Rubber Buffers / Cellular Buffers

Program 0170 / 0180

CONDUCTIX wampfler
DELACHAUX GROUP

Performance tables of our Buffers (KAT0170 and KAT0180 Load Diagrams) can be downloaded from: www.conductix.de/en

Part numbers marked with * are part of our standard range and are available from stock. Delivery times for other part numbers can be provided by request.

Contents

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General Information

Stop buffers are essentially damping units that absorb energy, for example at the end of a crane runway, to prevent damage and allow for smaller structural dimensions. In general, “energy before geometry” applies to buffers because load diagrams, precisely defined characteristic curves, physical dimensions, and mathematical formulae are used when dimensioning the buffers. Geometrical dimensions are of secondary importance here. Stop bumpers are not to be used as vibration dampers or supports.

Safety, quality, and know-how are our main focus!

Modern production methods, constantly increasing working speeds, and increasing demands for ergonomic working environment, make greater demands on existing buffer systems. Due to the wide variety of available buffer designs, we can offer a solution for every application. We have a large standard range of rubber buffers and cellular buffers to provide for individual solutions. Special designs are always possible by request.

Applications:
- Travel limitation
- Energy absorption
- End stops
- End position dampening

Rubber Buffers: Program 0170
Since rubber buffers are made from cost-effective, basic materials, our program offers an economic solution for most technical requirements. The energy absorption of a rubber buffer is limited due to the compression limits of the material.

Rubber-Metal Elements: Program 0170
Rubber-metal elements are used to support dynamic loads and isolate them from vibration. As a rule, the rubber-metal elements in this catalog are calculated based on construction attributes, as opposed to energy absorption or vibrational characteristics, given their usual application as a support member and isolation element.

Cellular Buffers: Program 0180
Due to their excellent energy absorption properties the cellular buffer program is a suitable complement to the rubber buffer program. Their volume compressibility allows long compression lengths and very good deceleration values.

Rubber Buffers and Cellular Buffers at a glance

- Highest dynamic and mechanical capacity
- Versatile resilience against demanding environmental conditions
- Compression travel up to 50% buffer height

- High energy absorption abilities make cellular buffers a maintenance-free and inexpensive alternative to complex buffer systems.
- Low delay values and very good damping qualities
- Lightweight design
- Compression travel up to 80% buffer height

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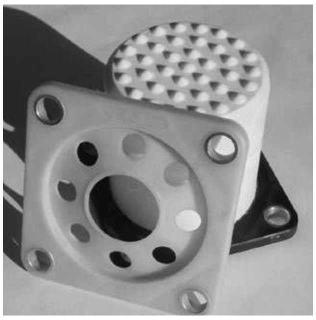
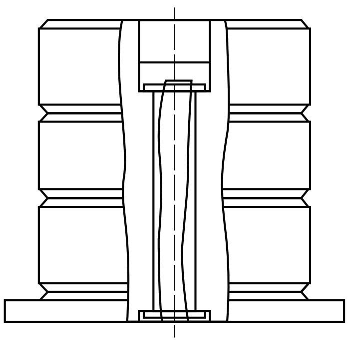
Fall Protection

Accidental falling of the stop bumpers is prevented by safeguard measures – so-called "fall protection" – which provides comprehensive safety for man and machine. Cellular bumpers with integrated safety rope and form-fitting, foam-covered cap are used for installation heights > 3 m. Fall protection is a standard feature for all cellular bumpers. The reliable vulcanization process, permanently joining the fastening element to the rubber bumper body, adds to the overall safety of the bumpers.
We take special care when choosing the raw material for our bumpers, using only the best quality materials. This results in homogenous base compounds, very high durability, and consistantly excellent energy absorption of the bumpers. Years of experience and continued development by the inventor of stop bumpers, Manfred Wampfler, still form the knowledge base of bumper manufacturing to this day.

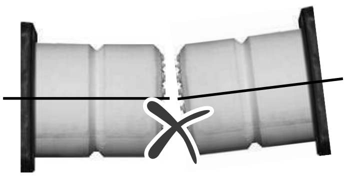


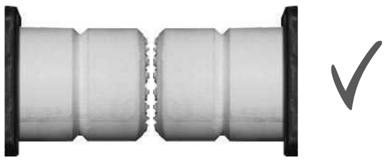


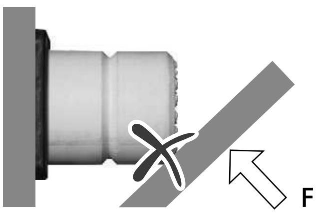
Integrated safety rope
(250 mm buffer diameter or higher)

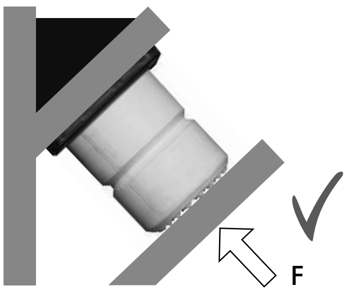
Placement

Mounting surfaces and counter-pressure surfaces must be level and parallel with the bumper. This avoids lateral forces and ensures a concentric, linear application of force and an impact over the whole reception area of the bumpers.

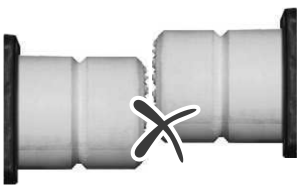


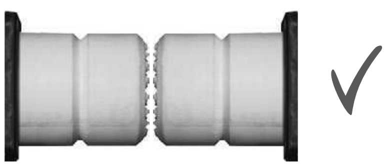






Vertical eccentricity of oppositely mounted buffers must not be higher than 10% of the buffer's diameter:





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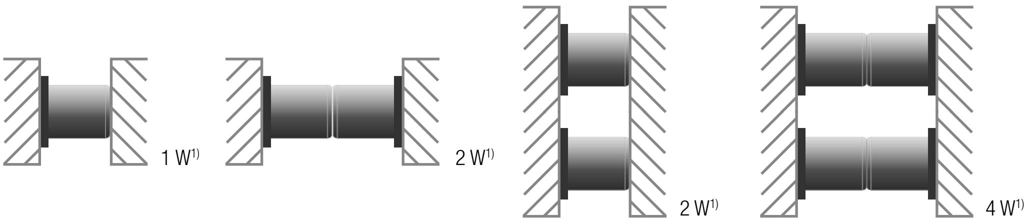
Project Planning

- Determine the effective mass and impact velocity
- Calculate the basic energy formula: **$W = \frac{1}{2} m \times v^2$**
- Determine the energy distribution for each single buffer
- Select the needed buffer (cellular or rubber material), depending on general requirements
- Select the buffer geometry according to max. buffer energy W_{max} from the tables on pages 11, 26, and 27 depending on the bumper type.
- Calculate the expected compression length
  (from diagram – see catalogs “Load Diagrams - Rubber Bumpers” and “Load Diagrams - Cellular Bumpers” on www.conductix.com)
- Calculate the resulting reacting force
- Check the resulting deceleration

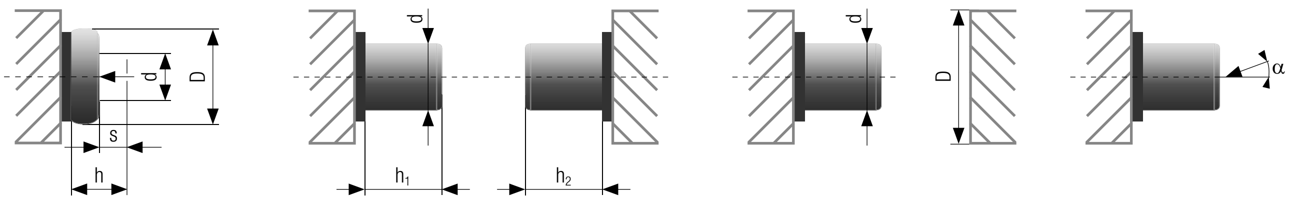
Possible Buffer Arrangements



[1)] Absorption of energy $W_{zul.}$

Buffer Loads

The load on the bumpers has to be centered and perpendicular to the bumper base plate. Do not weld the bumper base plate to the host surface. Use mounting screws according to DIN 6912 or DIN 7984.



Diameter expansion with maximum load:

- Rubber buffer:
  $s = 0.5\,h \triangleq D = 1.4\,d$
- Cellular buffer:
  $s = 0.5\,h \triangleq D = 1.25\,d$
  $s = 0.8\,h \triangleq D = 1.4\,d$

Bumper against bumper arrangement (cellular bumpers):

- Permissible:
  $h_1 + h_2 \leqq 2\,d$
- Not permissible:
  $h_1 + h_2 > 2\,d$

Because of variations in guiding and impact accuracy, the impact surface must be at least 25% greater than the buffer diameter: $D > 1.25\,d$

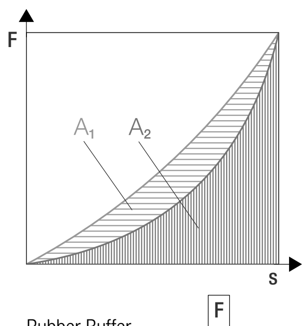
D = impact surface
d = buffer diameter

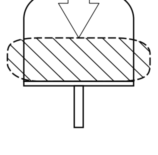
Impact direction:
$\alpha_{max} = \pm 4°$

Bumper characteristics are shown by the load-length curves. With rubber bumpers the shape of the curves mainly depends on the shape and the shore hardness.

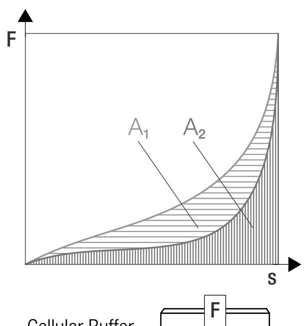
With cellular bumpers, volumetric density is the decisive factor for their physical behavior. Due to the spring characteristic curve of rubber and cellular bumpers (load **F** depending on the compression length **s**) the bumper final pressures, which are required for the specification of the neighboring components, can only be determined with static tests.

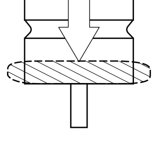
A1 = energy loss (hysteresis)
A2 = restoring energy
A1 + A2 = energy absorbed by the bumper





Rubber Buffer Compression: 50%





Cellular Buffer Compression: 80%

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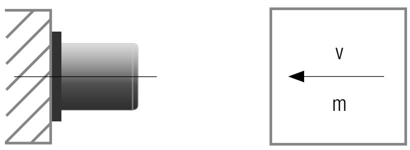
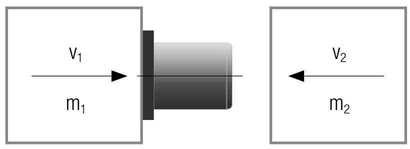
Basic Calculation Formulas

• Mass against limit stop



$$W = \tfrac{1}{2} m \cdot v^2$$

• Mass against mass

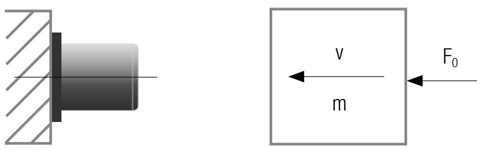


$$W = \frac{m_1 \cdot m_2 (v_1 + v_2)^2}{2(m_1 + m_2)}$$

$m_1 = m_2$ und $v_1 = v_2$

$$W = m \cdot v^2$$

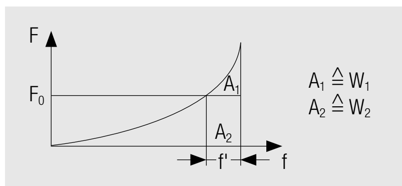
• Driven mass against limit stop



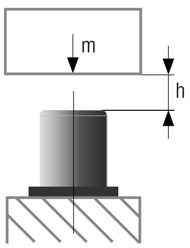
$$W = \tfrac{1}{2} m \cdot v^2$$

$$W_2 = F_0 \cdot f'$$

Buffer force-travel diagram

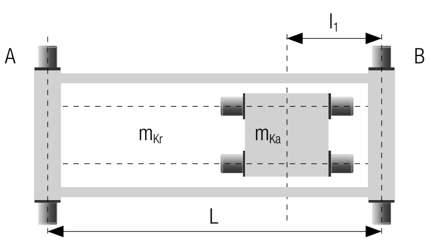


• Free fall (this formula does not apply for elevators)



$$W = m \cdot g \cdot h$$

• Calculation of buffers for cranes



$$W_B = \tfrac{1}{2} m_B \cdot v^2$$

$$m_B = \frac{m_{Kr}}{2} + \frac{m_{Ka}(L - l_1)}{L}$$

- Oscillating masses not taken into account
- Centrifugal moment of rotating parts must be taken into account
- Velocity must be reduced according to DIN 15018:
  v = 100% rated velocity on trolleys
  v = 85% rated velocity on cranes
  v = 70% rated velocity on cranes with brakes

• Formulas for calculating the deceleration

$$a_{mitt} = \frac{v^2}{2f}$$

$$a_{max} = \frac{F}{m}$$

a_{mitt}:	Median deceleration	(m/s^2)	h:	Drop height	(m)	m_B:	Mass on rail B	(kg)
a_{max}:	Maximum deceleration	(m/s^2)	L:	Rail spacing	(m)	v:	Velocity	(m/s)
F_0:	Driving force	(kN)	l:	Distance m_{Ka} to B	(m)	$v_{½}$:	Velocity body 1 / body 2	(m/s)
F:	Maximum buffer force	(kN)	m:	Mass	(kg)	w:	Kinetic energy	(kNm)
f:	Compression length	(mm)	m_{Kr}:	Mass crane without trolley	(kg)	w_1:	Kinetic energy	(kNm)
f':	Acting compression	(mm)	m_{Ka}:	Mass of trolley	(kg)	w_2:	Work acting through F_0	(kNm)
g:	Gravity acceleration	(9.81 m/s^2)	m_1/m_2:	Mass body 1 / body 2	(kg)	w_{zul}:	Max. energy absorption	(kNm)

Rubber Buffers
Program 0170

General Information

Natural caoutchouc rubbers are characterized by their very high elasticity, notch impact resistance, and good abrasion resistance. Among all elastomers, these have the highest mechanical and dynamic load capacities. Natural caoutchouc is not resistant to electrolytic liquids, aliphatic, aromatic hydrocarbons, or chlorinated hydrocarbons.

Oil and natural gas are the basic materials for synthetic caoutchouc. For many years, this has been a substitute material for natural caoutchouc, but today synthetic caoutchouc is increasingly used as first choice for many applications. Today there are a wide range of synthetic caoutchoucs, whose properties allow a variety of applications thereby establishing the use of rubber technology within modern methods. Rubber is not merely a chemical substance, but a compound of many different materials.
The varied mechanical and anti-corrosive properties can only be achieved by a recipe of several hundred substances. Caoutchouc, as a macro-molecular material, provides the elastic components of the rubber. The mechanical properties, such as breaking elongation, resilience elasticity, strength, and continuous breaking strength are dependent on it. The addition of chemicals and other additives and the subsequent vulcanization process make the material useful.
The multitude of additive combinations as well as the many physical forms means that for most problems there is a solution.

Rubber buffers are molded to the metal base plates. In rubber buffers with threaded bolts, the bolts are inserted twist-proof.
Visible areas are primed or galvanized, respectively.

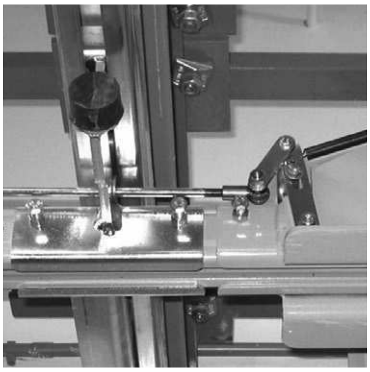
Example Part Number

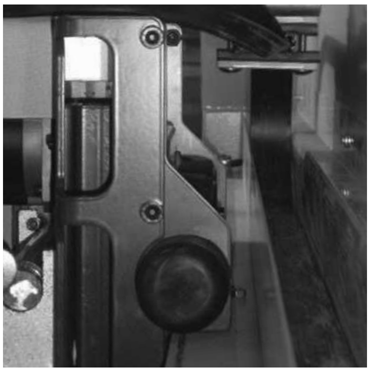
Part No.: 017220-080x040

- **Buffer type** — 017220
- **Diameter d_1 [mm]** — 080
- **Height h_1 [mm]** — 040

Application Examples

- Crane systems
- Transfer cars
- Smelter and rolling mill machines
- Handling technology
- Plant construction and engineering
- Conveyor, transport, and gate systems, etc.





Rubber Buffers
Program 0170

Conductix-Wampfler Standard Rubber Quality

N-Quality
- Resilient and tear-resistant
- Aging resistant
- Material incompressible
- Operating temperature: -30 to +70°C*
- Hardness: 70 Shore A +/-5

S-Quality (by request only)
- Seawater and ozone-resistant, weather-proof, oil and to a large extent acid and aging resistant
- Operating temperature: -30 to +80°C
- Hardness: 70 Shore A +/-5

Special qualities and special constructions by request!
* Characteristics may change depending on ambient temperature

Quality Degrees of the Most Common Materials

Conductix-Wampfler Qualities	N	S	Special Qualities [1]			
International abbreviated designation	**NR** Natural caoutchouc	**CR** Chloroprene caoutchouc	**SBR** Styrene-Butadiene caoutchouc	**EPDM** Ethylene-Propylene Terpolymere	**NBR** Nitrile-Butadien caoutchouc	**VMQ** Silicone caoutchouc
Abrasion resistance	++	++	++	+	++	--
Breaking elongation	+++	++	++	+	++	○
Tear resistance	++	++	+	+	+	---
Rebound resistance	++	+	+	+	+	+
Tensile strength not reinforced	+++	+	--	--	--	---
Tensile strength reinforced	+++	++	++	+	++	○
Temperature resistance, hot air	+90 °C	+120 °C	+100 °C	+150 °C	+130 °C	+200 °C
Temperature resistance, coldness	-50 °C	-30 °C	-40 °C	-40 °C	-40 °C	-80 °C
Alkali resistance	+	++	+	++	+	--
Aging resistance	+	++	+	+++	+	+++
Gasoline resistance	---	++	○	--	+++	--
Electrical insulation resistance	+++	+	++	++	4	+++
Oil and grease resistance	---	++	--	○	+++	+++
Ozone resistance	○	++	○	+++	+	+++
Acid resistance	+	++	+	+++	○	--
Hot water	+	+	++	++	+	--

Quality degrees of the individual material properties (depending on interactions and exposure time):
+++ = very good; ++ = good; + = satisfactory; ○ = sufficient; -- = deficient; --- = insufficient
Tolerances of the rubber parts according to ISO 3302-1M
[1] Special qualities available only in large order quantities – please contact us!

Rubber Buffers
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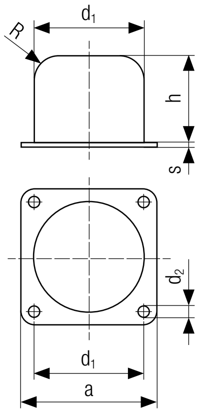
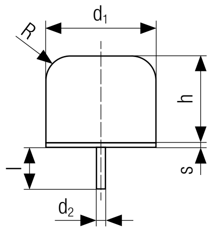
With Steel Base Plate



Part No.	W_{max} [J]	F [kN]	Weight [kg]	d_1 [mm]	h [mm]	a [mm]	d_2 [mm]	R [mm]	s [mm]	PU [1] [Qty.]
017110-040x032N [2] *	57.5	9	0.09	40	35	50	5.5	–	2	1
017110-050x040N [2] *	90	13	0.17	50	43	63	6.5	–	2	1
017110-063x050N [2] *	200	25	0.36	63	54	80	6.5	–	3	1
017111-080N*	400	40	0.88	80	63	100	11	16	6	1
017111-100N*	800	63	1.82	100	80	125	13	20	6	1
017111-125N*	1600	100	3.25	125	100	160	17	25	6	1
017111-160N*	3200	160	6.50	160	125	200	17	32	8	1
017111-200N*	6300	250	11.30	200	160	250	21	40	8	1
017111-250N*	12500	400	22.60	250	200	315	21	50	10	1
017111-315N*	25000	630	41.20	315	250	400	21	63	10	1

* Standard range
1) = Packing Unit = Minimum Order Qty.
2) = Conical form, see drawing on page 13

With Threaded Bolt



Part No.	W_{max} [J]	F [kN]	Weight [kg]	d_1 [mm]	h [mm]	l [mm]	d_2 [mm]	R [mm]	s [mm]	PU [1] [Qty.]
017120-080N*	400	40	0.6	80	63	37	M12	16	3	1
017120-100N*	800	63	1.1	100	80	36	M12	20	4	1
017120-125N*	1600	100	2.1	125	100	46	M16	25	4	1
017120-160N*	3200	160	4.4	160	125	44	M16	32	6	1
017120-200N*	6300	250	8.4	200	160	49	M20	40	6	1
017120-250N*	12500	400	16.3	250	200	47	M20	50	8	1

* Standard range
1) = Packing Unit = Minimum Order Qty.