FORKARDT

SDC

Industrial shock absorbers - self adjusting

WORKHOLDING SOLUTIONS WORLDWIDE

INDUSTRIAL SHOCK ABSORBERS

General

Increased automation in all branches of industry has resulted in higher handling and working speeds.
The resultant kinetic energy, however, rises with the square of the speed.

High kinetic energy can result in:

- damage
- destruction
- production stoppages
- repairs
- noise
- as well as costs
  arising from these causes.

Costs arising from uncontrolled kinetic energy can however be avoided.
FORKARDT industrial shock absorbers absorb kinetic energy and stop moving objects gently and reliably.
The retardation forces are thereby reduced, and can be calculated.
FORKARDT has created an entirely new generation of shock absorbers, based on its wide experience in this field.
The SDC series consists of “self adjusting“ shock absorbers which automatically compensate the effects of mass, speed and actuating force during the retardation process.
SDC shock absorbers can achieve linear retardation with a constant retarding force under favourable loading conditions.

In practice this means:

- low retardation forces
- improved dynamic performance
- higher productivity
- simpler designs
- simpler controls
- noise reduction
- less power consumption
- greater economy
- cost reduction

With the SDC series FORKARDT offers an at present unsurpassed, comprehensive and high performance range of “self adjusting" industrial shock absorbers, i. e. a range of high grade, long lasting and yet low cost hydraulic dampers.

Advantages

All series SDC shock absorbers are:

- self adjusting
- universally applicable
- cost effective

and feature:

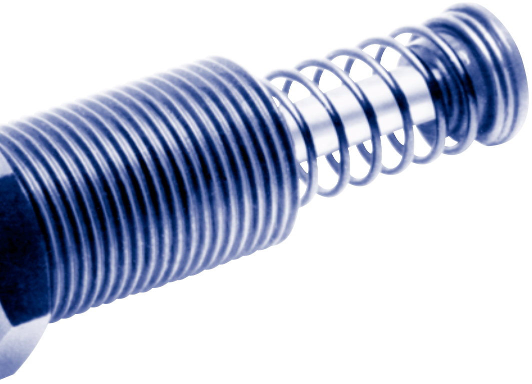
- high energy absorption
- high safety margins
- high reliability
- prolonged service
- metric dimensions
- product quality to traditionally high German standards

FORKARDT shock absorbers are outstandingly versatile, irrespective of whether it is necessary to arrest masses of a few grammes or many tons, or whether they are used in laboratories or rolling mills.

Contact

FORKARDT for a solution to your shock absorption needs.

Fields of application:



FORKARDT - Industrial Shock Absorbers		
for arresting	to facilitate	for use on
workpieces	automation	handling equipment
strips	machining	industrial robots
plates	forming	linear handling units
slabs	loading	rotary handling units
bars	unloading	machine tools
tubes	gripping	plastics processing machines
springs	lifting	textile machines
levers	lowering	packing machines
covers	swivelling	paper making machines
flaps	positioning	welding plants
doors	conveying	mechanisms
gates	closing	transfer equipment
windows	sorting	conveyors and elevators
frames	stacking	manipulators
guards	bundling	wood working machines
gate valves	indexing	pallet conveyors
sildes	handling	
carriages	machine linking	
cylinders	feeding	

Performance data

Type	Piston dia. ø mm	Stroke mm	Perm. energy absorption per stroke Nm/stroke	per hour kNm/h	Equivalent mass m_W from kg	to kg	Return spring force min. N	max. N	Permissible inclination of load °	Weight approx. kg
SDC 7 - 13 W					1	10				
SDC 7 - 13 M	7	13	17	36	10	100	4,5	11	4	0.06
SDC 7 - 13 H					100	200				
SDC 10 - 13 W					3	25				
SDC 10 - 13 M	10	13	30	46	25	250	10	19	4	0.14
SDC 10 - 13 H					200	650				
SDC 10 - 25 W					6	55				
SDC 10 - 25 M	10	25	60	58	55	480	8	20	3	0.17
SDC 10 - 25 H					410	1,330				
SDC 12 - 25 W					8	70				
SDC 12 - 25 M	12	25	80	70	70	650	11	21	3	0.27
SDC 12 - 25 H					550	1,700				
SDC 12 - 50 W					15	140				
SDC 12 - 50 M	12	50	160	92	140	1.300	14	26	2	0.38
SDC 12 - 50 H					1,000	3,500				
SDC 14 - 25 W					10	90				
SDC 14 - 25 M	14	25	100	80	90	800	29	50	4	0.44
SDC 14 - 25 H					680	2,000				
SDC 14 - 50 W					20	180				
SDC 14 - 50 M	14	50	200	105	180	1,600	26	56	3	0.54
SDC 14 - 50 H					1,300	4,400				
SDC 14 - 75 W					30	260				
SDC 14 - 75 M	14	75	300	130	260	2,400	26	60	2	0.70
SDC 14 - 75 H					2,000	6,600				
SDC 18 - 25 W					20	200				
SDC 18 - 25 M	18	25	225	120	200	1,800	56	76	4	0.80
SDC 18 - 25 H					1,500	5,000				
SDC 18 - 50 W					40	400				
SDC 18 - 50 M	18	50	450	150	400	3,600	36	76	3	0.94
SDC 18 - 50 H					3,000	10,000				
SDC 18 - 75 W					60	600				
SDC 18 - 75 M	18	75	675	180	600	5.500	38	76	2	1.15
SDC 18 - 75 H					4,500	15,000				
SDC 25 - 25 W					40	400				
SDC 25 - 25 M	25	25	450	165	400	3,600	83	115	5	1.43
SDC 25 - 25 H					3,000	10,000				
SDC 25 - 50 W					80	800				
SDC 25 - 50 M	25	50	900	200	800	7,300	50	115	4	1.64
SDC 25 - 50 H					6,000	20,000				
SDC 25 - 75 W					130	1,200				
SDC 25 - 75 M	25	75	1350	235	1,200	11,000	48	106	3	1.91
SDC 25 - 75 H					9,000	30,000				
SDC 25 -100 W					170	1,600				
SDC 25 -100 M	25	100	1800	270	1,600	14,500	50	115	2	2.30
SDC 25 -100 H					12,000	40,000				

B2

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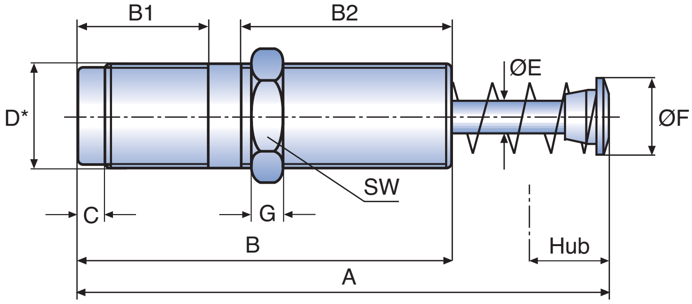
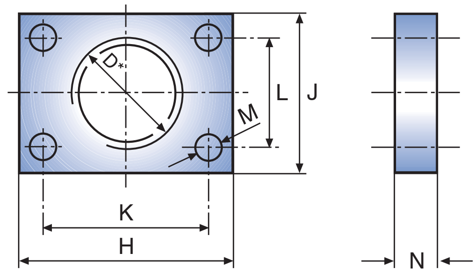
Dimensions / calculations

Shock absorber



Flange (optional)



The thread „D" is not full length from SDC 14 onwards
Other dimensions required will be supplied on request.

Performance data

Type SDC	A	B	Thread length B1	Thread length B2	C	D*	Special threads available on request	ø E	ø F	G	SW	Flange H	Flange J	Flange K	Flange L	Flange ø M	Flange N
7 - 13	87	66	overall length		7.0	M14 x 1.5	M14 x 1.0 M16 x 1.5	5	11	5	17	35	25	27	17	4.5	10
10 - 13 10 - 25	100 138	74 97	overall length		7.0	M20 x 1.5	M20 x 1.0	6	15	6	24	40	30	32	22	4.5	12
12 - 25 12 - 50	143 227	102 147	overall length		7.0	M24 x 1.5	M25 x 1.5 M27 x 1.5 M27	8	19	8	30	50	35	40	25	5.5	12
14 - 25 14 - 50 14 - 75	138 189 255	83 108 133	27.0	40 65 90	2.0	M32 x 1.5	M33 x 1.5	8	25	6	fluted nut ø 38	45	45	35	35	6.5	8
18 - 25 18 - 50 18 - 75	146 196 246	95 120 145	35.5	40 60 70	2.5	M42 x 1.5	M45 x 1.5	12	33	6	fluted nut ø 50	65	65	50	50	9.0	12
25 - 25 25 - 50 25 - 75 25 -100	155 205 265 334	105 130 155 180	40.0	45 70 90 110	4.0	M52 x 1.5		16	40	8	fluted nut ø 62	70	70	55	55	9.0	12

* Standard threads are preferable. Do not use special threads for new designs. Provide dead stop 0.5 to 1 mm prior to end of stroke. Dimensions in mm. Dimensions may be changed without prior notice. Shock absorbers may be fitted in any position. Temperature range: 0° to 80°C (other temperature ranges available on request). Other mounting styles, e.g. foot and clevis mounting, available on request.

Example of order code

SDC 10 - 25 W

- Type — SDC
- Piston dia. — 10
- Stroke — 25
- Damping action — W

	Degree of hardness	Characterisation (see dimension C)
W	Soft	red bottom
M	Medium	yellow bottom
H	Hard	blue bottom

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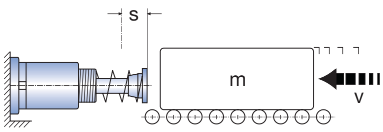
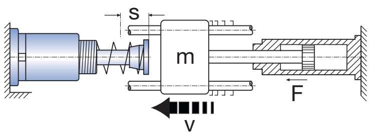
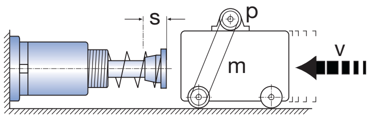
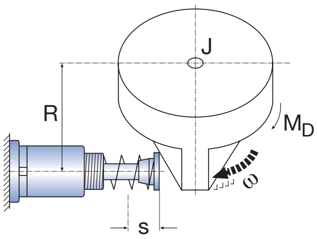
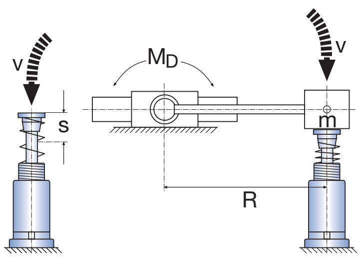
Formular and specimen calculations

Example	Loading conditions	Equations	Calculations / choice	
Mass without externally applied force 	m = 15 kg v = 1,8 m/s Z = 640 **required:** W_K, W_H, m_W	$W_K = \frac{m \cdot v^2}{2}$ $W_H = W_K \cdot Z$ $m_W = m$	$W_K = \frac{15 \cdot 1{,}8^2}{2}$ $W_H = 24{,}3 \cdot 640$ $m_W = 15$ kg **choice:** or:	**= 24,3 Nm** **= 15552 Nm/h** SDC 10 - 13 W SDC 25 - 25 W
Mass with externally applied force 	m = 20 kg v = 2 m/s F = 2000 N s = 0,025 m Z = 480 **required:** W_G, W_H, m_W	$W_G = \frac{m \cdot v^2}{2} + F \cdot s$ $W_H = W_G \cdot Z$ $m_W = \frac{W_G \cdot 2}{v^2}$	$W_G = \frac{20 \cdot 2^2}{2} + 2000 \cdot 0{,}025$ $W_H = 90 \cdot 480$ $m_W = \frac{90 \cdot 2}{2^2}$ **choice:**	**= 90 Nm** **= 43200 Nm/h** **= 45 kg** SDC 14 - 25 M
Motor driven mass 	m = 100 kg v = 1 m/s P = 2 kW s = 0,025 m H_M = 2,5 Z = Notfall **required:** W_K, A, W_G, m_W	$W_K = \frac{m \cdot v^2}{2}$ $A = \frac{P \cdot s \cdot 1000 \cdot H_M}{v}$ $W_G = W_K + A$ $m_W = \frac{W_G \cdot 2}{v^2}$	$W_K = \frac{100 \cdot 1^2}{2}$ $A = \frac{2 \cdot 0{,}025 \cdot 1000 \cdot 2{,}5}{1}$ $W_G = 50 + 125$ $m_W = \frac{175 \cdot 2}{1^2}$ **choice:** or:	**= 50 Nm** **= 125 Nm** **= 175 Nm** **= 350 kg** SDC 18 - 25 M SDC 25 - 25 W
Rotating mass 	J = 48 kgm^2 ω = 0,5 s^{-1} M_D = 630 Nm R = 0,3 m s = 0,025 m Z = 70 **required:** W_K, A, W_G, W_H, m_W	$W_K = \frac{J \cdot \omega^2}{2}$ $A = \frac{M_D}{R} \cdot s$ $W_G = W_K + A$ $W_H = W_G \cdot Z$ $m_W = \frac{W_G \cdot 2}{v^2}$	$W_K = \frac{48 \cdot 0{,}5^2}{2}$ $A = \frac{630}{0{,}3} \cdot 0{,}025$ $W_G = 6 + 52{,}5$ $W_H = 58{,}5 \cdot 70$ $m_W = \frac{58{,}5 \cdot 2}{0{,}5^2}$ **choice:**	**= 6 Nm** **= 52,5 Nm** **= 58,5 Nm** **= 4095 Nm/h** **= 468 kg** SDC 10 - 25 H
Mass with swivel drive 	m = 56 kg v = 0,4 m/s M_D = 1200 Nm R = 0,5 m s = 0,025 m Z = 120 **required:** W_K, A, W_G, W_H, m_W	$W_K = \frac{m \cdot v^2}{2}$ $A = \frac{M_D}{R} \cdot s$ $W_G = W_K + A$ $W_H = W_G \cdot Z$ $m_W = \frac{W_G \cdot 2}{v^2}$	$W_K = \frac{56 \cdot 0{,}4^2}{2}$ $A = \frac{1200}{0{,}5} \cdot 0{,}025$ $W_G = 4{,}5 + 60$ $W_H = 64{,}5 \cdot 120$ $m_W = \frac{64{,}5 \cdot 2}{0{,}4^2}$ **choice:** or:	**= 4,5 Nm** **= 60 Nm** **= 64,5 Nm** **= 7740 Nm/h** **= 806 kg** SDC 12 - 25 H SDC 18 - 25 M

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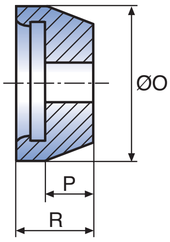
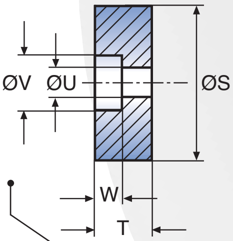
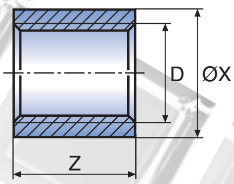
Accessories for shock absorbers



Striker cap
for fitting to piston rod end
Advantage:
noise reduction
Material: nylon



Striker plate
for bolting to the part to be arrested
Advantage:
noise reduction
Material: nylon



Dead stop
for screwing on the shock absorber body
Advantage:
no external stop required
Material: steel, phosphated

SDC	Ident. No.	ø O	P	R	Ident. No.	ø S	T	ø U	ø V	W	Ident. No.	D	ø X	Z
7-13	82210090	14	5	10	82000091	12	8	3.2	6	3,5	82210092	M14 x 1.5	18	25
10-13, 25	82010090	20	6	11	82010091	16	8	3.2	6	3,5	82010092	M20 x 1.5	25	30
12-25, 50	82030090	24	8	13	82030091	20	10	4.2	7.5	5	82030092	M24 x 1.5	32	50
14-25, 50, 75	81000090	30	10	16	81000091	25	10	4.2	7.5	5	81000092	M32 x 1.5	38	69
18-25, 50, 75	81100090	38	15	21	81100091	32	12	5.5	9.5	6	81100092	M42 x 1.5	50	65
25-25,50/75,100	81200090	46	20	27	81200091	40	12	5.5	9.5	6	81200092	M52 x 1.5	62	65/95

Explanatory note on effective mass m_w

The effective mass has to be calculated to ensure optimum operation of the self adjusting shock absorber. This is a virtual mass and is calculated from the kinetic energy/stroke (W_G) and the impact velocity. If purely kinetic energy has to be absorbed, then the effective mass corresponds to the actual mass ($m_w = m$).

Symbols and units employed

W_K	=	kinetic energy/stroke (excluding work done by drive)	Nm/stroke
W_G	=	kinetic energy/stroke ($W_G = W_K + A$)	Nm/stroke
W_H	=	kinetic energy/hour (W_G bzw. W_K x Z)	Nm/h
m	=	mass	kg
m_w	=	effective mass	kg
v	=	impact velocity	m/s
s	=	shock absorber stroke	m
F	=	external force applied	N
M_D	=	external torque applied	Nm
A	=	work done by drive (F · s)	Nm
P	=	power of drive	kW
Z	=	number of strokes/hour	
J	=	polar moment of inertia	kgm^2
ω	=	angular velocity	s^{-1}
R, r	=	radius	m
H_M	=	overload motor torque (normal: 2.5)	1... 2.5
1 N	**=**	**0.102 kp - 1 kp**	**= 9.81 N**
1 Nm	**=**	**0.102 mkp - 1 mkp**	**= 9.81 Nm**

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