FORKARDT

# SDKNE / SDKNZ

## Crane shock absorbers

WORKHOLDING SOLUTIONS WORLDWIDE

# General

FORKARDT crane shock absorbers are suitable tor reliable braking of masses.
They are more and more used instead of the conventional limit stops, the performance and operation of which are insufficient.
FORKARDT crane shock absorbers transform into heat the kinetic energy, which becomes free on the impact of one or more masses.
They are thereby in contrast to the traditional elastomere materials, which only store kinetic energies and release them as “repulsion“.
FORKARDT crane shock absorbers limit deceleration loads to a required minimum.
They thus avoid or reduce damages, which can arise from uncontrolled kinetic energies.
FORKARDT crane shock absorbers are designed for all applications ranges of transport, storage and conveying technology.
Preferably they are used as limit stops on shelf conveyor units, crane bridges and trolleys, container cranes, stripper cranes, pit - furnace cranes, radio - telescopes, hangar gates, transport carriages etc.

## FORKARDT crane shock absorbers offer many advantages, such as:

- low definable deceleration loads
- approximately constant deceleration power or linear deceleration
- reduction of stopping load on failures of control or operation errors
- protection of the accompanying operation personnel
- reduction of the risk of accidents

## FORKARDT can offer a comprehensive crane shock absorber standard programme, such as:

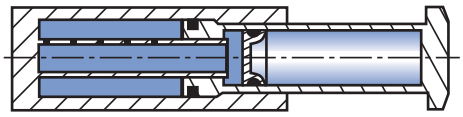
1. single - acting crane shock absorbers - **type SDKNE**
2. double - acting crane shock absorbers - **type SDKNZ**

**Particular advantages of the double - acting design:**

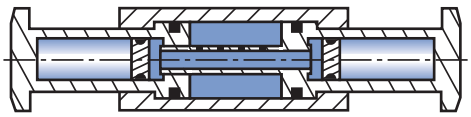
- only one shock absorber is required for decelerating bilaterally moved masses
- one shock absorber is less expensive than two
- low construction length increases the effective surface in elevated storage racks.

The most comprehensive standard programme with many various sizes and possibilities of variation will not always be sufficient for solving all shock absorbing problems. For this reason, we design and manufacture - in addition to the standard programme - special shock absorbers for any uncommon purposes.

**SDKNE**
single – acting



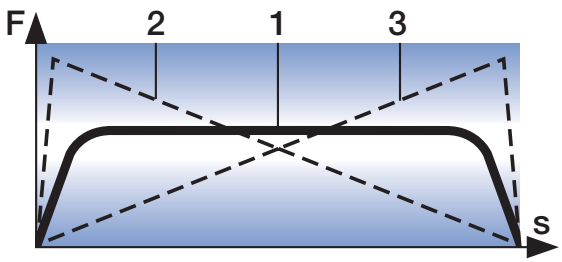
**SDKNZ**
double – acting



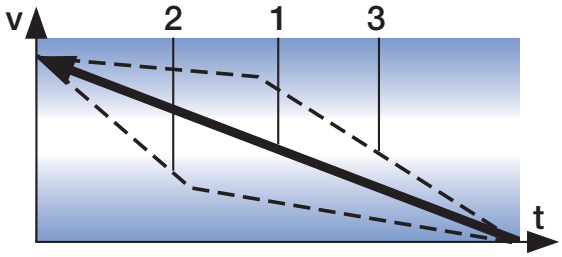
# Operation

On inserting the piston rod, the oil volume of the piston chamber penetrates into the hollow piston rod via a throttle system. There the oil volume is taken up by a nitrogen - loaded separating piston. The piston rod resetting after one working stroke is effected by the nitrogen preloading.
Identical design data produces a deceleration power, which is approximately constant over the entire stroke.
The sequence of deceleration is nearly linear - see curves 1.
In the case of loads, which vary from the design data, power or deceleration peak values as illustrated in curves 2 and 3 can result.

**Power/Travel Diagram**




**Speed/Time Diagram**




# Assembly

The shock absorbers can be installed in a position according to the respective requirements. It should be ensured that - in particular for long strokes - the piston rod is operated in axial direction. After assembly, i.e., by tightening 4 bolts, the shock absorber is ready for operation. Some static load trials are to be effected before maximum application of load.

**Note:**

The design data specified on the name plate must be in strict accordance with the actual load value on the place of use. Only then a reliable operation can be achieved.

# Calculation

Dimensioning is to be based on the respective most unfavourable load condition. The crane shock absorbers are suitable for a maximum energy input according to performance chart.

## The following data will be required for calculating the kinetic energy:

| | | | | |
|---|---|---|---|---|
| 1. | $m_A$ | = | impact mass | (kg) |
| 2. | $m_{KR}$ | = | total crane mass | (kg) |
| 3. | $m_{KA}$ | = | trolley mass | (kg) |
| 4. | $V_{KR}$ | = | crane speed | (m/s) |
| 5. | $V_{KA}$ | = | trolley speed | (m/s) |
| 6. | $L_{SP}$ | = | crane span width | (m) |
| 7. | $L_{KA}$ | = | max. trolley travel path | (m) |

**The impact mass for bridge cranes with trolleys is ascertained to the following formula:**

$$m_A = \frac{m_{KR} - m_{KA}}{2} + m_{KA} \times \frac{L_{KA}}{L_{SP}} \quad \text{(kg)}$$

## Please note:

Oscillating loads can be omitted tor ascertaining impact mass $m_A$.

**Important formulas for calculating the deceleration load:**

Deceleration load:

$$F = \frac{W_K \times 1{,}2}{s} \quad \text{(N)}$$

The support structure should be designed with a 2.5 to 3 times safety factor.

## Deceleration

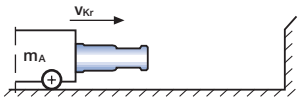
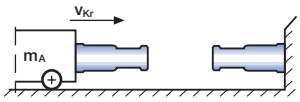
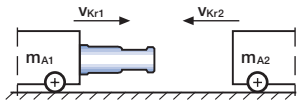
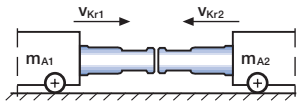
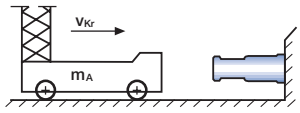
$$a = \frac{v^2}{2 \times s} \times 1{,}2 \quad \text{(m/s}^2\text{)}$$

| | | | |
|---|---|---|---|
| $W_K$ | = | kinetic energy | (Nm) |
| s | = | shock absorber stroke | (m) |
| v | = | impact speed | (m/s) |
| 1.2 | = | correction factor | |

According to DIN 15018, the energy absorption capacity of crane shock absorbers can be calculated from 85% of the nominal speed (not applicable for trolleys). If units for automatic decrease of the speed are available (e.g. limit switches), the calculation can be effected from 70% of the nominal speed.
Our calculation is based on a horizontal load, without additional drive power. Vertical, inclined or rotating loads as well as additional drive powers essentially influence the calculation of energy and are accordingly to be taken into consideration.

## Contact

FORKARDT for a solution to your shock absorption needs.

| No. | Condition of impact | Symbol | Calculation of the kinetic energy $W_K$ (Nm) for one crane shock absorber |
|---|---|---|---|
| 1 | Shock absorber against stationary stop |  | $W_K = \frac{m_A \times V_{KR}^2}{2}$ |
| 2 | Shock absorber against shock absorber 1 x stationary, 1 x movable, equal strokes |  | $W_K = \frac{m_A \times V_{KR}^2}{2 \times 2}$ |
| 3 | Shock absorber against stationary stop of two masses moved in opposite direction |  | $W_K = \frac{m_{A1} \times m_{A2} (V_{KR1} + V_{KR2})^2}{2 \times (m_{A1} + m_{A2})}$ |
| 4 | Shock absorber against shock absorber of two masses moved in opposite direction, equal strokes |  | $W_K = \frac{m_{A1} \times m_{A2} (V_{KR1} + V_{KR2})^2}{2 \times (m_{A1} + m_{A2}) \times 2}$ |
| 5 | Shelf conveyor unit against shock absorber |  | $W_K = \frac{m_A \times V_{KR}^2}{2}$ |

# Performance data and dimension charts for type SDKNE

(single-acting crane shock absorbers)

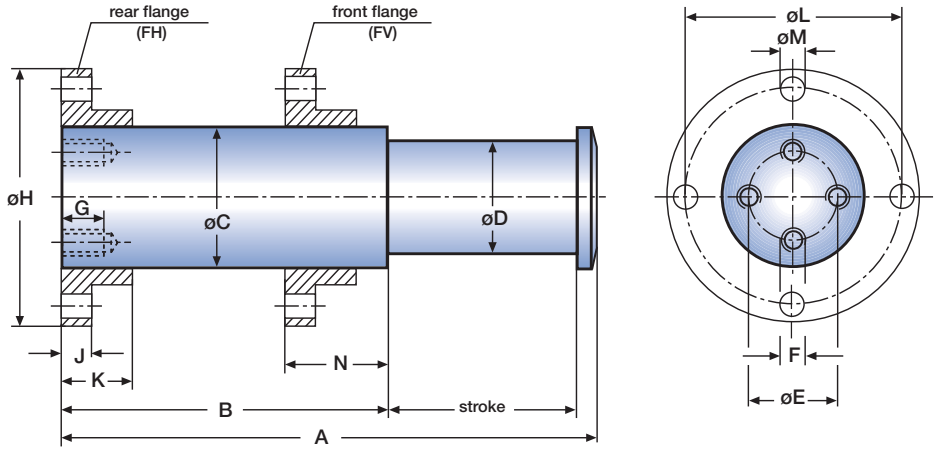
| Type SDKNE | Ident-No. | Piston dia. (mm) | Stroke (mm) | Permissible energy absorption (Nm/Hub) | max. deceleration power (N) | Static resetting power max.-min. (N) | Weight (kg) | max. brakable mass (kg) |
|---|---|---|---|---|---|---|---|---|
| 50 - 100 | 85440 | 50 | 100 | 8,000 | 80,000 | 2,200 - 350 | 6 | 30,000 |
| 60 - 200 | 85441 | | 200 | 16,000 | | | 9.5 | |
| 50 - 400 | 85442 | | 400 | 32,000 | | | 17 | |
| 50 - 600 | 85443 | | 600 | 48,000 | | | 22 | |
| 80 - 100 | 85444 | 80 | 100 | 20,000 | 200,000 | 5,200 - 900 | 18 | 75,000 |
| 80 - 200 | 85445 | | 200 | 40,000 | | | 25 | |
| 80 - 400 | 85446 | | 400 | 80,000 | | | 40 | |
| 80 - 600 | 85447 | | 600 | 120,000 | | | 55 | |
| 80 - 800 | 85448 | | 800 | 160,000 | | | 70 | |
| 125 - 200 | 85449 | 125 | 200 | 100,000 | 500,000 | 13,000 - 2,300 | 65 | 200,000 |
| 125 - 400 | 85450 | | 400 | 200,000 | | | 97 | |
| 125 - 600 | 85451 | | 600 | 300,000 | | | 128 | |
| 125 - 800 | 85452 | | 800 | 400,000 | | | 160 | |
| 125 -1,000 | 85453 | | 1,000 | 500,000 | | | 190 | |

## Example of order code

SDKNE - 50 - 200 - 5000 - 2 - OF - V

- SDKNE: Type symbol
- 50: Piston diameter (mm)
- 200: Stroke (mm)
- 5000: Impact mass (kg)
- 2: Impact speed (m/s)
- OF: Assembly method
- V: Piston rod design

Assembly method **OF** = without flange (standard design)
Assembly method **FH** = rear flange
Assembly method **FV** = front flange
Piston rod design **V** = chrome-plated



# Dimension chart SDKNE

| Piston - dia. - stroke | A | B | øC | ø D | øE | F | G | øH | J | K | øL | øM | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 - 100 | 410 | 298 | | | | | | | | | | | |
| 50 - 200 | 680 | 468 | 65 | 50 | 35 | M8 | 12 | 130 | 20 | 60 | 105 | 13 | 80 |
| 50 - 400 | 1,220 | 808 | | | | | | | | | | | |
| 50 - 600 | 1,765 | 1,153 | | | | | | | | | | | |
| 80 - 100 | 445 | 330 | | | | | | | | | | | |
| 80 - 200 | 720 | 505 | | | | | | | | | | | |
| 80 - 400 | 1,265 | 850 | 105 | 79 | 60 | M12 | 20 | 200 | 25 | 80 | 170 | 18 | 105 |
| 80 - 600 | 1,805 | 1,190 | | | | | | | | | | | |
| 80 - 800 | 2,350 | 1,535 | | | | | | | | | | | |
| 125 - 200 | 755 | 535 | | | | | | | | | | | |
| 125 - 400 | 1,290 | 870 | | | | | | | | | | | |
| 125 - 600 | 1,830 | 1,210 | 160 | 124 | 95 | M16 | 25 | 300 | 35 | 120 | 250 | 26 | 150 |
| 125 - 800 | 2,365 | 1,545 | | | | | | | | | | | |
| 125 - 1,000 | 2,900 | 1,880 | | | | | | | | | | | |

# Performance data and dimension charts for type SDKNZ

(double-acting crane shock absorbers)

| Type SDKNZ | Ident-No. | Piston dia. (mm) | Stroke (mm) | Permissible energy absorption (Nm/Hub) | max. deceleration power (N) | Static resetting power max.-min. (N) | Weight (kg) | max. brakable mass (kg) |
|---|---|---|---|---|---|---|---|---|
| 50 - 100 | 85454 | | 100 | 6,000 | | | 11.5 | |
| 50 - 200 | 85455 | 50 | 200 | 12,000 | 60,000 | 1,300 - 230 | 15 | 25,000 |
| 50 - 400 | 85456 | | 400 | 24,000 | | | 23 | |
| 50 - 600 | 85457 | | 600 | 36,000 | | | 33 | |
| 80 - 100 | 85458 | | 100 | 15,000 | | | 36 | |
| 80 - 200 | 85459 | | 200 | 30,000 | | | 46 | |
| 80 - 400 | 85460 | 80 | 400 | 60,000 | 150,000 | 2,900 - 570 | 68 | 60,000 |
| 80 - 600 | 85461 | | 600 | 90,000 | | | 90 | |
| 80 - 800 | 85462 | | 800 | 120,000 | | | 112 | |
| 125 - 200 | 85463 | | 200 | 75,000 | | | 112 | |
| 125 - 400 | 85464 | | 400 | 150,000 | | | 159 | |
| 125 - 600 | 85465 | 125 | 600 | 225,000 | 375,000 | 8,000 - 1,400 | 205 | 150,000 |
| 125 - 800 | 85466 | | 800 | 300,000 | | | 252 | |
| 125 -1,000 | 85467 | | 1,000 | 375,000 | | | 298 | |

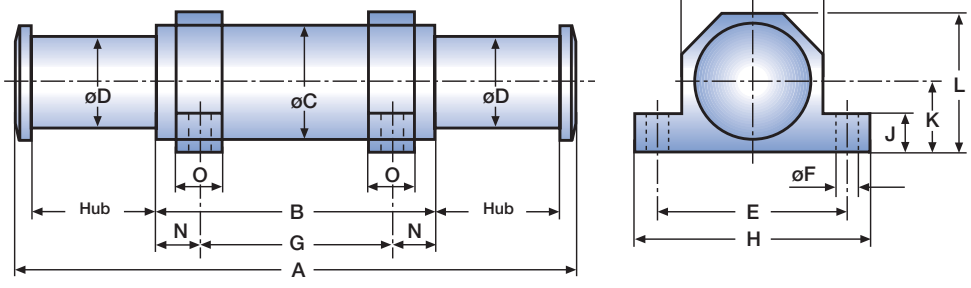
## Example of order code

SDKNZ - 50 - 200 - 5000 - 2 - V

- Type symbol
- Piston diameter (mm)
- Stroke (mm)
- Impact mass (kg)
- Impact speed (m/s)
- Piston rod design

Piston rod design **V** = chrome-plated

# Dimension chart SDKNZ




| Piston dia. - stroke | A | B | øC | ø D | E | øF | G | H | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 - 100 | 590 | 366 | | | | | 266 | | | | | | | |
| 50 - 200 | 960 | 536 | 65 | 44 | 110 | 17 | 436 | 140 | 20 | 40 | 80 | 80 | 50 | 30 |
| 50 - 400 | 1,700 | 876 | | | | | 776 | | | | | | | |
| 50 - 600 | 2,440 | 1,216 | | | | | 1,116 | | | | | | | |
| 80 - 100 | 670 | 440 | | | | | 310 | | | | | | | |
| 80 - 200 | 1,050 | 620 | | | | | 490 | | | | | | | |
| 80 - 400 | 1,810 | 980 | 105 | 70 | 170 | 26 | 850 | 220 | 30 | 60 | 120 | 120 | 65 | 50 |
| 80 - 600 | 2,570 | 1,340 | | | | | 1,210 | | | | | | | |
| 80 - 800 | 3,330 | 1,700 | | | | | 1,570 | | | | | | | |
| 125 - 200 | 1,060 | 620 | | | | | 510 | | | | | | | |
| 125 - 400 | 1,800 | 960 | | | | | 850 | | | | | | | |
| 125 - 600 | 2,540 | 1,300 | 160 | 110 | 250 | 38 | 1,190 | 320 | 50 | 90 | 180 | 180 | 55 | 70 |
| 125 - 800 | 3,280 | 1,640 | | | | | 1,530 | | | | | | | |
| 125 - 1,000 | 4,020 | 1,980 | | | | | 1,870 | | | | | | | |

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Printed in Germany
1840.10.02 E 12/08-0.0 FK