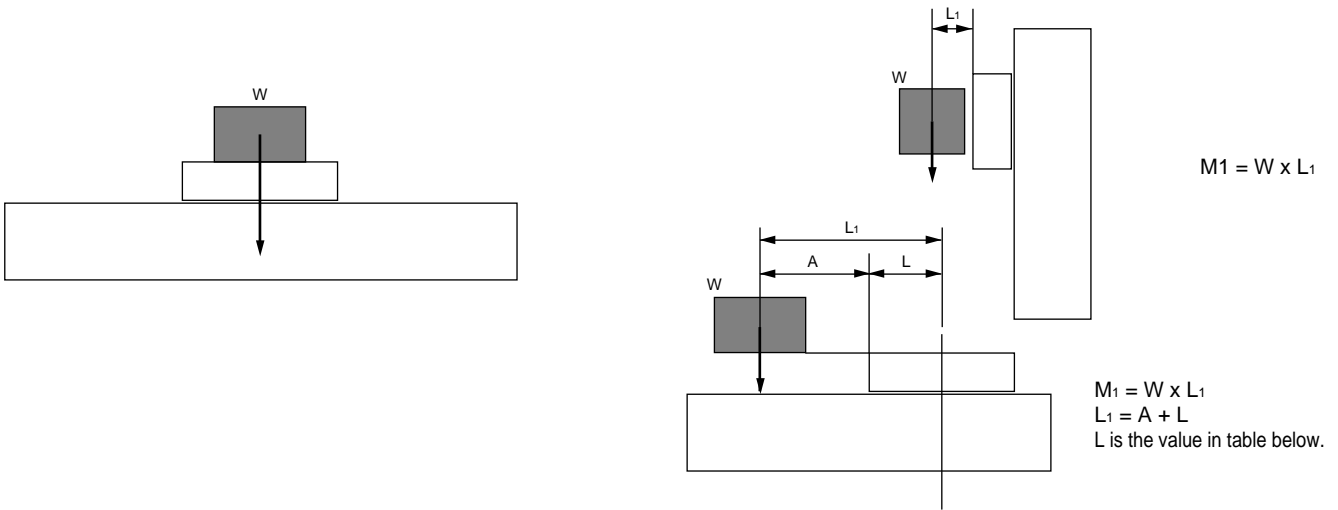
$$= \boxed{} \text{ (J)}$$

$$M_T = \frac{M1' \times G}{M1'_{max.}} + \frac{M2'}{M2'_{max.}} + \frac{M3' \times G}{M3'_{max.}} + \frac{W'}{W'_{max.}} = \boxed{}$$

Confirm composite moment M_T during travel. (This value is different from the value found at STEP-1.)

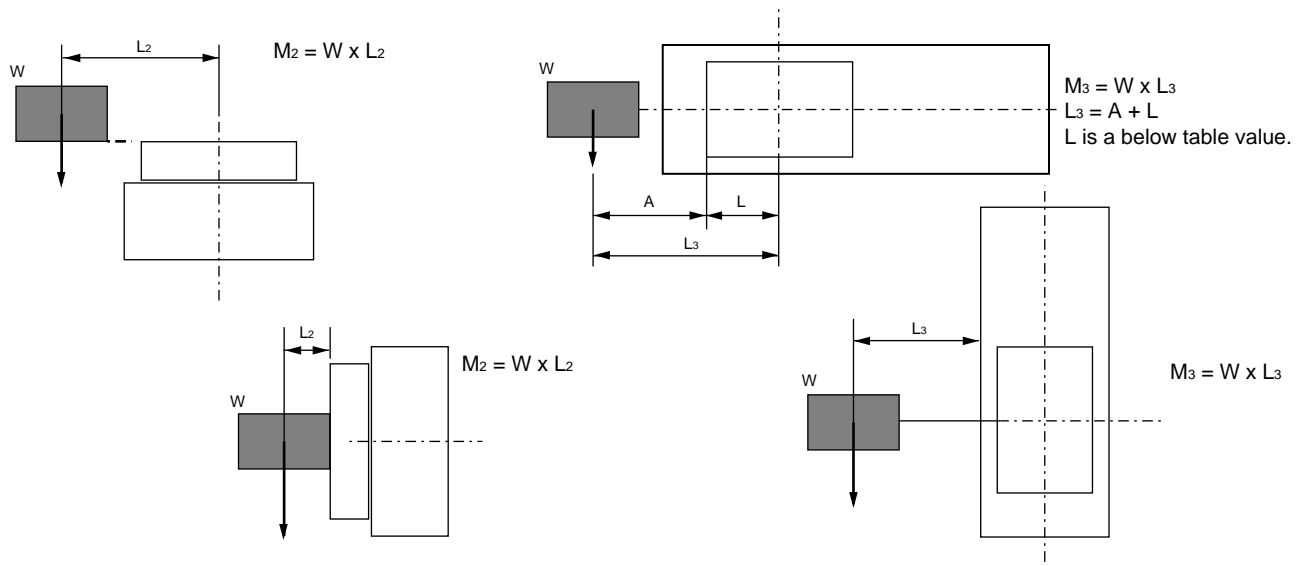
● Vertical load: W (N)

● Bending moment: $M1$ (N-m)



● Radial moment: $M2$ (N-m)

● Twisting moment: $M3$ (N-m)



L value

Stroke length	50	75	100	125	150	175
ϕ 8	43	55.5	-	-	-	-
ϕ 12	-	60.5	73	-	-	-
ϕ 16	-	59	71.5	84	96.5	109
ϕ 20	-	64.5	77	89.5	102	114.5
ϕ 25	-	66.5	79	91.5	104	116.5

$$\begin{aligned}
 M1 &= M1 &= & \boxed{} \text{ (N-m)} \\
 M2 &= M2 &= & \boxed{} \text{ (N-m)} \\
 M3 &= M3 &= & \boxed{} \text{ (N-m)} \\
 W &= W &= & \boxed{} \text{ (N)} \\
 & &= & \boxed{} \text{ (J)} \\
 M_T &= \frac{M1}{M1_{max}} + \frac{M2}{M2_{max}} + \frac{M3}{M3_{max}} + \frac{W}{W_{max}} = \boxed{}
 \end{aligned}$$

Table 6 Allowable static load

Vertical load W' max. (N)

Stroke length	50	75	100	125	150	175
φ 8	19.2		-	-	-	-
φ 12	-	34.3	72.6	-	-	-
φ 16	-	58.9		117.9		
φ 20	-	84.7			171.3	
φ 25	-	158.4			313.1	

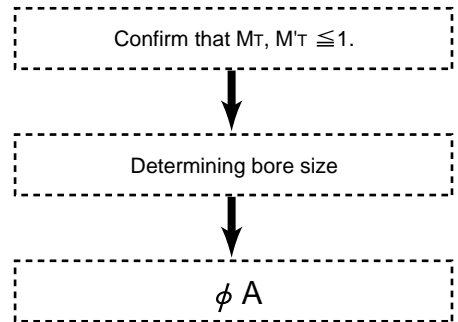
Bending moment M1', oscillating moment M3' max. (N-m)

Stroke length	50	75	100	125	150	175
φ 8	1.15	2.35	-	-	-	-
φ 12	2.21	4.35	16.49	-	-	-
φ 16	-	5.75	19.43	13.12	16.80	20.48
φ 20	-	13.45	18.75	24.04	29.34	34.63
φ 25	-	20.99	30.89	40.79	50.69	60.59

Radial moment M2' max. (N-m)

Stroke length	50	75	100	125	150	175
φ 8	0.48		-	-	-	-
φ 12	-	1.22	2.59	-	-	-
φ 16	-	2.40		4.79		
φ 20	-	4.71			9.52	
φ 25	-	15.84			31.31	

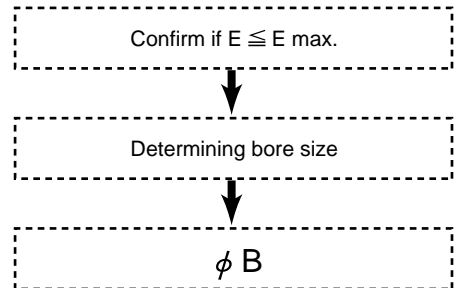
M_T : Composite of moment
 W_{max} : Max. allowable value of W (table 6 twist)
 $W1_{max}$: Max. allowable value of M1 (table 6 twist)
 $W2_{max}$: Max. allowable value of M2 (table 6 twist)
 $W3_{max}$: Max. allowable value of M3 (table 6 twist)
 E_{max} : Max. allowable of E_o (from table 3)



STEP-5

Confirming allowable energy absorption

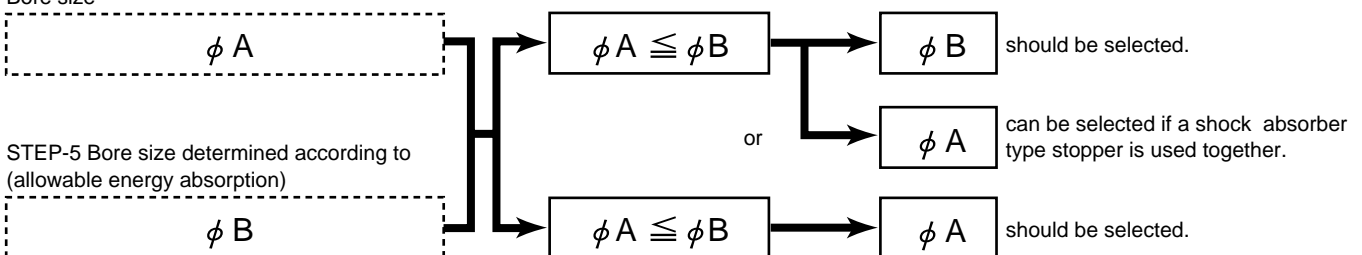
$$\begin{aligned}
 E' &= \frac{1}{2} \times m \times V_m^2 \\
 E &: \text{Kinetic energy at workpiece end (J)} \\
 m &: \text{Weight of load (kg) } (m \doteq \frac{W(N)}{9.8}) \\
 V_m &: \text{Speed at stroke end (m/s)} \\
 E_{max} &: \text{Max. allowable of } E_o \text{ (from table 3)}
 \end{aligned}$$



STEP-6

STEP-4 Bore size determined according to (load conditions)

Bore size



SCP*2
 CMK2
 CMA2
 SCM
 SCG
 SCA2
 SCS
 CKV2
 CA/OV2
 SSD
 CAT
 MDC2
 MVC
 SMD2
 MSD*
 FC*
 STK
 ULK*
 JSK/M2
 JSG
 JSC3
 USSD
 USC
 JSB3
 LMB
 STG
 STS/L
 LCS
 LCG
 LCM
LCT
 LCY
 STR2
 UCA2
 HCM
 HCA
 SRL2
 SRG
 SRM
 SRT
 MRL2
 MRG2
 SM-25
 CAC3
 UCAC
 RCC2
 MFC
 SHC
 GLC
 Ending

Linear slide cylinder
 Combined functions