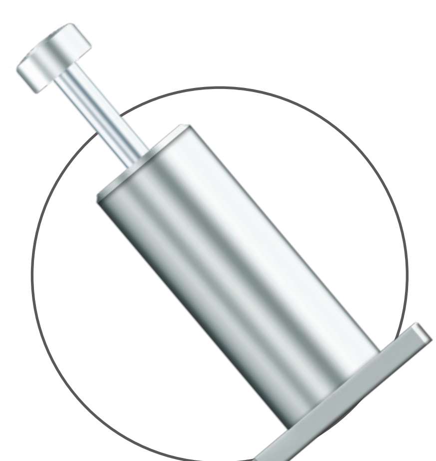
KOBA
BEST SHOCK ABSORBER

Visco-Elastic Buffer

KESM Series

KESE Series

KESH Series



KVD Series

KES Series Visco-Elastic Buffer

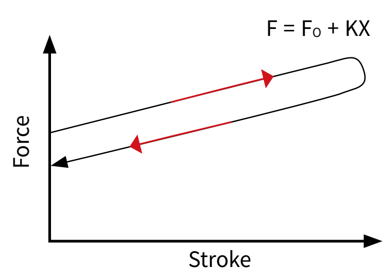
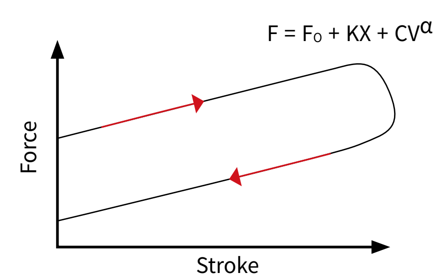
KES Series is developed on behalf of spring or shock absorber by fluid statics' compression principle and even it is simple and robust but can exert a large damping force despite of small return device such as appearance.
Because KES Series has spring and shock absorption function in one structure, Gas spring and Coil Spring is not needed and has a long lasting feature of damping performance in wide temperature range.

Feature

- Standard impact velocity : 3.8m/s
- Temperature ranges : Standard (-10~80°C), Special (-30~100°C)
- Piston Rod : Hard Chrome (25㎛ or more)
- Body and Mount : Epoxy Paint Coatings

Application

✓ For protection in wide industrial impact protection, especially Firewall, Cars, Railways, Marine Industry, Steel, paper, etc.

Spring Feature	Visco-elastic Function
F_0 : Initial Force, C : Damping coefficient, V : Impact Velocity, $0.1 \leq \alpha \leq 0.4$	
	

KES Series Ordering Information

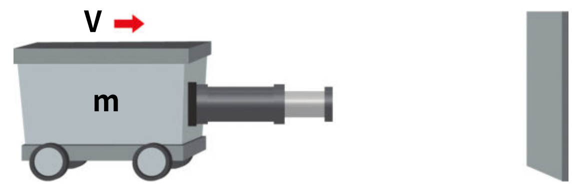
KES M - 116 - 50 - RF

- KES : Series
- M : Model : M, E, S, H
- 116 : Body Dia
- 50 : Stroke
- RF : RS : Rear Flange, FS : Front Flange, FM : Foot Mount

Model selection guide

Example : KESM Series

- Impact velocity (V_e) : 1.5 m/s
- Impact mass (m_e) : 5 ton
- Impact frequency : 20 impact/h



1. Energy calculation (E)

$$E_T = \frac{1}{2} m_e V_e^2 \qquad E = \frac{1}{2} \times 5{,}000 \times 1.5^2 = 5{,}625\ Nm = 5.6\ kJ$$

2. Temporary Model Selection

KESM90-60 $\quad E_T = 7\,[kJ] \qquad (E < E_T)$

KESS50-150 $\quad E_T = 6\,[kJ]$

3. Allowable Impact Frequency

■ Case1 : KESM90-60 $\quad C_e = 20 < 20 \cdot \frac{E_T}{E} = 20 \cdot \frac{7}{5.6} = 25\ [impact/h]$

■ Case2 : KESS50-150 $\quad C_e = 20 > 8 \cdot \frac{E_T}{E} = 8 \cdot \frac{6}{5.6} = 8.57\ [impact/h]$ (dissatisfaction)

4. Required Stroke Calculation

$$S_e = S\left(\sqrt{\frac{E}{E_T(0.03V + 0.24)} + 1.36} - 1.17\right)$$

$$= 60\left(\sqrt{\frac{5.6}{7\,(0.03 \times 1.5 + 0.24)} + 1.36} - 1.17\right) = 52.3[mm]$$

5. Calculation of Effective Reaction

$$F_{ME} = \left[\left(\frac{RDmax - RDmin}{S}\right)S_e + RDmin\right](0.1 \times V_e + 0.8)$$

$$= \left[\left(\frac{150 - 90}{60}\right) \times 52.3 + 90\right](0.1 \times 1.5 + 0.8) = 135.18[kN]$$

6. Final Model Selection

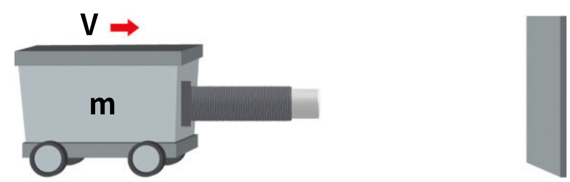
KESM90-60

E_T : Max Energy/cycle (kJ)

Model selection guide

Example : KESE Series

- Impact velocity (V_e) : 1.8 m/s
- Impact mass (m_e) : 40 ton
- Impact frequency (C_e) : 15 impact/h



1. Energy calculation (E)

$E_T = \frac{1}{2} m_e V_e^2$ $\qquad$ $E = \frac{1}{2} \times 40{,}000 \times 1.8^2 = 64{,}800\ Nm = 64.8\ kJ$

2. Temporary Model Selection

KESE160-140 $\qquad E_T = 75\,[kJ] \qquad (E < E_T)$

KESS110-400H $\qquad E_T = 100\,[kJ]$

3. Allowable Impact Frequency

■ Case1 : KESE160-140 $\qquad C_e = 15 < 15 \cdot \frac{E_T}{E} = 15 \cdot \frac{75}{64.8} = 17.36\ [impact/h]$

■ Case2 : KESS110-400H $\qquad C_e = 15 > 8 \cdot \frac{E_T}{E} = 8 \cdot \frac{100}{64.8} = 12.34\ [impact/h]$ $\qquad$ (dissatisfaction)

4. Required Stroke Calculation

$$S_e = S\left(\sqrt{\frac{E}{E_T\,(0.03V + 0.24)}} + 1.36 - 1.17\right)$$

$$= 140\left(\sqrt{\frac{64.8}{75\,(0.03 \times 1.8 + 0.24)}} + 1.36 - 1.17\right) = 126.47\ [mm]$$

5. Calculation of Effective Reaction

$$F_{ME} = \left[\left(\frac{RDmax - RDmin}{S}\right)S_e + RDmin\right](0.1 \times V_e + 0.8)$$

$$= \left[\left(\frac{700 - 400}{140}\right) \times 52.3 + 90\right](0.1 \times 1.8 + 0.8) = 657.87\ [kN]$$

6. Final Model Selection

KESE160-140

E_T : Max Energy/cycle (kJ)

Model selection guide

Example : KESS Series

- Impact velocity (V_e) : 2.8 m/s
- Impactor mass (m_e) : 20 ton
- Impact frequency (C_e) : 8 impact/h
- Allowable Reaction Force : 350 kN
- Allowable D1 : 150 mm

1. Energy calculation (E)

$$E_T = \frac{1}{2} m_e V_e^2 \qquad E = \frac{1}{2} \times 20{,}000 \times 2.8^2 = 78{,}400\ Nm = 78.4\ kJ$$

2. Temporary Model Selection

KESS110-400H $\quad E_T = 100\ [kJ] \quad (E < E_T)$

3. Allowable Impact Frequency

$$C_e = 8 < 8 \cdot \frac{E_T}{E} = 8 \cdot \frac{100}{78.4} = 10.2\ [impact/h]$$

4. Required Stroke Calculation

$$S_e = S\left(\sqrt{\frac{E}{E_T\,(0.03V + 0.24)}} + 1.36 - 1.17\right)$$

$$= 400\left(\sqrt{\frac{78.4}{100\,(0.03 \times 2.8 + 0.24)}} + 1.36 - 1.17\right) = 290.8\ [mm]$$

5. Calculation of Effective Reaction

$$F_{ME} = \left[\left(\frac{RDmax - RDmin}{S}\right)S_e + RDmin\right](0.1 \times V_e + 0.8)$$

$$= \left[\left(\frac{320 - 175}{400}\right) \times 290.8 + 175\right](0.1 \times 2.8 + 0.8) = 302.8\ [kN]$$

6. Final Model Selection

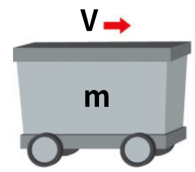
KESH175-850

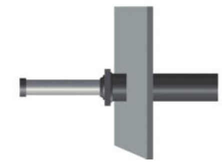
E_T : Max Energy/cycle (kJ)

Model selection guide

Example : KESH Series

- Impact velocity (V_e) : 2.8 m/s
- Impactor mass (m_e) : 80 ton
- Impact frequency (C_e) : 8 impact/h
- Allowable Reaction Force : 650 kN





1. Energy calculation (E)

$$E_T = \frac{1}{2} m_e V_e^2 \qquad E = \frac{1}{2} \times 80{,}000 \times 2.8^2 = 313{,}600\ Nm = 313.6\ kJ$$

2. Temporary Model Selection

KESH175-850 $\qquad E_T = 100\ [kJ] \qquad (E < E_T)$

3. Allowable Impact Frequency

$$C_e = 8 < 8 \cdot \frac{E_T}{E} = 8 \cdot \frac{400}{313.6} = 10.2\ [impact/h]$$

4. Required Stroke Calculation

$$S_e = S\left(\sqrt{\frac{E}{E_T\,(0.03V + 0.24)}} + 1.36 - 1.17\right)$$

$$= 400\left(\sqrt{\frac{313.6}{400\ (0.03 \times 2.8 + 0.24)}} + 1.36 - 1.17\right) = 658.0\ [mm]$$

5. Calculation of Effective Reaction

$$F_{ME} = \left[\left(\frac{RDmax - RDmin}{S}\right)S_e + RDmin\right](0.1 \times V_e + 0.8)$$

$$= \left[\left(\frac{600 - 330}{850}\right) \times 658.0 + 330\right](0.1 \times 2.8 + 0.8) = 582.1\ [kN]$$

6. Final Model Selection

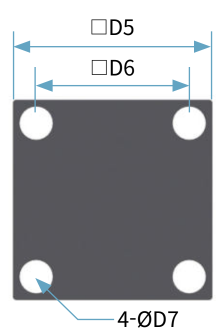
KESH175-850

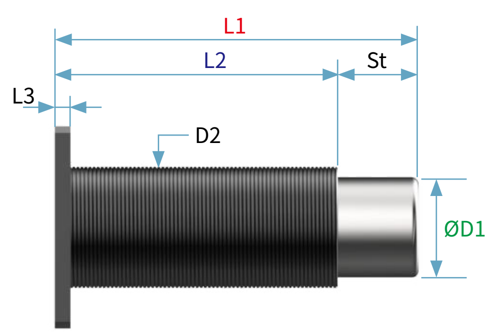
E_T : Max Energy/cycle (kJ)

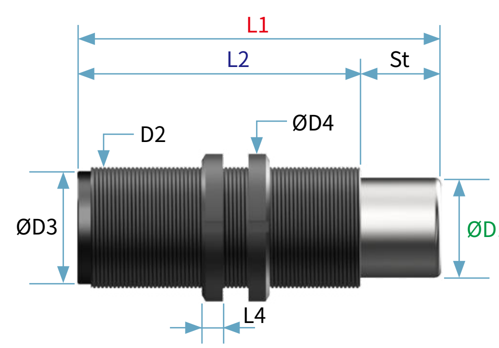
KESM Series

Engineering Data

Model	Stroke (mm) St	Max.Energy / Cycle (kJ) E_T	Dyn. Reaction Force(kN)		Impact Velocity(m/s)	Weight (kg)
			RDmin	RDmax	max	
KESM 25-12	12	0.1	6	11	2	0.3
KESM 35-22	22	0.4	14	27	4	0.7
KESM 40-22	22	0.4	14	27	5	0.8
KESM 50-35	35	1.5	28	60	5	1.9
KESM 60-35	35	1.5	28	60	5	2
KESM 75-45	45	3.5	45	100	5	5
KESM 90-60	60	7	90	150	5	10.5
KESM110-80	80	14	130	230	5	17







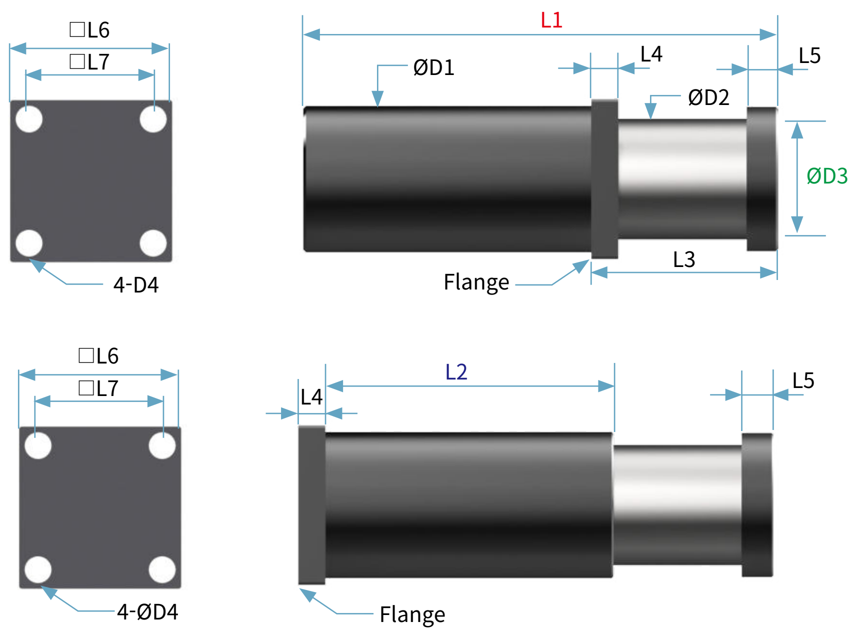
Dimensions (unit：mm)

Model	L1	L2	L3	L4	ØD1	D2	ØD3	ØD4	□D5	□D6	4-ØD7
KESM 25-12	75	53	10	7	19	M25x1.5	20	38	57	41	7
KESM 35-22	120	98	12	8	25	M35x1.5	32	52	80	60	9
KESM 40-22	120	98	12	9	25	M40x1.5	32	58	-	-	-
KESM 50-35	175	140	12	11	38	M50x1.5	45	70	90	70	9
KESM 60-35	175	140	12	11	38	M60x2.0	45	70	-	-	-
KESM 75-45	213	168	10	13	60	M75x2.0	72	98	122	100	11
KESM 90-60	270	210	12	16	74.5	M90x2.0	87	120	150	120	13
KESM110-80	337	257	14	19	90	M110x2.0	107	145	175	143	18

KESE Series

Engineering Data

Model	Stroke (mm) St	Max.Energy / Cycle (kJ) E_T	Dyn. Reaction Force(kN)		Impact Velocity(m/s)	Weight (kg)
			RDmin	RDmax	max	
KESE116-105	105	25	167	310	4	25
KESE142-130	130	50	260	500	4	37
KESE160-140	140	75	400	700	4	45
KESE180-160	160	100	470	820	4	73
KESE215-180	180	150	640	1100	4	117



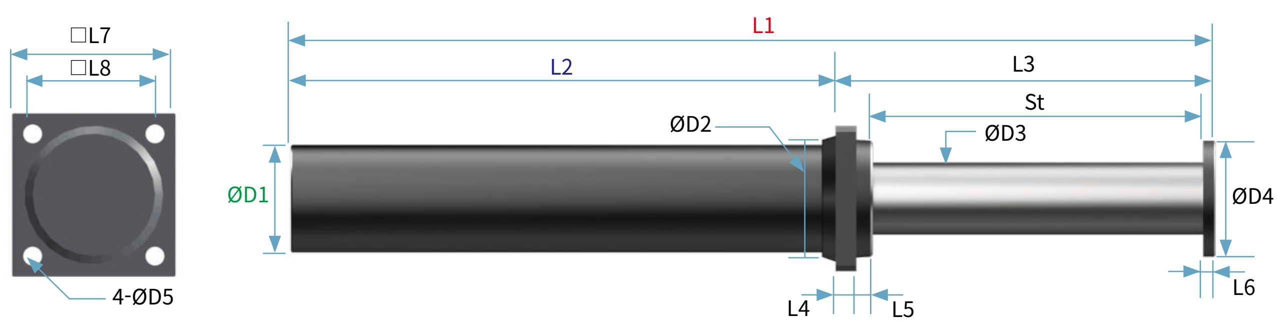
Dimensions (unit : mm)

Model	L1	L2	L3	L4	L5	□L6	□L7	ØD1	ØD2	ØD3	4-ØD4
KESE116-105	415	275	140	20	15	135	105	116	87	120	14
KESE142-130	500	325	175	30	15	155	125	142	117	140	15
KESE160-140	520	315	205	30	35	175	140	160	132	158	18
KESE180-160	585	350	235	35	40	215	170	180	153	185	22
KESE215-180	670	405	265	40	45	250	195	215	182	220	26

KESS Series

Engineering Data

Model	Stroke (mm) St	Max.Energy / Cycle (kJ) E_T	Dyn. Reaction Force(kN)		Impact Velocity(m/s)	Weight (kg)
			RDmin	RDmax	max	
KESS 50-150	150	6	25	50	3	4.2
KESS 75-150	150	12	66	100	3	11
KESS 75-200	200	12	42	78	3	11
KESS 90-200	200	25	95	150	3	20
KESS 90-270	270	25	66	112	3	25
KESS110-275	275	50	118	230	3	40
KESS110-400	400	50	75	150	3	40
KESS110-400H	400	100	175	320	3	65
KESS110-600	600	100	85	230	3	65
KESS110-800	800	150	80	250	3	115



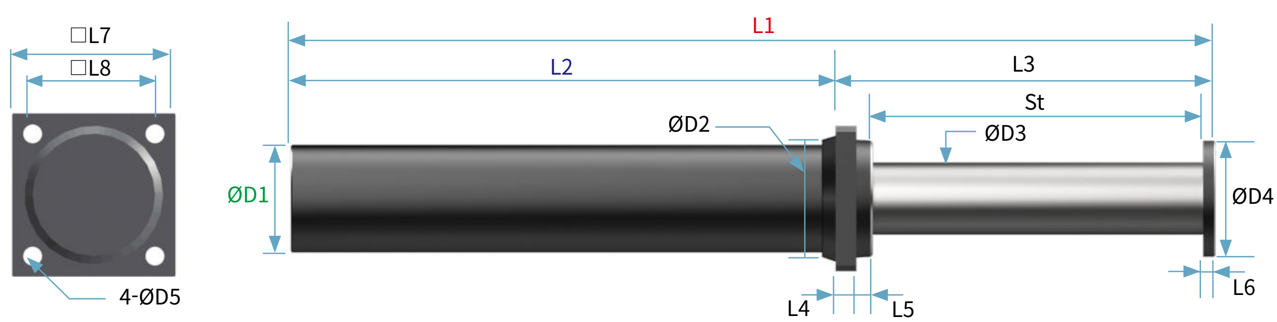
Dimensions (unit : mm)

Model	L1	L2	L3	L4	L5	L6	□L7	□L8	ØD1	ØD2	ØD3	ØD4	4-ØD5
KESS 50-150	410	231	179	19	0	10	90	70	50	90	38	50	9
KESS 75-150	480	285	195	18	15	12	110	85	75	90	57	80	11
KESS 75-200	530	285	245	18	15	12	110	85	75	90	57	80	11
KESS 90-200	620	370	250	20	18	12	135	105	90	110	72	100	14
KESS 90-270	690	370	320	20	18	12	135	105	90	110	72	100	14
KESS110-275	855	520	335	25	20	15	175	140	110	150	87	120	18
KESS110-400	980	520	460	25	20	15	175	140	110	150	87	120	18
KESS110-400H	1,370	910	460	25	20	15	175	140	110	150	87	120	18
KESS110-600	1,570	910	660	25	20	15	175	140	110	150	87	120	18
KESS110-800	2,640	1,780	860	25	20	15	175	140	110	150	87	120	18

KESH Series

Engineering Data

Model	Stroke (mm) St	Max.Energy / Cycle (kJ) E_T	Dyn. Reaction Force(kN)		Impact Velocity(m/s)	Weight (kg)
			RDmin	RDmax	max	
KESH130-400	400	100	190	310	3	63
KESH140-500	500	150	200	380	3	90
KESH140-400H	400	220	380	685	3	100
KESH155-650	650	250	270	490	3	135
KESH175-850	850	400	330	600	3	218
KESH200-1050	1,050	600	370	740	3	295
KESH220-1200	1,200	800	430	860	3	420
KESH230-1300	1,300	1,000	500	1,000	3	470



Dimensions (unit : mm)

Model	L1	L2	L3	L4	L5	L6	□L7	□L8	ØD1	ØD2	ØD3	ØD4	4-ØD5
KESH130-400	1,120	660	460	25	20	15	175	140	130	150	110	140	18
KESH140-500	1,350	775	575	30	25	20	215	170	140	185	120	150	22
KESH140-400H	1,258	783	475	30	25	20	215	170	140	185	120	150	22
KESH155-650	1,750	1,025	725	30	25	20	215	170	155	185	135	170	22
KESH175-850	2,185	1,250	935	35	25	25	265	210	175	235	150	190	27
KESH200-1050	2,555	1,420	1,135	35	25	25	265	210	200	235	175	215	27
KESH220-1200	2,935	1,630	1,305	40	35	30	300	240	220	270	190	235	30
KESH230-1300	3,225	1,820	1,405	40	35	30	300	240	230	270	205	248	30