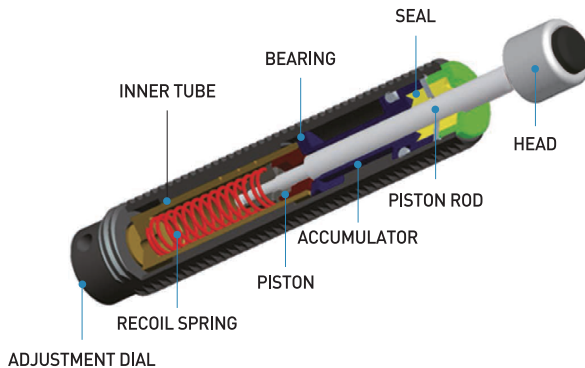


TDA(조정형) & TDS(자기조정형) 시리즈

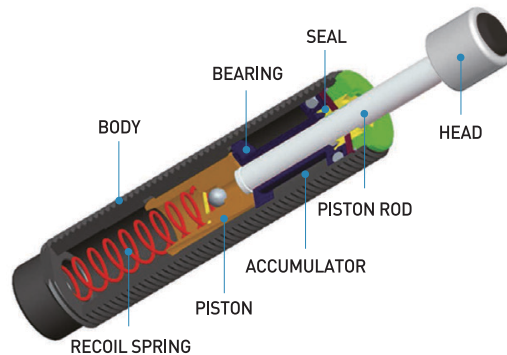
■ Description

TDA Series는 충돌 속도에 따라 12 단계 범위로 미세 조절이 가능하고 기존제품에 비해 댐핑조절 범위가 크게 개선되었다. TDS Series는 자기 조정형으로 충돌속도에 따른 댐핑력을 스스로 제어해 준다.

TDA & TDS Series는 기존제품에 비해 피스톤 단면적 증가로 용량이 200%이상 증가하였으며, Effective Weight의 범위가 더 광범위해졌다.



TDA series



TDS series

■ Features

- 외부 전체가 나사로 취부가 용이하고 정확한 위치에 고정 가능하며 표면적의 증가로 인하여 보다 많은 열에너지를 방출할 수 있다.
- 몸체 표면 처리는 특수 흑색 피막처리로 내부식성을 획기적으로 향상시켰다.
- 스틸 헤드 사용시 STOP COLLAR가 불 필요하며 POLY PAD나 URETHANE CAP을 사용하면 충돌시 소음이 크게 감소한다.
- BEARING은 장시간 사용에도 견디는 재질로 SEAL을 보호하며 긴 수명을 보장한다.
- 속도범위 표준 : 0.1 ~ 5m/s 저속 : OPTION
- 온도범위 표준 : -10 ~ 80°C SPECIAL : -40 ~ 120°C

■ TDA & TDS 주문형식

TDS	1210	(S)	C	-	SC
1	2	3	4		5

1. SHOCK ABSORBER 종류 2. 나사의 종류 x STROKE

TD : SERIES
A : Adjustable
S : Non-Adjustable

TDA 표준 조정형
1210 : M12 X 1.0P X 10
1412 : M14 X 1.5P X 11
1612 : M16 X 1.5P X 11
2015 : M20 X 1.5P X 14
2525 : M25 X 1.5P X 25
2725 : M27 X 3.0P X 25
2725F : M27 X 1.5P X 25
3625 : M36 X 1.5P X 25
3650 : M36 X 1.5P X 50

TDS 자기 조정형
0806 : M08 X 1.0P X 06
1008 : M10 X 1.0P X 08
1210 : M12 X 1.0P X 10
1415 : M14 X 1.5P X 15
1415F : M14 X 1.0P X 15
2020 : M20 X 1.5P X 20
2525 : M25 X 2.0P X 25
2525F : M25 X 1.5P X 25

3. Effective Weight 5. OPTION

(TDS Series만 해당)
무기호 : Soft
M : Medium
H : Hard

4. CAP 유무

무기호 : 없음
C : CAP 있음

무기호 : Lock Nut 2개 기본
SC : Stop Collar
RF : Rectangular Flange
(TDA36만 해당)
SA : Side Load Adaptor
CM : Clamp Mount
UC : Urethane Cap
(TDA36만 해당)

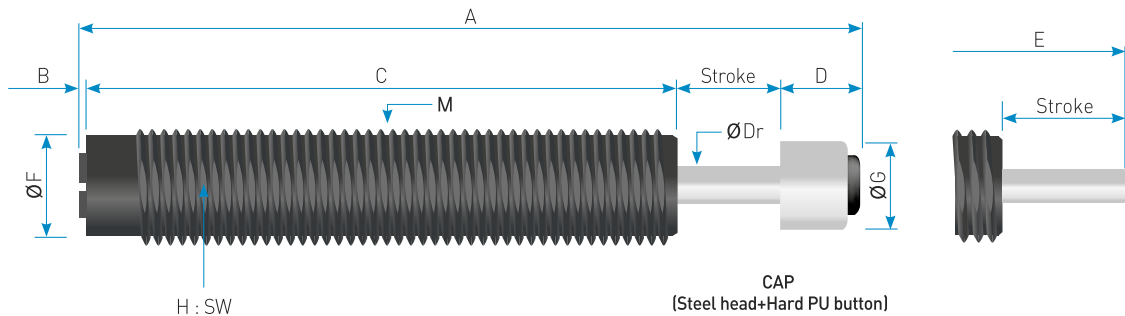
TDA(조정형) 12/14 시리즈

Engineering Data

Model	Stroke(mm)	Max.Energy / Cycle (Nm)	Max.Energy / Hour [Nm/h]	Effective Weight (kg)	Recoil Force (N)		Weight (g)
					Ext.	Com.	
TDA1210(C)	10	16	30,500	1.5~333	3.6	9.8	55
TDA1412(C)	12	18	38,000	1.8~400	4.9	11.4	80

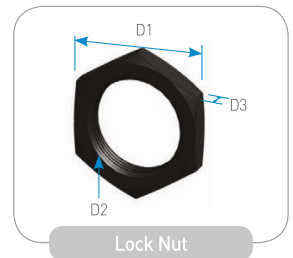
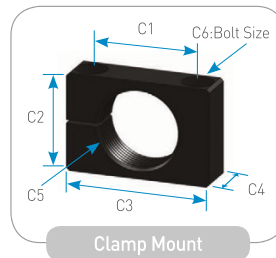
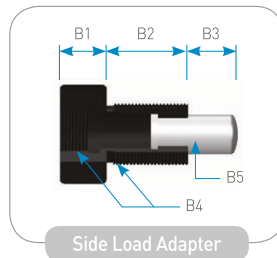
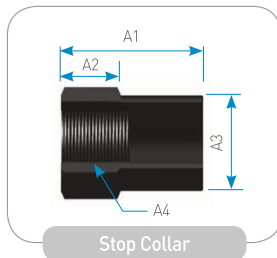
Dimensions

Model	Stroke	A	B	C	D	E	F	G	H	M	Dr
TDA1210(C)	10	84	1.2	62.8	10	74	Φ10.3	Φ10.5	-	M12 X 1.0	Φ4
TDA1412(C)	12	96	1.2	72.8	10	86	Φ12	Φ10.5	12.5	M14 X 1.5	Φ4



Accessories

Model	Stop Collar				Side Load Adapter					Clamp Mount						Lock Nut		
	A1	A2	A3	A4	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5	C6	D1	D2	D3
TDA1210(C)	20	8	Φ13.8	M12X 1.0	12	17.5	10	M12 X 1.0	Φ5	20	16	32	12	M12 X 1.0	M5X 18L	14	M12X 1.0	4
TDA1412(C)	27	12	Φ18	M14X 1.5	14	19.5	12	M14 X 1.5	Φ6	20	20	32	12	M14 X 1.5	M5X 25L	19	M14X 1.5	5

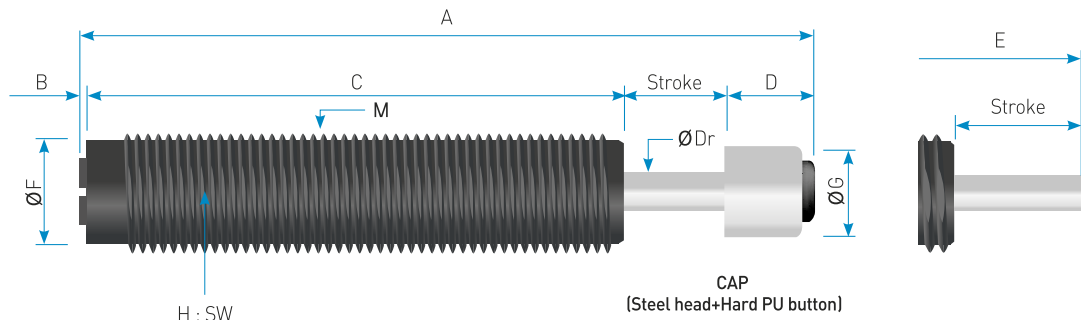


Engineering Data

Model	Stroke(mm)	Max.Energy / Cycle (Nm)	Max.Energy/Hour (Nm / h)	Effective Weight (kg)	Recoil Force (N)		Weight (g)
					Ext.	Comp.	
TDA1612(C)	12	24	47,200	2-533	5	11.5	80
TDA2015(C)	15	56	58,000	4.5-1,244	8	19.6	145
TDA2525(C)	25	150	96,000	11.5-3,334	10.2	29.5	285
TDA2725(C)	25	150	96,000	11.5-3,334	10.2	29.5	305

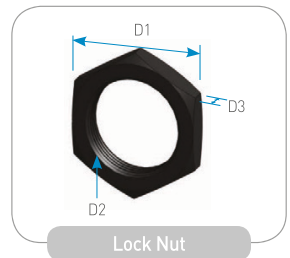
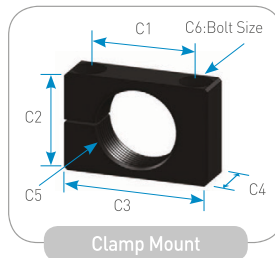
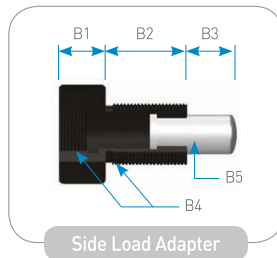
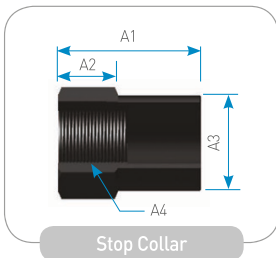
Dimensions

Model	Stroke	A	B	C	D	E	F	G	H	M	Dr
TDA1612(C)	12	97	1.2	71.3	12.5	84.5	Φ13.6	Φ13.5	14.5	M16 X 1.5	Φ5
TDA2015(C)	15	109	1.5	79	13.5	95.5	Φ17.6	Φ13.5	18.5	M20 X 1.5	Φ6
TDA2525(C)	25	144	1.5	101	16.5	127.5	Φ22.6	Φ16	23	M25 X 1.5	Φ8
TDA2725(C) TDA2725F(C)	25	144	1.5	101	16.5	127.5	Φ22.6	Φ16	23	M27 X 3.0 M27 X 1.5	Φ8



Accessories

Model	Stop Collar				Side Load Adapter					Clamp Mount						Lock Nut		
	A1	A2	A3	A4	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5	C6	D1	D2	D3
TDA 1612(C)	27	12	Φ19	M16X1.5	19	22.8	12	M16X1.5	Φ8	24	22	36	16	M16X1.5	M6X25L	19	M16X1.5	6
TDA 2015(C)	36	15	Φ24	M20X1.5	20	34	15	M20X1.5	Φ12	28	25	40	20	M20X1.5	M6X30L	24	M20X1.5	6
TDA 2525(C)	42	18	Φ31.5	M25X1.5	20	42	25	M25X1.5	Φ16	32	32	46	25	M25X1.5	M6X35L	32	M25X1.5	8
TDA 2725(C) TDA 2725F(C)	42	18	Φ31.5	M27X3.0 M27X1.5	20	42	25	M27X3.0 M27X1.5	Φ16	35	32	48	25	M27X3.0 M27X1.5	M6X35L	32	M27X3.0 M27X1.5	8



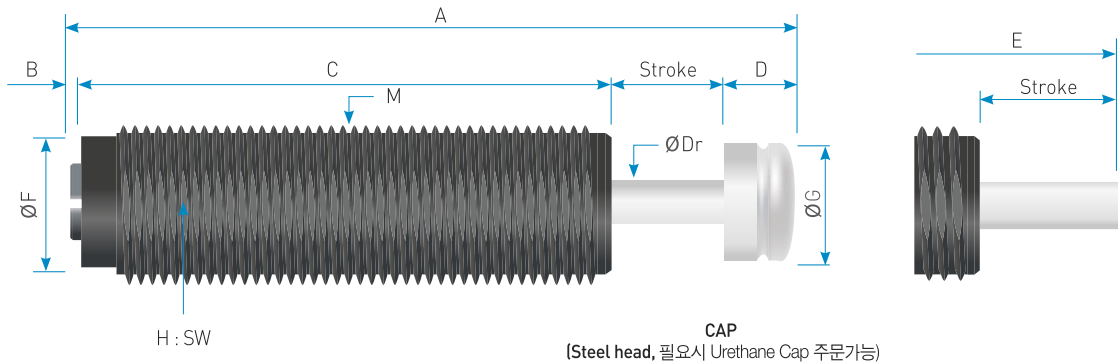
TDA(조정형) 36 시리즈

Engineering Data

Model	Stroke(mm)	Max.Energy / Cycle (Nm)	Max.Energy / Hour [Nm / h]	Effective Weight (kg)	Recoil Force (N)		Weight (g)
					Ext.	Comp.	
TDA3625(C)	25	300	108,000	24-6,667	25	56.2	725
TDA3650(C)	50	615	142,000	49-13,667	22.5	60	885

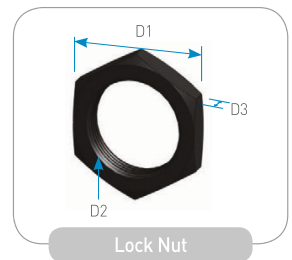
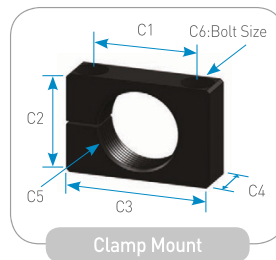
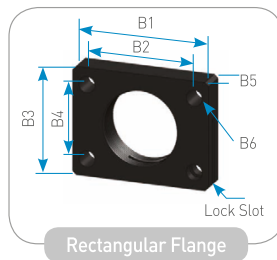
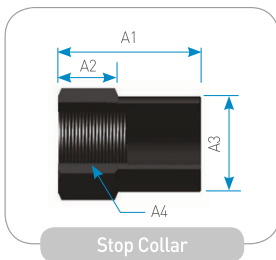
Dimensions

Model	Stroke	A	B	C	D	E	F	G	H	M	Dr
TDA3625(C)	25	158.5	2	116	15.5	143	Φ31	Φ28	34	M36 X 1.5	Φ10
TDA3650(C)	50	218	2	150.5	15.5	202.5	Φ31	Φ28	34	M36 X 1.5	Φ10



Accessories

Model	Stop Collar					Rectangular Flange					Clamp Mount						Lock Nut		
	A1	A2	A3	A4	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	D1	D2	D3
TDA3625(C)	62	26	Φ45	M36 X 1.5	51	41	45	29	10	4-Φ20	45	42	61	25	M36 X 1.5	M6 X 45L	46	M36 X 1.5	10

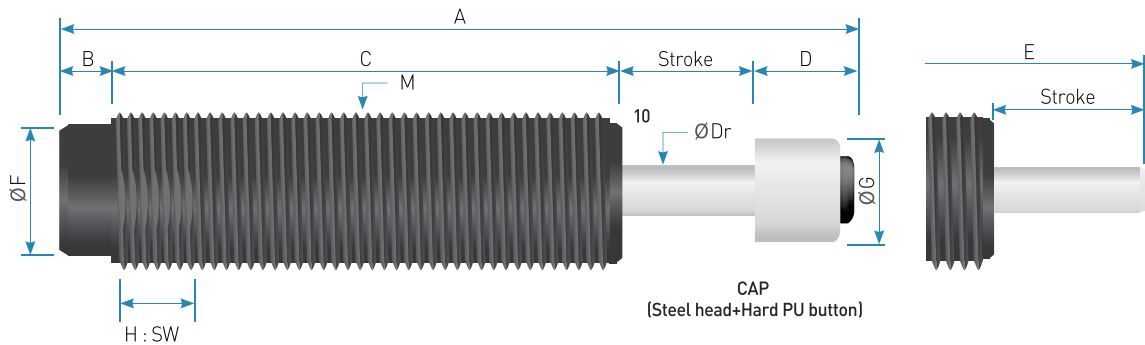


Engineering Data

Model	Stroke(mm)	Max.Energy / Cycle (Nm)	Max.Energy / Hour (Nm / h)	Effective Weight (kg)			Recoil Force (N)		Weight (g)
				S	M	H	Ext.	Comp.	
TDS0806(*)	6	5	8,000	0.8-2.8	2.5-12.3	10-111	2.2	5.8	10
TDS1008(*)	8	10	13,200	1.6-5.0	3.2-14	10.2-41	2.6	7	15
TDS1210(*)	10	16	30,000	1.3-8	6.6-22	16-65	3.8	9.8	23
TDS1415(*)	15	30	51,000	3.8-15	12-42	31-1,500	3.8	13	43

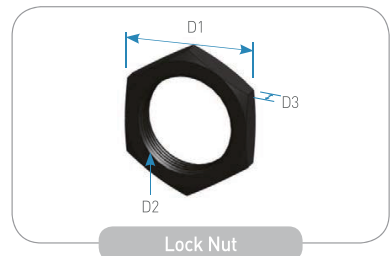
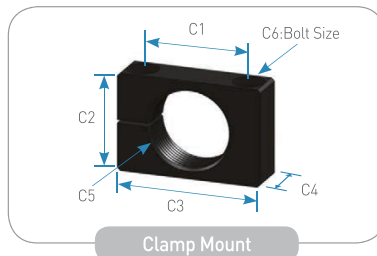
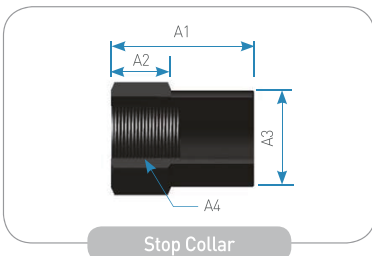
Dimensions

Model	Stroke	A	B	C	D	E	F	G	H	M	Dr
TDS0806(*)	6	54	6	35	7	47	Φ6.8	Φ6.8		M8 X 1.0	Φ3
TDS1008(*)	8	64.5	7.5	42	7	57.5	Φ8.6	Φ8.6	8	M10 X 1.0	Φ3
TDS1210(*)	10	80.5	6.5	54	10	70.5	Φ10.8	Φ10.5	10	M12 X 1.0	Φ4
TDS1415(*) TDS1415F(*)	15	100.5	6.5	69	10	90.5	Φ11.8	Φ10.5	12	M14 X 1.5 M14 X 1.0	Φ4



Accessories

Model	Stop Collar				Clamp Mount						Lock Nut		
	A1	A2	A3	A4	C1	C2	C3	C4	C5	C6	D1	D2	D3
TDS0806(*)	20	8	Φ11.5	M8 X 1.0	16	14	25	10	M8 X 1.0	M4	12	M8 X 1.0	3
TDS1008(*)	20	8	Φ12.8	M10 X 1.0	16	14	25	10	M10 X 1.0	M4 X 16L	13	M10 X 1.0	4
TDS1210(*)	20	8	Φ13.8	M12 X 1.0	20	16	32	12	M12 X 1.0	M5 X 18L	14	M12 X 1.0	4
TDS1415(*) TDS1415F(*)	27	12	Φ18	M14 X 1.5 M14 X 1.0	20	20	32	12	M14 X 1.5 M14 X 1.0	M5 X 25L	19	M14 X 1.5 M14 X 1.0	5



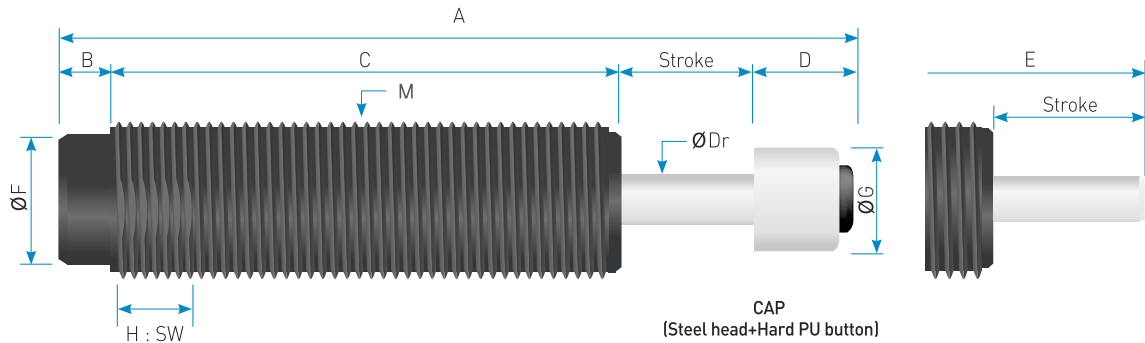
TDS (자기조정형) 20/25 시리즈

Engineering Data

Model	Stroke (mm)	Max.Energy / Cycle (Nm)	Max.Energy / Hour (Nm / h)	Effective Weight (kg)			Recoil Force (N)		Weight (g)
				S	M	H	Ext.	Comp.	
TDS2020(*)	20	96	55,000	9-59	48-192	133-4,800	8.1	23	135
TDS2525(*)	25	205	69,000	33-209	103-1,139	641-10,250	11	29	255

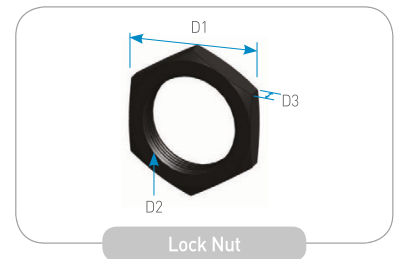
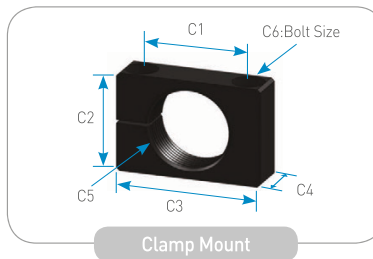
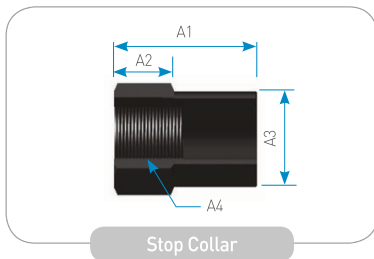
Dimensions

Model	Stroke	A	B	C	D	E	F	G	H	M	Dr
TDS2020(*)	20	118.5	8	77	13.5	105	Φ17	Φ13.5	17	M20 X 1.5	Φ6
TDS2525(*) TDS2525F(*)	25	141.5	9	91	16.5	125	Φ22	Φ16	22	M25 X 2.0 M25 X 1.5	Φ8



Accessories

Model	Stop Collar				Clamp Mount						Lock Nut		
	A1	A2	A3	A4	C1	C2	C3	C4	C5	C6	D1	D2	D3
TDS2020(*)	36	15	Φ24	M20 X 1.5	28	25	40	20	M20 X 1.5	M6 X 30L	24	M20 X 1.5	6
TDS2525(*) TDS2525F(*)	42	18	Φ31.5	M25 X 2.0 M25 X 1.5	32	32	46	25	M25 X 2.0 M25 X 1.5	M6 X 35L	32	M25 X 2.0 M25 X 1.5	8



▪ Symbols

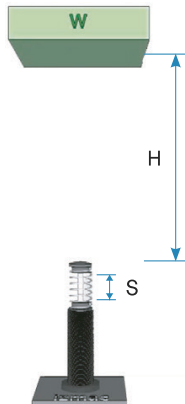
Symbol	Unit	Description	Symbol	Unit	Description
E_k	Nm	운동에너지	T	Nm	추진토크
E_w	Nm	일에너지	H	m	낙하높이
E_T	Nm	충에너지	W	kg	충돌물중량
E_{TC}	Nm/h	시간당 충에너지	P	bar	압력
F_s	N	충격력	ω	rad/s	각속도
F_P	N	추진력	α	°	경사각도
W_E	kg	중량효과치	I	kgm ²	관성모멘트
C	Cycles/h	시간당 충돌횟수	K	m	회전반경
S	m	행정거리	R_s	m	장착위치
V	m/s	충돌속도	μ		마찰계수
V_d	m/s	질량속도	g	m/s ²	중력가속도
P_M	kW	모터출력	a	m/s ²	감속도
D	mm	실린더내경	t	s	시간

▪ Useful Formulas

Description	Symbol	Formulas
충격력	F_s	$= E_T / S / 0.8$
모터 추진력	N	$= 3000 \times P_M / V$
실린더 추진력	N	$= 0.0785 \times D^2 \times P$
중량효과치	W_E	$= 2 \times E_T / V^2$
속도(자유낙하)	V	$= \sqrt{2 \times g \times H}$
속도(가속도 유)	V	$= 2 \times D / t$
속도(가속도 무)	V	$= D / t$
감속도	a	$= V^2 / 2 / S$
정지시간	t	$= 2.6 \times S / V$

▪ Sizing Examples

A. Free Falling Mass

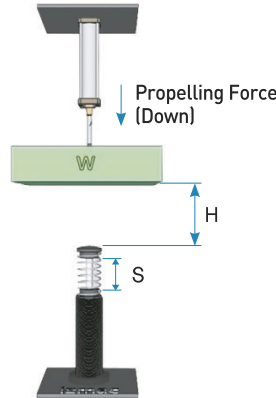


- 중량 $W = 600\text{kg}$
- 낙하높이 $H = 0.5\text{m}$
- 충돌횟수 $C = 60\text{Cycles/h}$
- 중력가속도 $g = 9.81\text{m/s}^2$

$E_k = W \times g \times H$	$600 \times 9.81 \times 0.5$	2,943 Nm
Select Model with E_k : TDM64100		
$E_w = W \times g \times S$	$600 \times 9.81 \times 0.1$	589 Nm
$E_T = E_k + E_w$	$2,943 + 589$	3,532 Nm
$E_{TC} = E_T \times C$	$3,532 \times 60$	211,896 Nm/h
$V = \sqrt{2 \times g \times H}$	$\sqrt{2 \times 9.81 \times 0.5}$	3.13 m/s
$W_E = 2 \times E_T / V^2$	$2 \times 3,532 / 3.13^2$	720 kg

Selected Model with E_k , E_{TC} & W_E : TDM64100

B. Down Mass with Propelling Force



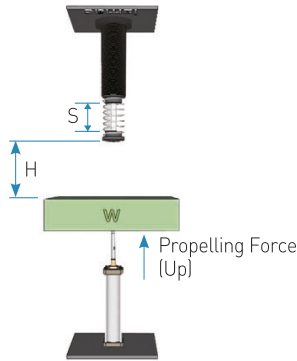
- 중량 $W = 1,200\text{kg}$
- 충돌속도 $V = 1.8\text{m/s}$
- 실린더내경 $D = 140\text{mm}$
- 사용압력 $P = 5\text{bar}$
- 충돌횟수 $C = 125\text{Cycles/h}$

$E_k = W \times V^2 / 2$	$1,200 = 1.8^2 / 2$	1,944 Nm
Select Model with E_k : TDM8550		
$N = 0.0785 \times D^2 \times P + W \times g$	$0.0785 \times 140^2 \times 5 + 1,200 \times 9.81$	19,465 Nm
$E_w = N \times S$	$19,465 \times 0.05$	973 Nm
$E_T = E_k + E_w$	$1,944 + 973$	2,917 Nm
$E_{TC} = E_T \times C$	$2,917 \times 125$	364,656 Nm/h
$W_E = 2 \times E_T / V^2$	$2 \times 2,917 / 1.8^2$	1,801 kg

Select Model with E_k , E_{TC} & W_E : TDM8550

Hydraulic Shock Absorbers

C. Up Mass with Propelling Force

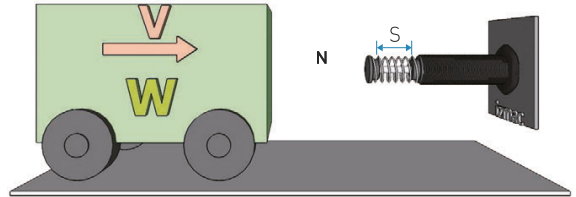


- 중량 $W = 200\text{kg}$
- 충돌속도 $V = 2.5\text{m/s}$
- 실린더내경 $D = 150\text{mm}$
- 사용압력 $P = 5\text{bar}$
- 충돌횟수 $C = 180\text{Cycles/h}$

$E_k = W \times V^2 / 2$	$200 \times 2.5^2 / 2$	625 Nm
Select Model with E_k : TDM4550		
$N = 0.0785 \times D^2 \times P - W \times g$	$0.0785 \times 150^2 \times 5 - 200 \times 9.81$	6,869 Nm
$E_w = N \times S$	$6,869 \times 0.05$	343 Nm
$E_t = E_k + E_w$	$625 + 343$	968 Nm
$E_t C = E_t \times C$	968×180	174,323 Nm/h
$W_e = 2 \times E_t / V^2$	$2 \times 968 / 2.5^2$	310 kg

Select Model with $E_k, E_t C$ & W_e : TDM4550

D. Horizontal Mass without Propelling Force

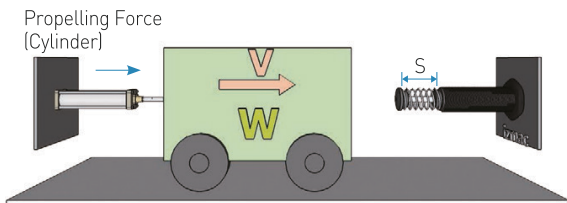


- 중량 $W = 100\text{kg}$
- 충돌속도 $V = 1.5\text{m/s}$
- 충돌횟수 $C = 600\text{Cycles/h}$

$E_k = W \times V^2 / 2$	$100 \times 1.5^2 / 2$	113 Nm
$E_t = E_k + E_w$	$113 + 0$	113 Nm
$E_t C = E_t \times C$	113×600	67,800 Nm/h
$W_e = 2 \times E_t / V^2$	$2 \times 113 / 1.5^2$	100 kg

Select Model with $E_k, E_t C$ & W_e : TDA2525(C)

E. Horizontal Mass with Propelling Force [Cylinder]

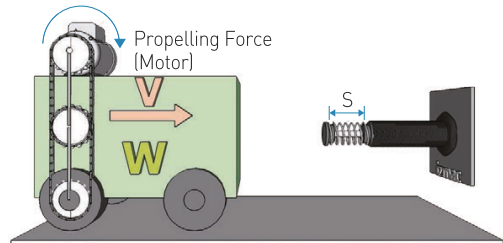


- 중량 $W = 300\text{kg}$
- 충돌속도 $V = 1.2\text{m/s}$
- 실린더내경 $D = 50\text{mm}$
- 사용압력 $P = 5\text{bar}$
- 충돌횟수 $C = 300\text{Cycles/h}$

$E_k = W \times V^2 / 2$	$300 \times 1.2^2 / 2$	216 Nm
Select Model with E_k : TDM3625		
$N = 0.0785 \times D^2 \times P$	$0.0785 \times 50^2 \times 5$	981 Nm
$E_w = N \times S$	981×0.025	25 Nm
$E_t = E_k + E_w$	$216 + 25$	241 Nm
$E_t C = E_t \times C$	241×300	72,300 Nm/h
$W_e = 2 \times E_t / V^2$	$2 \times 241 / 1.2^2$	334 kg

Select Model with $E_k, E_t C$ & W_e : TDM3625

F. Horizontal Mass with Propelling Force [Motor]

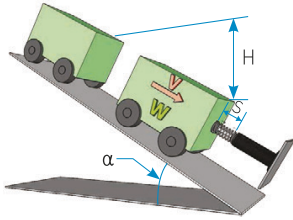


- 중량 $W = 1,300\text{kg}$
- 충돌속도 $V = 1.6\text{m/s}$
- 충돌횟수 $C = 100\text{Cycles/h}$
- 모터출력 $P_M = 3\text{kW}$

$E_k = W \times V^2 / 2$	$1,300 \times 1.6^2 / 2$	1,664 Nm
Select Model with E_k : TDM6450		
$N = 3,000 \times P_M / V$	$3,000 \times 3 / 1.6$	5,625 N
$E_w = N \times S$	$5,625 \times 0.05$	281 Nm
$E_t = E_k + E_w$	$1,664 + 281$	1,945 Nm
$E_t C = E_t \times C$	$1,945 \times 100$	194,500 Nm/h
$W_e = 2 \times E_t / V^2$	$2 \times 1,945 / 1.6^2$	1,520 kg

Select Model with $E_k, E_t C$ & W_e : TDM6450

G. Sliding Down Mass without Propelling Force

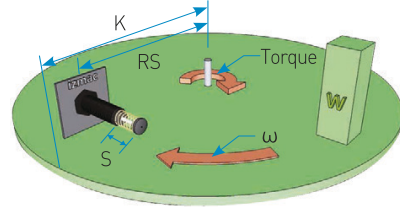


- 중량 $W = 800\text{kg}$
- 경사각 $\alpha = 30^\circ$
- 낙하높이 $H = 0.7\text{m}$
- 충돌횟수 $C = 100\text{Cycles/h}$

$E_k = W \times H \times g$	$800 \times 0.7 \times 9.81$	5,494 Nm
Select Model with E_k : TDM85100		
$N = W \times \sin \alpha \times g$	$800 \times \sin(30) \times 9.81$	3,922 N
$E_w = N \times S$	$3,922 \times 0.1$	392 Nm
$E_t = E_k + E_w$	$5,494 + 392$	5,886 Nm
$E_t C = E_t \times C$	$5,886 \times 100$	588,600 Nm/h
$V = \sqrt{2 \times g \times H}$	$\sqrt{2 \times 9.81 \times 0.7}$	3.7 m/s
$W_e = 2 \times E_t / V^2$	$2 \times 5,886 / 3.7^2$	857 Nm/h

Select Model with E_k , $E_t C$ & W_e : TMD85100

H. Rotary Table Mass with Propelling Force

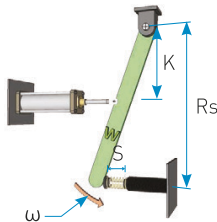


- 중량 $W = 200\text{kg}$
- 각속도 $\omega = 2\text{rad/s}$
- 장착위치 $R_s = 0.5\text{m}$
- 회전반경 $K = 0.8\text{m}$
- 토크 $T = 400\text{Nm}$
- 충돌횟수 $C = 350\text{Cycles/h}$

$I = W \times K^2$	200×0.8^2	128 kgm ²
$E_k = I \times \omega^2 / 2$	$128 \times 2^2 / 2$	256 Nm
Select Model with E_k : TDA3625(C)		
$N = T / R_s$	$400 / 0.5$	800 N
$E_w = N \times S$	800×0.025	20 Nm
$E_t = E_k + E_w$	$256 + 20$	276 Nm
$E_t C = E_t \times C$	276×350	96,600 Nm/h
$V = R_s \times \omega$	0.5×2	1 m/s
$W_e = 2 \times E_t / V^2$	$2 \times 276 / 1^2$	552 kg

Select Model with E_k , $E_t C$ & W_e : TDA3625(C)

I. Swiveling Mass with Propelling Force

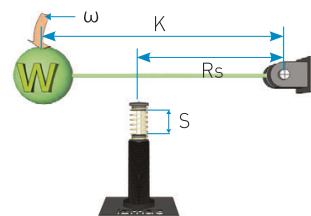


- 중량 $W = 50\text{kg}$
- 각속도 $\omega = 2.5\text{rad/s}$
- 장착위치 $R_s = 0.8\text{m}$
- 회전반경 $K = 0.5\text{m}$
- 실린더내경 $D = 40\text{mm}$
- 사용압력 $P = 5\text{Bar}$
- 충돌횟수 $C = 1,000\text{Cycles/h}$

$I = W \times K^2$	50×0.5^2	13 kgm ²
$E_k = I \times \omega^2 / 2$	$13 \times 2.5^2 / 2$	39 Nm
Select Model with E_k : TDA2015(C)		
$N = 0.0785 \times D^2 \times P \times K / R_s$	$0.0785 \times 40^2 \times 5 \times 0.5 / 0.8$	393 N
$T = N \times R_s$	393×0.8	314 Nm
$E_w = N \times S$	393×0.015	6 Nm
$E_t = E_k + E_w$	$39 + 6$	45 Nm
$E_t C = E_t \times C$	$45 \times 1,000$	45,000 Nm/h
$V = R_s \times \omega$	2.5×0.8	2 m/s
$W_e = 2 \times E_t / V^2$	$2 \times 45 / 2^2$	22 kg

Select Model with E_t , $E_t C$ & W_e : TDA2015(C)

J. Swiveling Mass without Propelling Force



- 중량 $W = 200\text{kg}$
- 장착위치 $R_s = 0.6\text{m}$
- 각속도 $\omega = 2.5\text{rad/s}$
- 회전반경 $K = 0.8\text{m}$
- 충돌횟수 $C = 200\text{Cycles/h}$

$I = W \times K^2$	200×0.8^2	128 kgm ²
$E_k = I \times \omega^2 / 2$	$128 \times 2.5^2 / 2$	400 Nm
Select Model with E_k : TDA3625(C)		
$N = W \times g \times K / R_s$	$200 \times 9.81 \times 0.8 / 0.6$	2,616 N
$E_w = N \times S$	$2,616 \times 0.05$	131 Nm
$E_t = E_k + E_w$	$400 + 131$	531 Nm
$E_t C = E_t \times C$	531×200	106,200 Nm/h
$V_0 = V \times R_s / K$	$2 \times 0.6 / 0.8$	1.5 m/s
$W_e = 2 \times E_t / V_0^2$	$2 \times 531 / 1.5^2$	472 kg

Select Model with E_k , $E_t C$ & W_e : TDA3625(C)