# SDH38 to SDH63

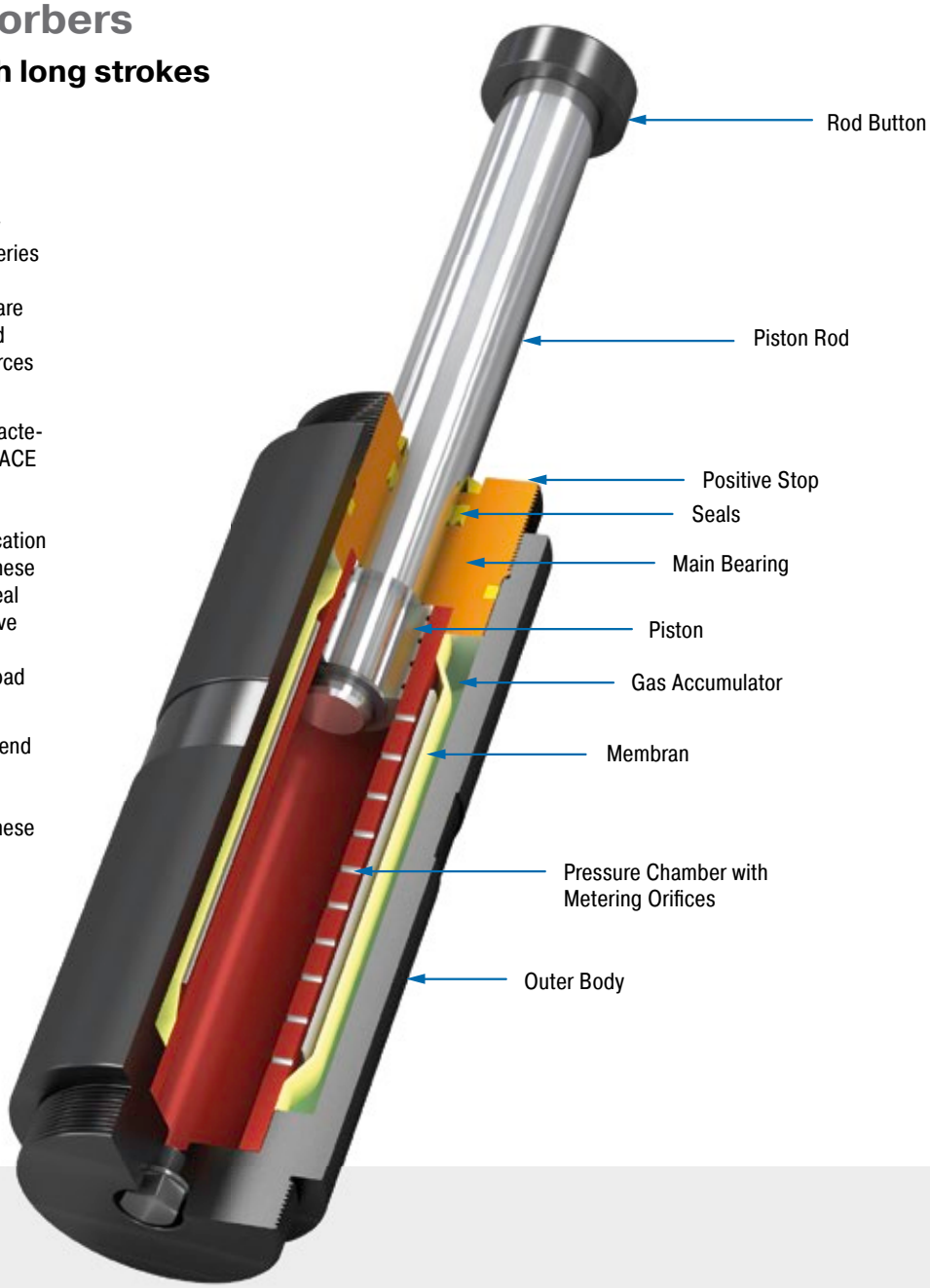
## Safety Shock Absorbers

### Low reaction forces with long strokes

Intelligent protective measure: The safety shock absorbers from the SDH38 to 63 series are also designed for emergency-stop applications. Strokes of up to 1,200 mm are possible with these maintenance-free and ready-to-install dampers. Low support forces result due to the large strokes.

The characteristic curve or damping characteristics of all safety shock absorbers from ACE is individually adjusted to the respective application, specific to the customer. The metering orifices for the respective application are specially calculated and produced. These tailor-made machine elements are the ideal protection because they are less expensive than industrial shock absorbers and are effective with up to 1,000 maximum full load emergency cycles possible.

Anyone who wants to reliably protect the end positions of rack operating equipment, conveyor and crane systems, heavy duty applications and test benches chooses these safety shock absorbers from ACE.




## Technical Data

**Energy capacity:** 3,600 Nm/Cycle to 229,100 Nm/Cycle

**Impact velocity range:** 0.5 m/s to 4.6 m/s. Other speeds on request.

**Reacting force:** At max. capacity rating = 51 kN to 210 kN

**Operating temperature range:** -20 °C to +60 °C. Other temperatures on request.

**Mounting:** In any position

**Positive stop:** Integrated

**Material:** Outer body: Painted steel; Piston rod: Hard chrome plated steel; Rod end button: Steel

**Damping medium:** HLP 46

**Filling pressure:** Approx. 5 bar. Rod return by integrated nitogen accumulator.

**Application field:** Shelf storage systems, Test stations, Heavy load applications, Conveyor systems

**Note:** For creep speed applications, please consult ACE.

**On request:** Special oils, special flanges, additional corrosion protection etc. Integrated rod sensor for indicating the complete extension of the piston rod. Type normally closed or normally open, option PNP or NPN switch.

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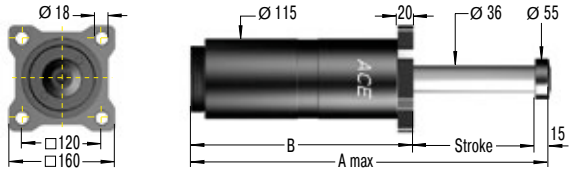
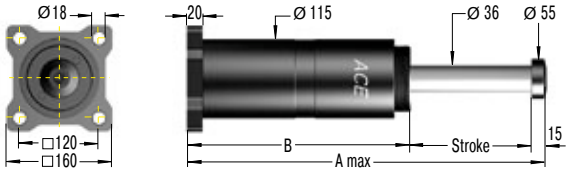
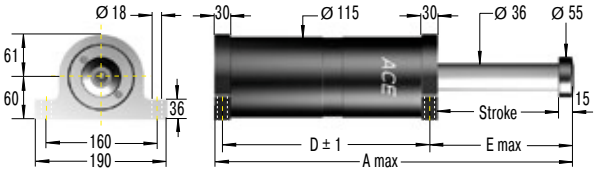
## SDH38EU-F Front Flange




## SDH38EU-R Rear Flange




## SDH38EU-S Foot Mount




## Technical Data

**Impact velocity range:** 0.9 m/s to 4.6 m/s

**The calculation and selection of the most suitable damper should be carried out or be approved by ACE.**

## Complete details required when ordering

Moving load: m (kg)
Impact velocity range: v (m/s) max.
Creep speed: vs (m/s)
Motor power: P (kW)
Stall torque factor: ST (normal, 2.5)
Number of absorbers in parallel: n

or technical data according to formulae and calculations on page 259.

**Ordering Example** **SDH38-400EU-F-XXXXX**

Safety Shock Absorber
Bore Size Ø 38 mm
Stroke 400 mm
EU Compliant
Mounting Style: Front Flange
Identification No. assigned by ACE

**Please indicate identification no. in case of replacement order**

### Performance and Dimensions

| TYPES | [1] Energy capacity Nm/cycle | [1] Reacting force N | Return force min. N | Return force max. N | Stroke mm | A max. mm | B mm | D mm | E max. mm | Mounting Style F and R Weight kg | Mounting Style S Weight kg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SDH38-50EU | 3,600 | 80,000 | 600 | 700 | 50 | 270 | 204 | 165 | 84 | 13.5 | 13.7 |
| SDH38-100EU | 7,300 | 80,000 | 600 | 700 | 100 | 370 | 254 | 215 | 134 | 15.5 | 15.7 |
| SDH38-150EU | 10,900 | 80,000 | 600 | 700 | 150 | 470 | 304 | 265 | 184 | 17.0 | 17.2 |
| SDH38-200EU | 14,500 | 80,000 | 600 | 700 | 200 | 585 | 369 | 330 | 234 | 19.5 | 19.7 |
| SDH38-250EU | 18,200 | 80,000 | 600 | 700 | 250 | 685 | 419 | 380 | 284 | 21.5 | 21.7 |
| SDH38-300EU | 21,800 | 80,000 | 600 | 700 | 300 | 800 | 484 | 445 | 334 | 23.5 | 23.7 |
| SDH38-350EU | 25,500 | 80,000 | 600 | 700 | 350 | 900 | 534 | 495 | 384 | 25.5 | 25.7 |
| SDH38-400EU | 29,100 | 80,000 | 600 | 700 | 400 | 1,015 | 599 | 560 | 434 | 28.0 | 28.2 |
| SDH38-500EU | 36,400 | 80,000 | 600 | 700 | 500 | 1,230 | 714 | 675 | 534 | 32.0 | 32.2 |
| SDH38-600EU | 43,600 | 80,000 | 600 | 700 | 600 | 1,445 | 829 | 790 | 634 | 36.0 | 36.2 |
| SDH38-700EU | 50,900 | 80,000 | 600 | 700 | 700 | 1,660 | 944 | 905 | 734 | 40.0 | 40.2 |
| SDH38-800EU | 58,200 | 80,000 | 600 | 700 | 800 | 1,875 | 1,059 | 1,020 | 834 | 44.0 | 44.2 |

[1] The values apply to mounting style Front Flange and Foot Mounting. For mounting style Rear Flange, please consult ACE.
In case of an existing side load angle, please consult ACE.



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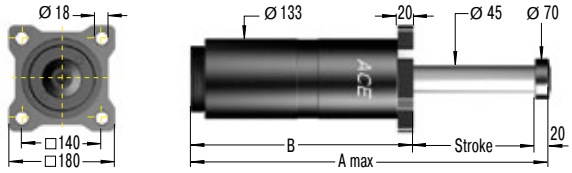
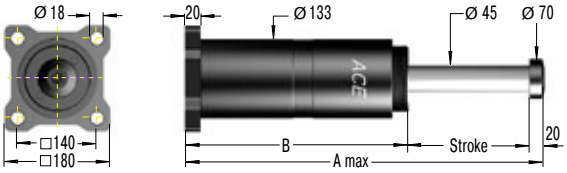
# Safety Shock Absorbers SDH50EU

## High Rack Damper, Optimized Characteristic

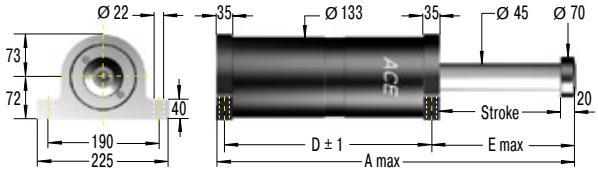
### SDH50EU-F Front Flange




### SDH50EU-R Rear Flange




### SDH50EU-S Foot Mount




## Technical Data

**Impact velocity range:** 0.6 m/s to 4.6 m/s

**The calculation and selection of the most suitable damper should be carried out or be approved by ACE.**

## Complete details required when ordering

Moving load: m (kg)
Impact velocity range: v (m/s) max.
Creep speed: vs (m/s)
Motor power: P (kW)
Stall torque factor: ST (normal, 2.5)
Number of absorbers in parallel: n

or technical data according to formulae and calculations on page 259.

**Ordering Example** **SDH50-400EU-F-XXXXX**

Safety Shock Absorber
Bore Size Ø 50 mm
Stroke 400 mm
EU Compliant
Mounting Style: Front Flange
Identification No. assigned by ACE

**Please indicate identification no. in case of replacement order**

### Performance and Dimensions

| TYPES | [1] Energy capacity Nm/cycle | [1] Reacting force N | Return force min. N | Return force max. N | Stroke mm | A max. mm | B mm | D mm | E max. mm | Mounting Style F and R Weight kg | Mounting Style S Weight kg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SDH50-100EU | 14,500 | 160,000 | 1,000 | 1,200 | 100 | 416 | 297 | 258 | 139 | 23.5 | 25.0 |
| SDH50-150EU | 21,800 | 160,000 | 1,000 | 1,200 | 150 | 516 | 347 | 308 | 189 | 26.0 | 27.5 |
| SDH50-200EU | 29,100 | 160,000 | 1,000 | 1,200 | 200 | 616 | 397 | 358 | 239 | 28.5 | 30.0 |
| SDH50-250EU | 36,400 | 160,000 | 1,000 | 1,200 | 250 | 731 | 462 | 423 | 289 | 32.0 | 33.5 |
| SDH50-300EU | 43,600 | 160,000 | 1,000 | 1,200 | 300 | 831 | 512 | 473 | 339 | 34.5 | 36.0 |
| SDH50-350EU | 50,900 | 160,000 | 1,000 | 1,200 | 350 | 931 | 562 | 523 | 389 | 37.0 | 38.5 |
| SDH50-400EU | 58,200 | 160,000 | 1,000 | 1,200 | 400 | 1,046 | 627 | 588 | 439 | 40.0 | 41.5 |
| SDH50-500EU | 72,700 | 160,000 | 1,000 | 1,200 | 500 | 1,261 | 742 | 703 | 539 | 46.0 | 47.5 |
| SDH50-600EU | 87,300 | 160,000 | 1,000 | 1,200 | 600 | 1,476 | 857 | 818 | 639 | 52.0 | 53.5 |
| SDH50-700EU | 101,800 | 160,000 | 1,000 | 1,200 | 700 | 1,691 | 972 | 933 | 739 | 58.0 | 59.5 |
| SDH50-800EU | 116,400 | 160,000 | 1,000 | 1,200 | 800 | 1,906 | 1,087 | 1,048 | 839 | 64.0 | 65.5 |
| SDH50-1000EU | 145,500 | 160,000 | 1,000 | 1,200 | 1,000 | 2,336 | 1,317 | 1,278 | 1,039 | 75.0 | 76.5 |

[1] The values apply to mounting style Front Flange and Foot Mounting. For mounting style Rear Flange, please consult ACE.
In case of an existing side load angle, please consult ACE.

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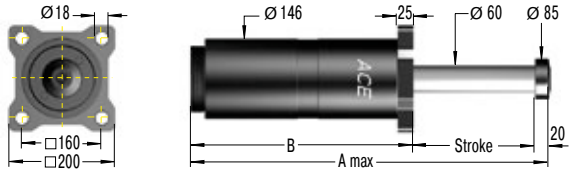
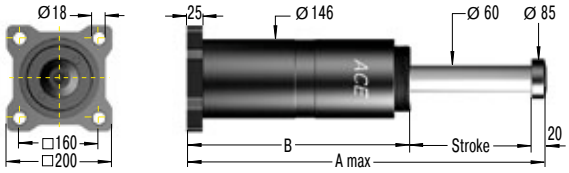
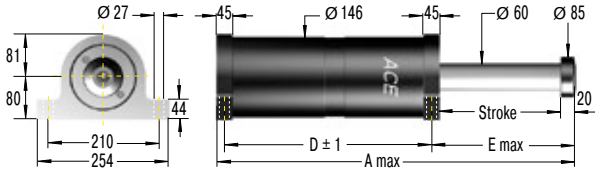
## SDH63EU-F Front Flange




## SDH63EU-R Rear Flange




## SDH63EU-S Foot Mount




## Technical Data

**Impact velocity range:** 0.5 m/s to 4.6 m/s

## Complete details required when ordering

Moving load: m (kg)
Impact velocity range: v (m/s) max.
Creep speed: vs (m/s)
Motor power: P (kW)
Stall torque factor: ST (normal, 2.5)
Number of absorbers in parallel: n

or technical data according to formulae and calculations on page 259.

**The calculation and selection of the most suitable damper should be carried out or be approved by ACE.**

**Ordering Example** **SDH63-400EU-F-XXXXX**

Safety Shock Absorber
Bore Size Ø 63 mm
Stroke 400 mm
EU Compliant
Mounting Style: Front Flange
Identification No. assigned by ACE

**Please indicate identification no. in case of replacement order**

### Performance and Dimensions

| TYPES | [1] Energy capacity Nm/cycle | [1] Reacting force N | Return force min. N | Return force max. N | Stroke mm | A max. mm | B mm | D mm | E max. mm | Mounting Style F and R Weight kg | Mounting Style S Weight kg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SDH63-100EU | 19,100 | 210,000 | 1,500 | 2,500 | 100 | 420 | 301 | 252 | 144 | 32 | 35 |
| SDH63-150EU | 28,600 | 210,000 | 1,500 | 2,500 | 150 | 520 | 351 | 302 | 194 | 35 | 38 |
| SDH63-200EU | 38,200 | 210,000 | 1,500 | 2,500 | 200 | 620 | 401 | 352 | 244 | 39 | 42 |
| SDH63-250EU | 47,700 | 210,000 | 1,500 | 2,500 | 250 | 720 | 451 | 402 | 294 | 43 | 46 |
| SDH63-300EU | 57,300 | 210,000 | 1,500 | 2,500 | 300 | 850 | 531 | 482 | 344 | 48 | 51 |
| SDH63-350EU | 66,800 | 210,000 | 1,500 | 2,500 | 350 | 950 | 581 | 532 | 394 | 52 | 55 |
| SDH63-400EU | 76,400 | 210,000 | 1,500 | 2,500 | 400 | 1,080 | 661 | 612 | 444 | 60 | 63 |
| SDH63-500EU | 95,500 | 210,000 | 1,500 | 2,500 | 500 | 1,280 | 761 | 712 | 544 | 68 | 71 |
| SDH63-600EU | 114,500 | 210,000 | 1,500 | 2,500 | 600 | 1,510 | 891 | 842 | 644 | 78 | 81 |
| SDH63-700EU | 133,600 | 210,000 | 1,500 | 2,500 | 700 | 1,740 | 1,021 | 972 | 744 | 88 | 91 |
| SDH63-800EU | 152,700 | 210,000 | 1,500 | 2,500 | 800 | 1,970 | 1,151 | 1,102 | 844 | 98 | 101 |
| SDH63-1000EU | 190,900 | 210,000 | 1,500 | 2,500 | 1,000 | 2,430 | 1,411 | 1,362 | 1,044 | 118 | 121 |
| SDH63-1200EU | 229,100 | 210,000 | 1,500 | 2,500 | 1,200 | 2,890 | 1,671 | 1,622 | 1,244 | 138 | 141 |

[1] The values apply to mounting style Front Flange and Foot Mounting. For mounting style Rear Flange, please consult ACE.
In case of an existing side load angle, please consult ACE.



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### Permitted Use

ACE safety shock absorbers are machine elements to brake moving masses in a defined end position in emergency stop situations for axial forces. The safety shock absorbers are not designed for regular operational usage.

### Calculation of safety shock absorbers

The calculation of safety shock absorbers should generally be performed or checked by ACE.

### Deceleration Properties

The orifice sizing and drill pattern in the pressure chamber are individually designed for each safety shock absorber. The respective absorption characteristic is optimised corresponding to the maximum mass that occurs in the emergency stop and the impact speed. Correspondingly, each safety shock absorber is given an individual identification number.

### Model Code

For types SCS33 to 64, the individual five-digit identification numbers can be taken from the last digits of the shock absorber model code shown on the label. Example: SCS33-50EU-1XXXX. For type series SDH38 to SDH63 and SDP63 to SDP160, the identification number is a five digit number. Example: SDH38-400EU-F-XXXXX. In addition to the model code, the label also shows the authorised maximum impact velocity and maximum authorised impact mass for the unit.

### Mounting

To mount the shock absorber, we recommend the use of original ACE mounting accessories shown in catalogue.

The mounting of each shock absorber must be exactly positioned so that the reaction force (Q) can be adequately transmitted into the mounting structure.

ACE recommends installation via the front flange -F mounting style that ensures the maximum protection against buckling. The damper must be mounted so that the moving loads are decelerated with the least possible side loading to the piston rod. The maximum permissable side load angles are detailed in our current catalogue.

The entire stroke length must be used for deceleration because only using part of the stroke can lead to overstressing and damage to the unit.

Mounting style **front flange**

Safety Shock Absorber SDH

Safety Shock Absorber SDP

### Environmental Requirements

The permissible **temperature range** for each shock absorber type can be found in our current catalogue.
**Caution:** Usage outside the specified temperature range can lead to premature breakdown and damage of of the shock absorbers which can then result in severe system damage or machine failures.

Trouble free operation outdoors or in damp environments is only warranted if the dampers are coated with a specific corrosion protection finish.

### Initial Start-Up Checks

First impacts on the shock absorber should only be tried after correctly mounting and with reduced impact speeds and – if possible – with reduced load. Differences between calculated and actual operating data can then be detected early on, and damage to your system can be avoided. If the shock absorbers were selected on calculated data that does not correspond to the maximum possible loading (i.e. selection based on drive power being switched off or at reduced impact speed) then these restricted impact conditions must not be exceeded during initial testing or subsequent use of the system. Otherwise you risk damaging the shock absorbers and/or your machine by overstressing materials. After the initial trial check that the piston rod fully extends again and that there are no signs of oil leakage. Also check that the mounting hardware is still securely tightened. You need to satisfy your- self that no damage has occurred to the piston rod, the body, or the mounting hardware.

### Fixed Mechanical Stop

Safety shock absorbers do not need an external stop as a stroke limiter. The stroke of the safety absorber is limited by the stop of the impact head on the shock absorber. For types SCS33 to SCS64, the fixed stop point is achieved with the integrated stop collar.

### What Needs to be Checked after a Full Load Impact?

Safety shock absorbers that were originally checked only at reduced speed or load need to be checked again after a full load impact (i.e. emergency use) has occurred. Check that the piston rod fully extends to its full out position, that there are no signs of oil leakage and that the mounting hardware is still securely fixed. You need to satisfy yourself that no damage has occurred to the piston rod, the body, or the mount- ing hardware. If no damage has occurred, the safety shock absorber can be put back into normal operation (see **initial start-up**).

### Maintenance

Safety shock absorbers are sealed systems and do not need special maintenance. Safety shock absorbers that are not used regularly (i.e. that are intended for emergency stop systems) should be checked within the normal time frame for safety checks, but **at least once a year**. At this time special attention must be paid to checking that the piston rod resets to its fully extended position, that there is no oil leakage and that the mounting brackets are still secure and undamaged. The piston rod must not show any signs of damage. Safety shock absorbers that are **in use regularly** should be checked **every three months**.

### Repair Notice

If any damage to the shock absorber is detected or if there are any doubts as to the proper functioning of the unit please send the unit for service to ACE. Alternatively contact your local ACE office for further advice.

Detailed information on the above listed points can be taken from the corresponding operating and assembly instructions.

Issue 08.2016 – Specifications subject to change

# Calculation Bases for the Design of Safety Shock Absorbers

More formulae on page 10 to 13

ACE shock absorbers provide linear deceleration and are therefore superior to other kinds of damping element. It is easy to calculate around 90 % of applications knowing only the following four parameters:

| | | |
|---|---|---|
| **1. Mass to be decelerated (weight)** | **m** | **[kg]** |
| **2. Impact velocity at shock absorber** | **$v_D$** | **[m/s]** |
| **3. Propelling force** | **F** | **[N]** |
| **4. Number of absorbers in parallel** | **n** | |

### Key to symbols used

| | | | | | |
|---|---|---|---|---|---|
| $W_1$ | Kinetic energy per cycle | Nm | $^2v_D$ | Impact velocity at shock absorber | m/s |
| $W_2$ | Propelling force energy per cycle | Nm | F | Propelling force | N |
| $W_3$ | Total energy per cycle ($W_1 + W_2$) | Nm | c | Cycles per hour | 1/hr |
| $^1W_4$ | Total energy per hour ($W_3 \cdot x$) | Nm/hr | s | Shock absorber stroke | m |
| me | Effective weight | kg | Q | Reaction force | N |
| m | Mass to be decelerated | kg | t | Deceleration time | s |
| n | Number of shock absorbers (in parallel) | | a | Deceleration | $m/s^2$ |
| $^2v$ | Velocity at impact | m/s | | | |

[1] All mentioned values of W4 in the capacity charts are only valid for room temperature. There are reduced values at higher temperature ranges.

[2] v or $v_D$ is the final impact velocity of the mass. With accelerating motion the final impact velocity can be 1.5 to 2 times higher than the average. Please take this into account when calculating kinetic energy.

**In all the following examples the choice of shock absorbers made from the capacity chart is based upon the values of ($W_3$), ($W_4$), (me) and the desired shock absorber stroke (s).**

**Note: When using several shock absorbers in parallel, the values ($W_3$), ($W_4$) and (me) are divided according to the number of units used.**

| Application | Formulae | Example |
|---|---|---|
| **19 Wagon against 2 shock absorbers** | $W_1 = m \cdot v^2 \cdot 0.25$<br>$W_2 = F \cdot s$<br>$W_3 = W_1 + W_2$<br>$v_D = v \cdot 0.5$ | m = 5000 kg<br>v = 2 m/s<br>F = 3500 N<br>s = 0.10 m (chosen) |
| **20 Wagon against wagon** | $W_1 = \frac{m_1 \cdot m_2}{(m_1+m_2)} \cdot (v_1+v_2)^2 \cdot 0.5$<br>$W_2 = F \cdot s$<br>$W_3 = W_1 + W_2$<br>$v_D = v_1 + v_2$ | m = 7000 kg<br>$v_1$ = 1.2 m/s<br>$m_2$ = 10000 kg<br>$v_2$ = 0.5 m/s<br>F = 5000 N<br>s = 0.10 m (chosen) |
| **21 Wagon against wagon 2 shock absorbers** | $W_1 = \frac{m_1 \cdot m_2}{(m_1+m_2)} \cdot (v_1+v_2)^2 \cdot 0.25$<br>$W_2 = F \cdot s$<br>$W_3 = W_1 + W_2$<br>$v_D = \frac{v_1 + v_2}{2}$ | m = 7000 kg<br>$v_1$ = 1.2 m/s<br>$m_2$ = 10000 kg<br>$v_2$ = 0.5 m/s<br>F = 5000 N<br>s = 0.10 m (chosen) |

| Example | | | |
|---|---|---|---|
| **19** | $W_1 = 5000 \cdot 2^2 \cdot 0.25$ | = 5000 | Nm |
| | $W_2 = 3500 \cdot 0.10$ | = 350 | Nm |
| | $W_3 = 5000 + 350$ | = 5350 | Nm |
| | $v_D = 2 \cdot 0.5$ | = 1 | m/s |
| | **Chosen from capacity chart: Model SDH38-100EU self-compensating** | | |
| **20** | $W_1 = \frac{7000 \cdot 10000}{(7000+10000)} \cdot 1.7^2 \cdot 0.5$ | = 5950 | Nm |
| | $W_2 = 5000 \cdot 0.10$ | = 500 | Nm |
| | $W_3 = 5950 + 500$ | = 6450 | Nm |
| | $v_D = 1.2 + 0.5$ | = 1.7 | m/s |
| | **Chosen from capacity chart: Model SDH50-100EU self-compensating** | | |
| **21** | $W_1 = \frac{7000 \cdot 10000}{(7000+10000)} \cdot 1.7^2 \cdot 0.25$ | = 2975 | Nm |
| | $W_2 = 5000 \cdot 0.10$ | = 500 | Nm |
| | $W_3 = 2975 + 510$ | = 3475 | Nm |
| | $v_D = (1.2 + 0.5) : 2$ | = 0.85 | m/s |
| | **Chosen from capacity chart: Model SDH38-100EU self-compensating** | | |