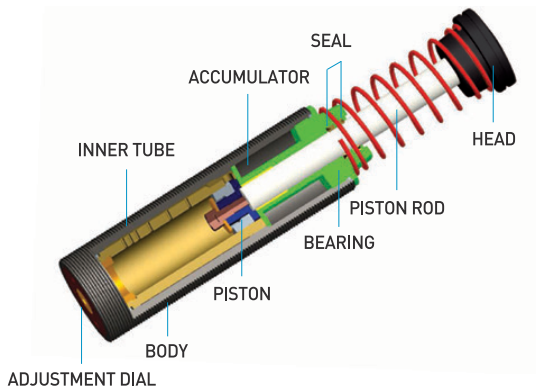


TDM(조정형) 시리즈

■ Description

TDM Series는 중대형 모델로 물체가 충돌 시 피스톤 로드와 이동함에 따라 피스톤이 이너튜브 내부의 오일챔버를 압축하면 오일은 이너튜브 외측면의 GROOVE를 통해 피스톤 후위와 어큐뮬레이터로 유동된다. 이 과정 중에 유동저항에 의해 감쇠력이 발생하며 운동에너지는 열 에너지로 변환되어 대기 중으로 소산된다. 부하가 제거되면 RECOIL SPRING이 피스톤 로드를 원래의 위치로 복귀시킨다.



■ Features

- TDM SERIES는 조정형으로 충돌 속도에 따라 12 단계 범위로 미세 조정이 가능하다.
- 피스톤 단면적 증가로 용량이 200% 이상 증가하였으며 Effective Weight의 범위가 더 넓어 졌다.
- 외부 전체가 나사로 취부가 용이하며 정확한 위치에 고정 가능하며 표면적의 증가로 인하여 보다 많은 열에너지를 방출할 수 있다.
- 몸체 표면은 니켈 또는 흑색으로 처리되었다.
- 스틸 헤드 사용시 STOP COLLAR가 불 필요하며 POLY PAD나 URETHANE CAP을 사용하면 소음을 크게 감소시킨다.
- BEARING은 장시간 사용에도 견디는 재료로 SEAL을 보호하며 긴 수명을 보장한다.
- 속도범위 표준 : 0.3 ~ 5m/s 저속 : OPTION
- 온도범위 표준 : -10 ~ 80°C SPECIAL : -40 ~ 120°C

■ TDM Series Ordering Information

TDM	4535C	-	SC
1	2		3

1. SHOCK ABSORBER 종류

TDM : SERIES

2. 나사의 종류 x STROKE

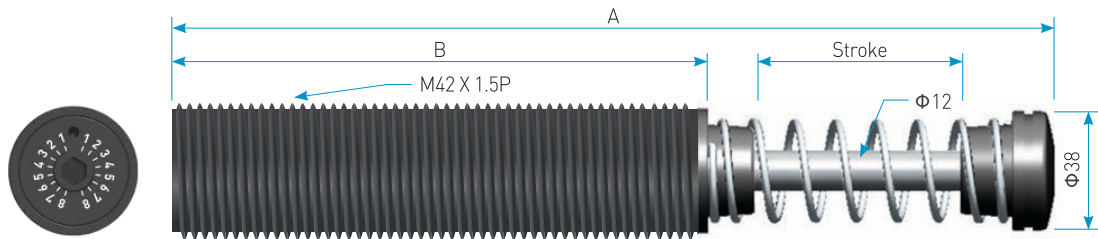
TDM 강력 조정형
4225C : M42 X 1.5P X 25
4250C : M42 X 1.5P X 50
4275C : M42 X 1.5P X 75
4525C : M45 X 1.5P X 25
4550C : M45 X 1.5P X 50
4575C : M45 X 1.5P X 75
6450C : M64 X 2.0P X 50
64100C : M64 X 2.0P X 100
64150C : M64 X 2.0P X 150
8550C : M85 X 2.0P X 50
85100C : M85 X 2.0P X 100
85150C : M85 X 2.0P X 150

3. OPTION

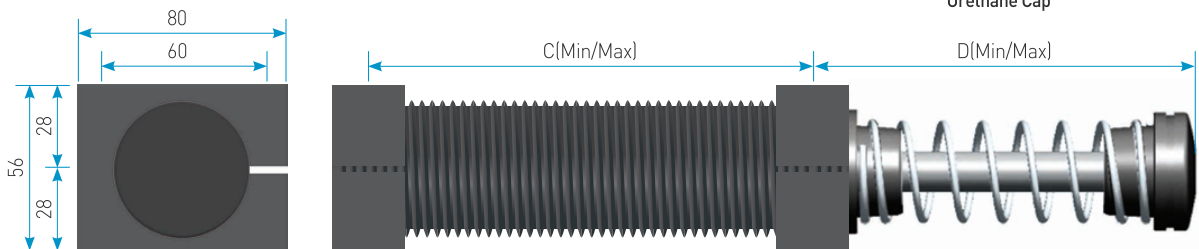
무기호 : Lock Collar 2개 기본
SC : Stop Collar
UC : Urethane Cap
SF : Square Flange
LC : Lock Collar
RC : Rod Clevis
EC : End Clevis
CM : Clamp Mount

Engineering Data

Model	Stroke(mm)	Max.Energy/Cycle (Nm)	Max.Energy/ Hour (Nm/h)	Effective Weight (kg)	Recoil Force (N)		Weight (kg)
					Ext.	Comp.	
TDM4225	25	490	146,000	39~10,889	50	83	1.0
TDM4250	50	980	196,000	78~21,773	46	84	1.1
TDM4275	75	1,470	220,000	117~32,667	44	86	1.3

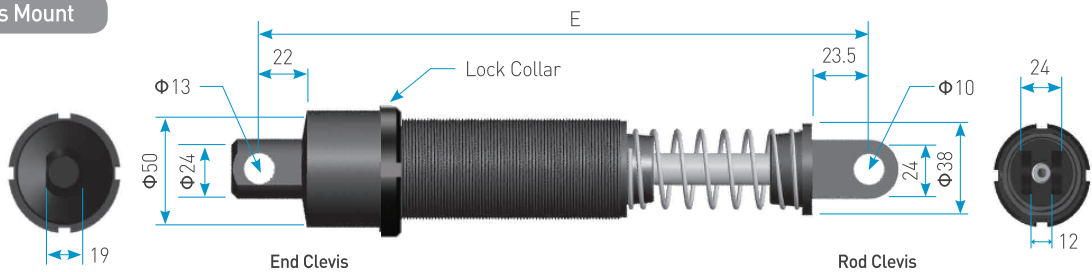


Clamp Mount



Urethane Cap

Clevis Mount



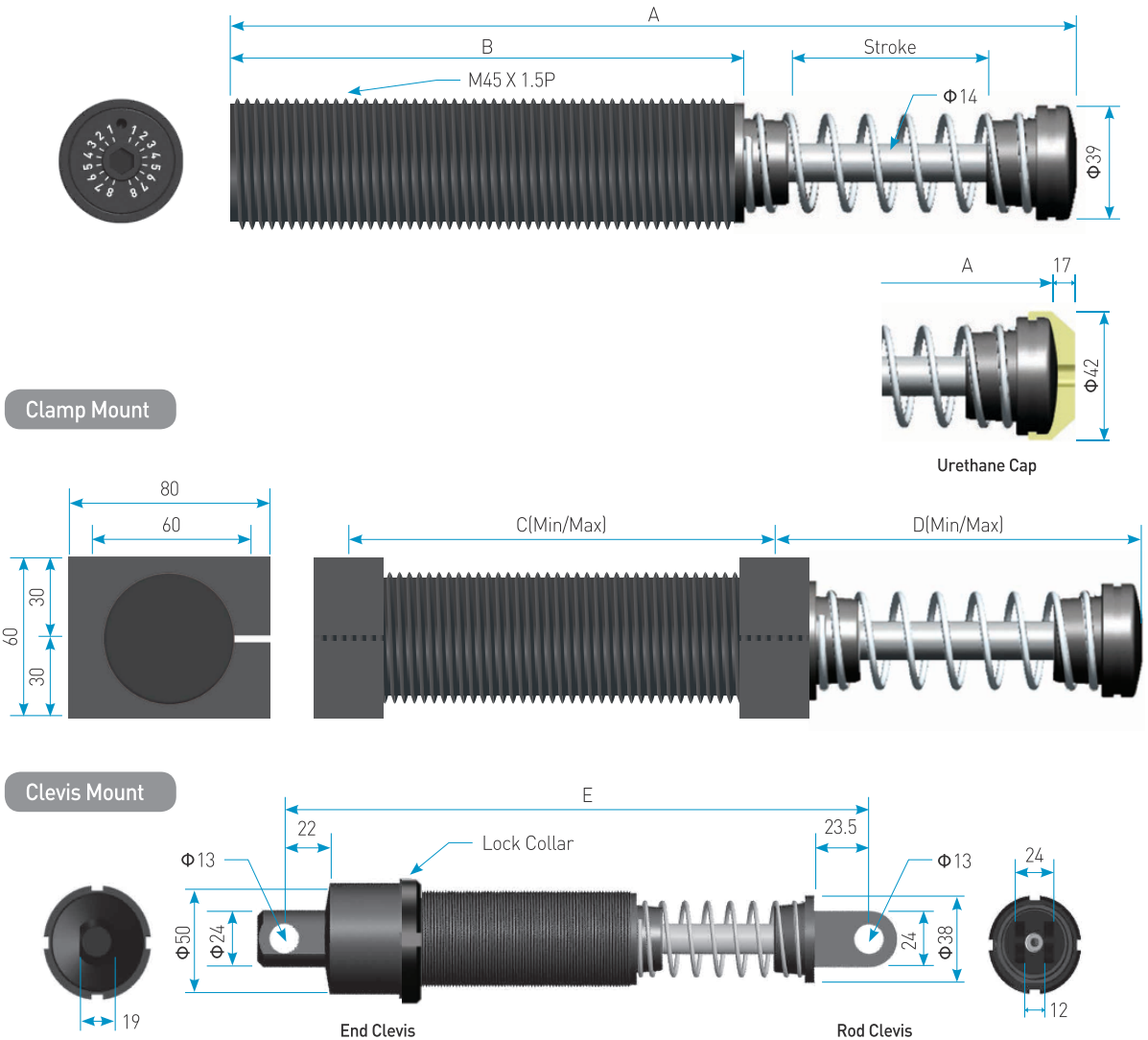
Dimensions

Model	Stroke	A	B	C	D	E
TDM4225	25	159.5	106.5	25/78.5	68.5/95.25	211.5
TDM4250	50	220.5	140.5	25/112.5	95.5/139.25	272.5
TDM4275	75	292.5	182.5	25/154.5	125.5/190.25	344.5

TDM(조정형) 45 시리즈

Engineering Data

Model	Stroke(mm)	Max.Energy / Cycle (Nm)	Max.Energy / Hour (Nm / h)	Effective Weight (kg)	Recoil Force (N)		Weight (kg)
					Ext.	Comp.	
TDM4525	25	570	170,000	46-12,667	50	83	1.1
TDM4550	50	1,150	230,000	92-25,550	46	84	1.3
TDM4575	75	1,750	263,000	140-38,890	44	86	1.5

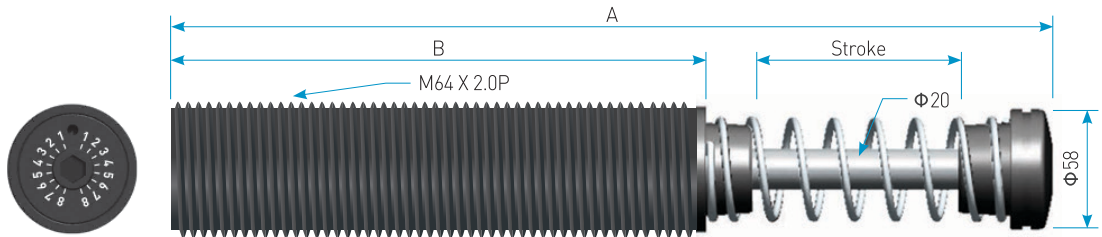


Dimensions

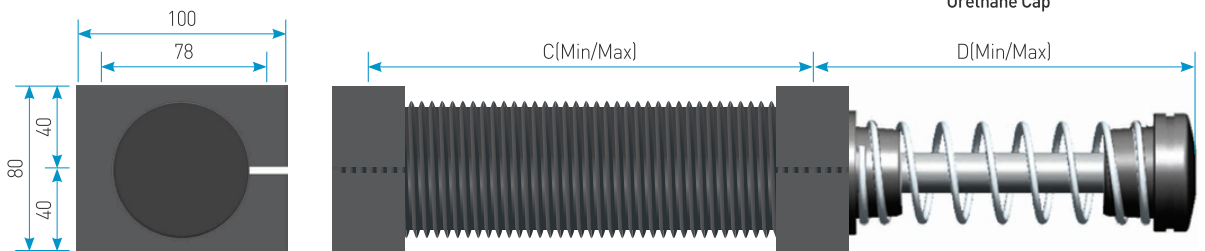
Model	Stroke	A	B	C	D	E
TDM4525	25	159.5	93	25 / 68	79.5 / 100.5	206
TDM4550	50	220.5	129	25 / 104	104 / 143.5	267
TDM4575	75	292.5	168.5	25 / 143.5	129 / 170.75	339

Engineering Data

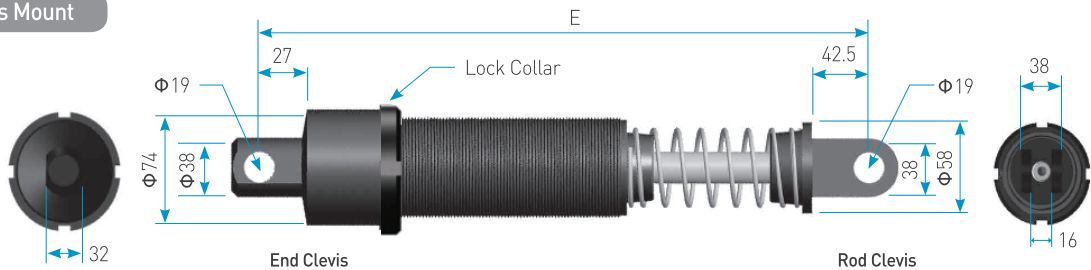
Model	Stroke(mm)	Max.Energy/Cycle (Nm)	Max.Energy/Hour (Nm/h)	Effective Weight (kg)	Recoil Force (N)		Weight (kg)
					Ext.	Comp.	
TDM6450	50	2,220	215,000	178-49, 330	61	133	3.2
TDM64100	100	4,400	316,000	352-97, 778	59	160	3.9
TDM64150	150	6,800	408,000	554-151,110	51	167	8.8



Clamp Mount



Clevis Mount



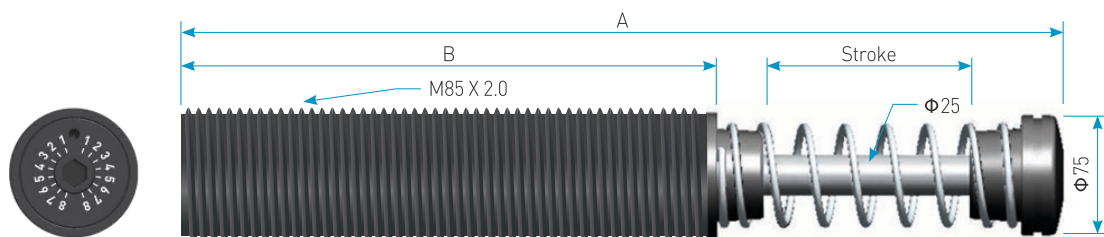
Dimensions

Model	Stroke	A	B	C	D	E
TDM6450	50	239	135.5	25 / 110.5	117.5 / 160.25	303
TDM64100	100	375	214.5	25 / 189.5	174.5 / 256.75	439
TDM64150	150	518.5	294.5	25 / 269.5	238 / 360.25	-

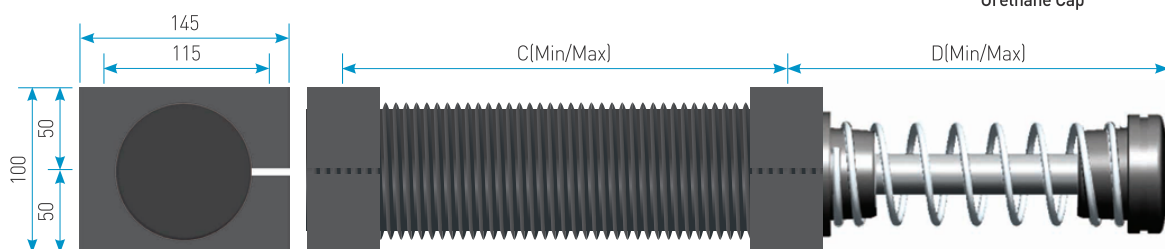
TDM(조정형) 85 시리즈

Engineering Data

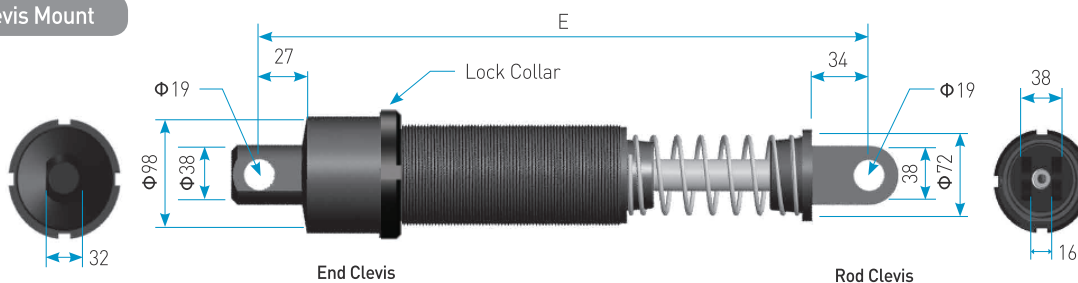
Model	Stroke(mm)	Max.Energy / Cycle (Nm)	Max.Energy / Hour [Nm / h]	Effective Weight (kg)	Recoil Force (N)		Weight (kg)
					Ext.	Comp.	
TDM8550	50	3,600	416,000	288-80,000	132	271	14
TDM85100	100	7,200	745,000	576-160,000	125	327	20
TDM85150	150	10,600	800,000	848-235,550	127	386	28



Clamp Mount



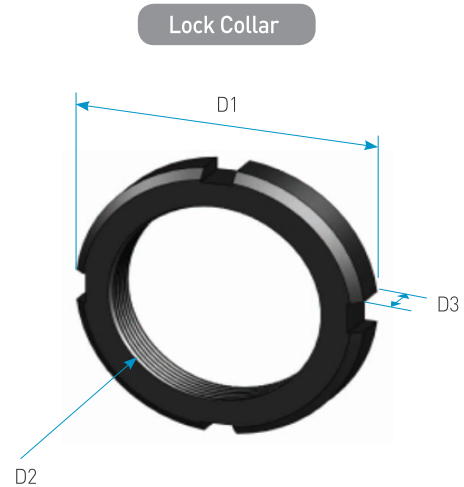
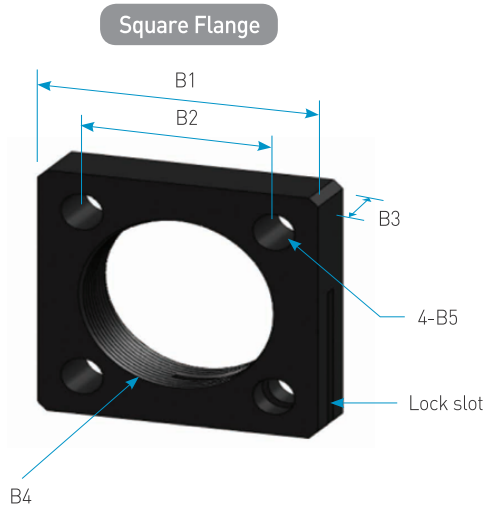
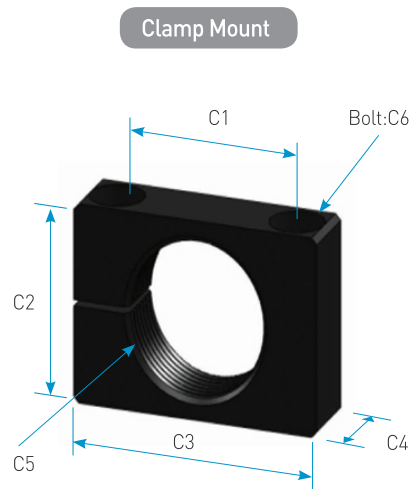
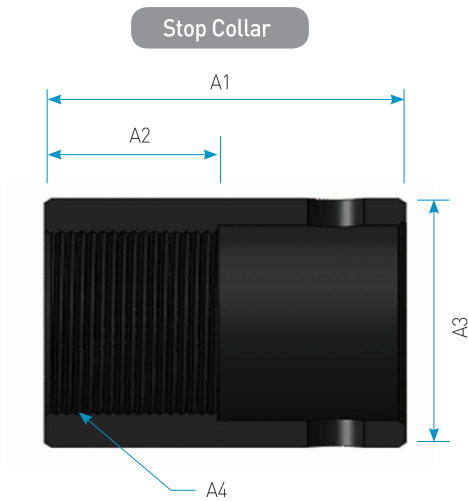
Clevis Mount



Dimensions

Model	Stroke	A	B	C	D	E
TDM8550	50	251	145.5	25 / 114	120.5 / 162.5	312
TDM85100	100	384.5	217	25 / 187	182.5 / 261	447
TDM85150	150	513.5	292	25 / 262	236.5 / 352.2	-

▪ Accessories



▪ Dimensions

Model	Stop Collar				Square Flange					Clamp Mount						Lock Collar		
	A1	A2	A3	A4	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5	C6	D1	D2	D3
TDM45-Series	52	25	Φ56	M45 X 1.5P	□ 60	□ 41	14	M45 X 1.5P	Φ 9	60	60	80	25	M45 X 1.5P	M8 X 60L	Φ58	M45 X 1.5P	9
TDM64-Series	85	45	Φ75	M64 X 2.0P	□ 90	□ 70	16	M64 X 2.0P	Φ 11	78	80	100	25	M64 X 2.0P	M10 X 80L	Φ80	M64 X 2.0P	11
TDM85-Series	95	45	Φ98	M85 X 2.0P	□ 104	□ 76	19	M85 X 2.0P	Φ 13	115	100	145	30	M85 X 2.0P	M12 X 100L	Φ 110	M85 X 2.0P	16

Hydraulic Shock Absorbers

▪ Symbols

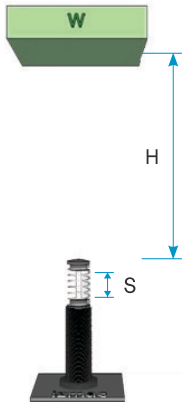
Symbol	Unit	Description	Symbol	Unit	Description
E_k	Nm	운동에너지	T	Nm	추진토크
E_w	Nm	일에너지	H	m	낙하높이
E_T	Nm	총에너지	W	kg	충돌물중량
E_{TC}	Nm/h	시간당 총에너지	P	bar	압력
F_s	N	충격력	ω	rad/s	각속도
F_P	N	추진력	α	°	경사각도
W_E	kg	충량효과치	I	kgm ²	관성모멘트
C	Cycles/h	시간당 충돌횟수	K	m	회전반경
S	m	행정거리	R_s	m	장착위치
V	m/s	충돌속도	μ		마찰계수
V_D	m/s	질량속도	g	m/s ²	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	$= 0.0785 \times D^2 \times P$
충량효과치	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

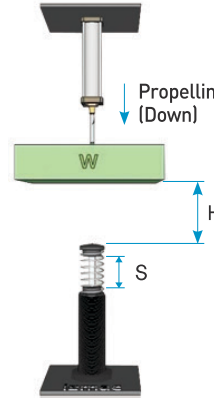


- 중량 $W = 600\text{kg}$
- 낙하높이 $H = 0.5\text{m}$
- 충돌횟수 $C = 60\text{Cycles/h}$
- 중력가속도 $g = 9.81\text{m/s}^2$

$E_k = W \times g \times H$	$600 \times 9.81 \times 0.5$	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



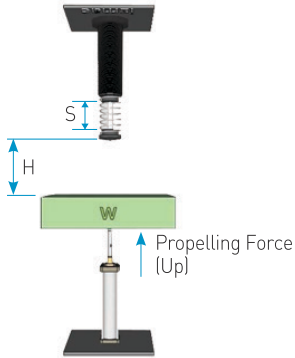
- 중량 $W = 1,200\text{kg}$
- 충돌속도 $V = 1.8\text{m/s}$
- 실린더내경 $D = 140\text{mm}$
- 사용압력 $P = 5\text{bar}$
- 충돌횟수 $C = 125\text{Cycles/h}$

$E_k = W \times V^2 / 2$	$1,200 = 1.8^2 / 2$	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
$E_w = F_P \times S$	$19,465 \times 0.05$	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

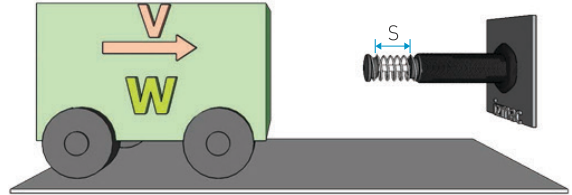


- 중량 $W = 200\text{kg}$
- 충돌속도 $V = 2.5\text{m/s}$
- 실린더내경 $D = 150\text{mm}$
- 사용압력 $P = 5\text{bar}$
- 충돌횟수 $C = 180\text{Cycles/h}$

$E_k = W \times V^2 / 2$	$200 \times 2.5^2 / 2$	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
$E_{tC} = E_t \times C$	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_{tC} & W_e : TDM4550

D. Horizontal Mass without Propelling Force

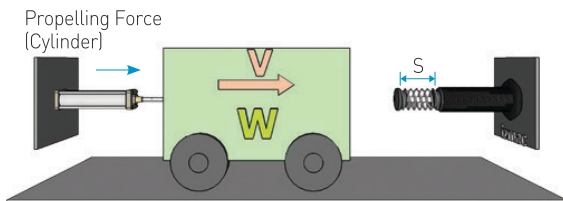


- 중량 $W = 100\text{kg}$
- 충돌속도 $V = 1.5\text{m/s}$
- 충돌횟수 $C = 600\text{Cycles/h}$

$E_k = W \times V^2 / 2$	$100 \times 1.5^2 / 2$	113 Nm
$E_t = E_k + E_w$	$113 + 0$	113 Nm
$E_{tC} = E_t \times C$	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_{tC} & W_e : TDA2525C

E. Horizontal Mass with Propelling Force [Cylinder]

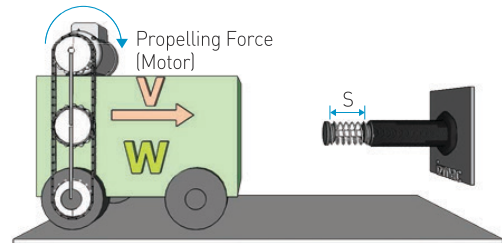


- 중량 $W = 300\text{kg}$
- 충돌속도 $V = 1.2\text{m/s}$
- 실린더내경 $D = 50\text{mm}$
- 사용압력 $P = 5\text{bar}$
- 충돌횟수 $C = 300\text{Cycles/h}$

$E_k = W \times V^2 / 2$	$300 \times 1.2^2 / 2$	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
$E_w = F_p \times S$	981×0.025	25 Nm
$E_t = E_k + E_w$	$216 + 25$	241 Nm
$E_{tC} = E_t \times C$	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_{tC} & W_e : TDM3625

F. Horizontal Mass with Propelling Force [Motor]



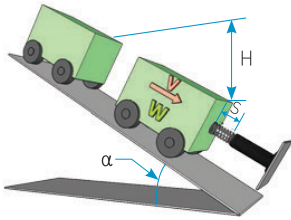
- 중량 $W = 1,300\text{kg}$
- 충돌속도 $V = 1.6\text{m/s}$
- 모터출력 $P_m = 3\text{kW}$
- 충돌횟수 $C = 100\text{Cycles/h}$

$E_k = W \times V^2 / 2$	$1,300 \times 1.6^2 / 2$	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
$E_{tC} = E_t \times C$	$1,945 \times 100$	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_{tC} & W_e : TDM6450

Hydraulic Shock Absorbers

G. Sliding Down Mass without Propelling Force

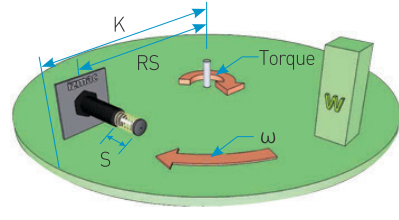


- 중량 $W = 800\text{kg}$
- 경사각 $\alpha = 30^\circ$
- 낙하높이 $H = 0.7\text{m}$
- 충돌횟수 $C = 100\text{Cycles/h}$

$E_k = W \times H \times g$	$800 \times 0.7 \times 9.81$	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
$E_{TC} = E_T \times C$	$5,886 \times 100$	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_{TC} & W_E : TMD85100

H. Rotary Table Mass with Propelling Force

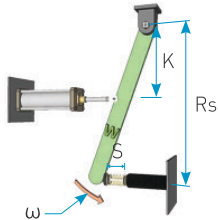


- 중량 $W = 200\text{kg}$
- 회전반경 $K = 0.8\text{m}$
- 각속도 $\omega = 2\text{rad/s}$
- 토크 $T = 400\text{Nm}$
- 장착위치 $R_s = 0.5\text{m}$
- 충돌횟수 $C = 350\text{Cycles/h}$

$I = W \times K^2$	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 : TDA3625C		
$N = T / R_s$	$400 / 0.5$	800 N
$E_w = N \times S$	800×0.025	20 Nm
$E_T = E_k + E_w$	$256 + 20$	276 Nm
$E_{TC} = E_T \times C$	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_{TC} & W_E : TDA3625C

I. Swiveling Mass with Propelling Force

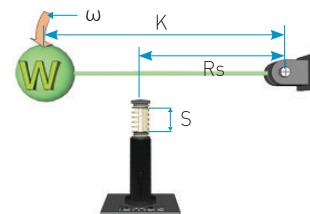


- 중량 $W = 50\text{kg}$
- 실린더내경 $D = 40\text{mm}$
- 각속도 $\omega = 2.5\text{rad/s}$
- 사용압력 $P = 5\text{Bar}$
- 장착위치 $R_s = 0.8\text{m}$
- 충돌횟수 $C = 1,000\text{Cycles/h}$
- 회전반경 $K = 0.5\text{m}$

$I = W \times K^2$	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 : TDA2015C		
$N = 0.0785 \times D^2 \times P \times K / R_s$	$0.0785 \times 40^2 \times 5 \times 0.5 / 0.8$	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
$E_{TC} = E_T \times C$	$45 \times 1,000$	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_{TC} & W_E : TDA2015C

J. Swiveling Mass without Propelling Force



- 중량 $W = 200\text{kg}$
- 장착위치 $R_s = 0.6\text{m}$
- 충돌속도 $V = 2\text{m/s}$
- 회전반경 $K = 0.8\text{m}$
- 각속도 $\omega = 2.5\text{rad/s}$
- 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 : TDA3625C		
$N = W \times g \times K / R_s$	$200 \times 9.81 \times 0.8 / 0.6$	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
$E_{TC} = E_T \times C$	531×200	106,200 Nm/h
$V_D = V \times R_s / K$	$2 \times 0.6 / 0.8$	1.5 m/s
$W_E = 2 \times E_T / V_D^2$	$2 \times 531 / 1.5^2$	472 kg

Select Model with E_k , E_{TC} & W_E : TDA3625C