KoRo·IBS
MOVING AND BRAKE SYSTEM

Rubber- and cellular buffers

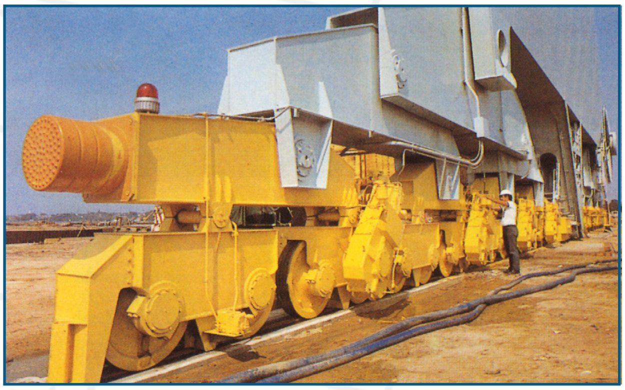
Rubber- and cellular buffers

Industrial Brakes · Thrusters · Pressure Oil Pumps · Couplings · Hydraulic Buffers · Cellular Buffers
Rail Pliers · Sheaves · Hook Blocks · Crane Rail Wheels · Rail Clamps · Reparation · Service

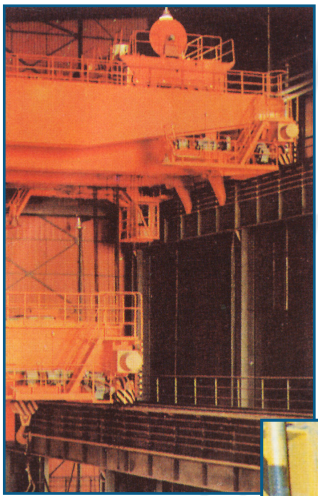
Buffers with high energy absorption capacity are required on cranes to avoid deformation of structural components when the crane strikes against the runway limit stop. For this purpose, a special cellular buffer has been developed which is also useful in any other application where impact energy with a limit maximum load is to be converted.

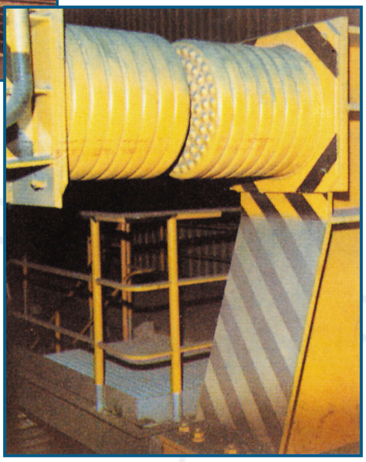
Polyurethane®, a cellular material with excellent physical properties, is used for the buffer body whose elasticity and energy absorption capacity are materially improved by the cellular structure. Due to the specific properties of the plastic material employed and to the action of the gas occluded in the cells, the energy absorption increases with impact velocity.

There is no limit stop that would restrict the compression of the buffer body, so that even in the case of a violent collision the cushioning effect is maintained till the end of impact.


Cellular buffers at the travel unit of a 900 t gantry crane


Cellular buffers at the travel unit of a 200 t shipyard crane


Cellular buffers at the travel units of two 175 t ladle cranes


Cellular buffers at the travel unit of a 250 t ladle crane and at the end stop of the crane track

The entire buffer volume is utilized to absorb energy, since the impact load will be distributed throughout the buffer's cross-sectional area. The buffer undergoes very little radial expansion even under the largest possible compression.

A favourable diameter-to-length ratio in conjunction with non-slip face make the cellular buffer virtually insensitive to axial misalignment due to the crane's normal wheel/rail clearance.

The buffer material provides chemical resistance to ozone, oxygen, water, gasoline and most oils and industrial lubricants. The buffer works silently. Its shock-absorbing capacity is fully retained over a temperature range from – 40°C to + 80°C.

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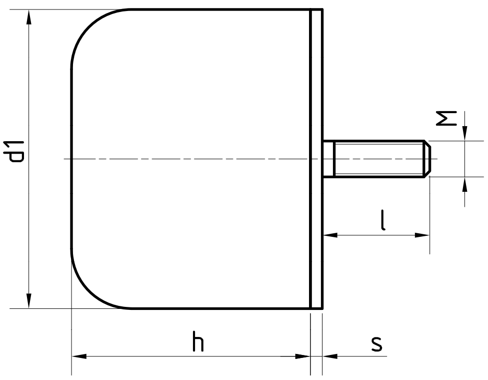
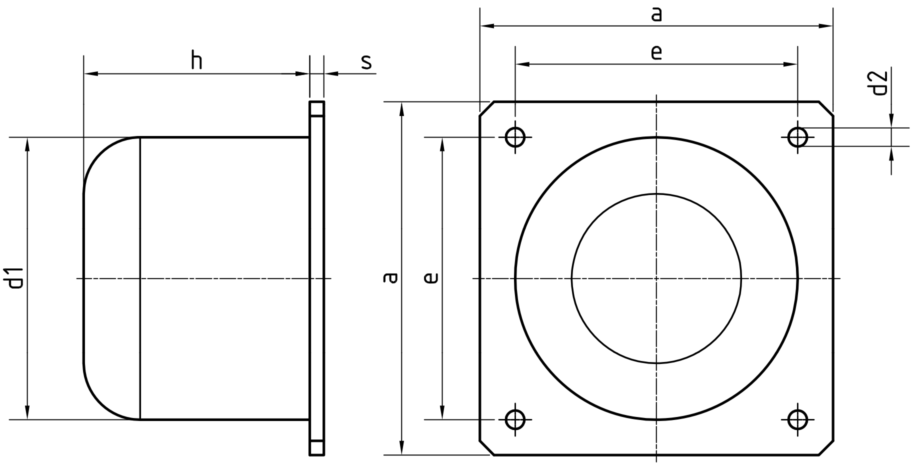


Type GPZ



Type GPP

Size	Dimensions							Energy absorption characteristic	Wheel travel	End force	Weight kg	
d_1	a	d_2	e	h	l	s	M	kJ[1)]	mm[1)]	kN[1)]	KPG	GPP
40	50	5,5	40	32	28	2	M 8	0,05	16	10	0,07	0,08
50	63	6,5	50	40	33	2	M10	0,10	20	16	0,14	0,15
63	80	6,5	63	50	32	3	M10	0,20	25	25	0,26	0,31
80	100	9,0	80	63	37	3	M12	0,39	32	39	0,50	0,59
100	125	9,0	100	80	36	4	M12	0,78	40	62	0,98	1,20
125	160	11,0	125	100	46	4	M16	1,57	50	98	1,90	2,30
160	200	11,0	160	125	44	6	M16	3,14	63	157	4,10	4,90
200	250	13,0	200	160	49	6	M20	6,18	80	245	7,80	9,50
250	315	13,0	250	200	47	8	M20	12,30	100	392	16,40	19,40
315	400	-	315	250	-	-	-	24,50	125	618	-	-

1) These values are only valid for strokes that occur in crane operations

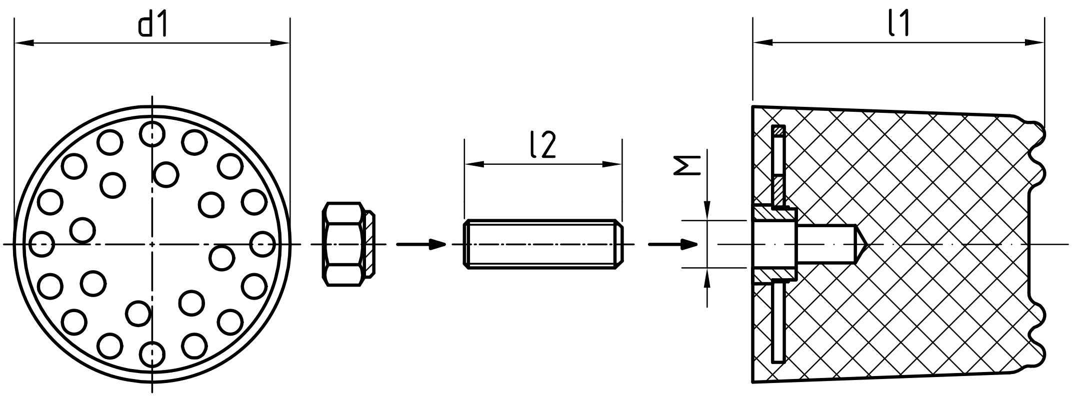
Rubber buffer with thread:
Rubber quality: NK/SBR 70 +/-5 Shore A
Other qualities upon request
Metal parts are white zinc-plated

Rubber buffer with baseplate:
Material plate: S 235 JR

Customer-specific design upon request

Cellular Buffer KPZ

Data sheet



Size				Energy absorption characteristic	Wheel travel	End force		Weight
d_1	l1	l2	M	kJ (max)***	mm*	kN**	kN (max)***	kg
KPZ 70	70			0,9	46,2	18	37	0,4
KPZ 100	105	45	M 12	2,6	70,0	27	70	0,8
KPZ 130	125			5,1	84,0	45	105	1,2
KPZ 160	155	55		9,2	105,0	95	150	1,8
KPZ 210	205	85	M 20	20,0	140,0	120	270	4,1

* recommended maximal deformation (70% of H)
** at recommended max. deformation and 120 m/min
*** data for impact speed of 240 m/min
for lower speeds is the max. energy absorption reduced
data can be taken from the characteristics

Reliabilities:

Polyetherurethane is in the temperature range -40 ° C to +80 ° C max.

Transient temperature peaks up to +110 °C are possible.

Polyetherurethane is resistant to oils, fats and other chemicals and has good resistance to hydrolysis, too.

Material buffer:

Mixed cellular polyetherurethane 500 – 600 kg/m³

Material symbol >PUR<

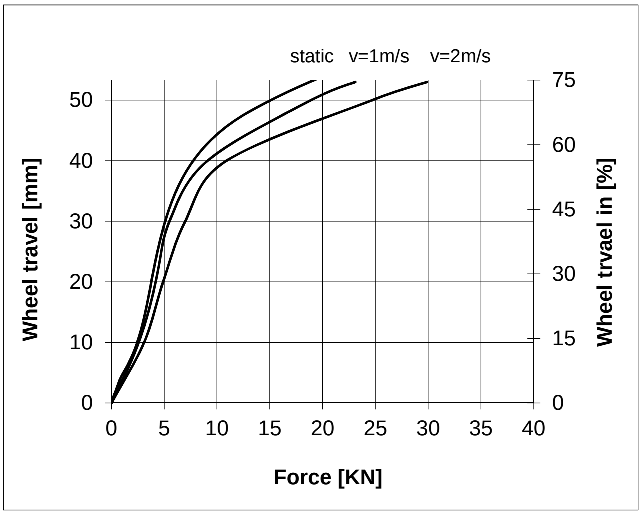
Pin: 8.8

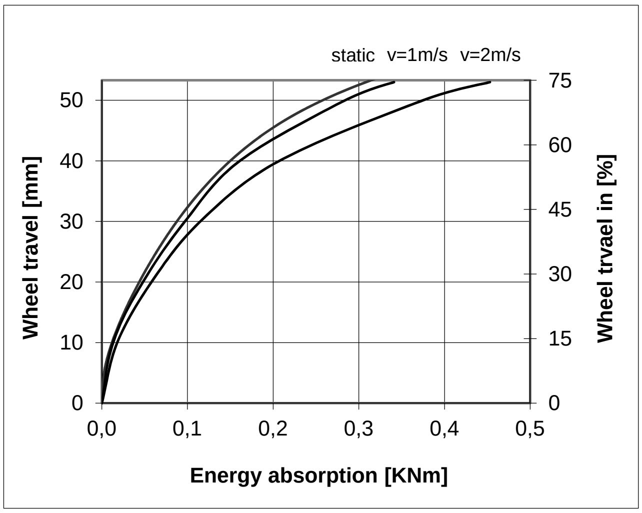
These buffers aren’t usable as springs.

Usage of buffer against buffer H max. <= 1,5 x D

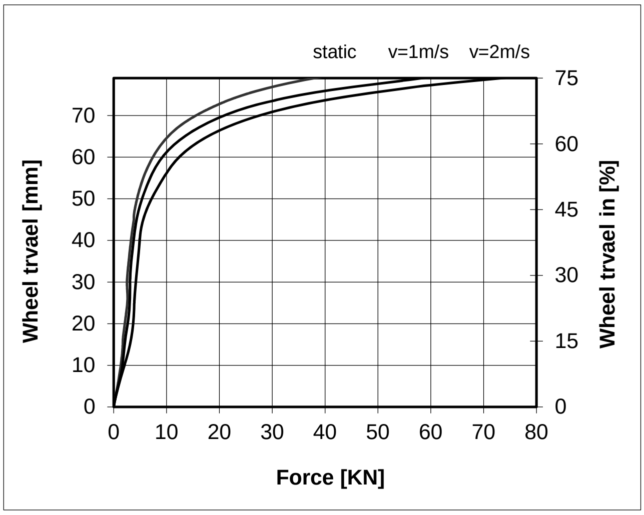
Cellular Buffer KPZ
Characteristics

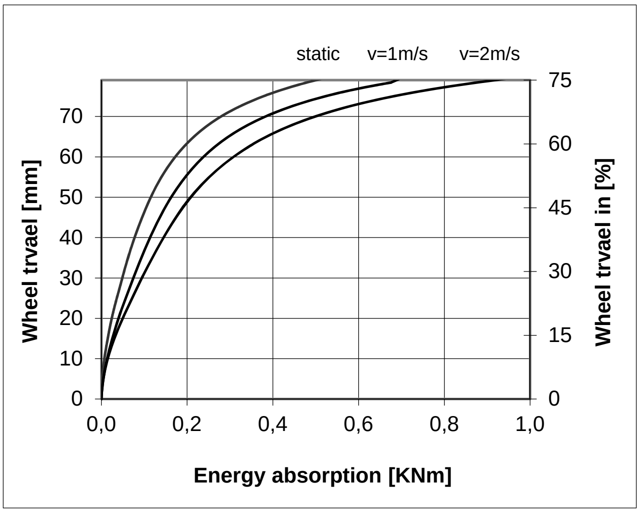
Bump stop KPZ 70



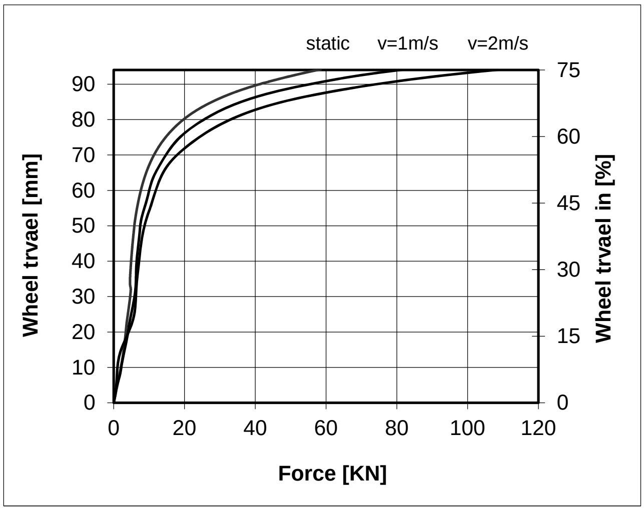


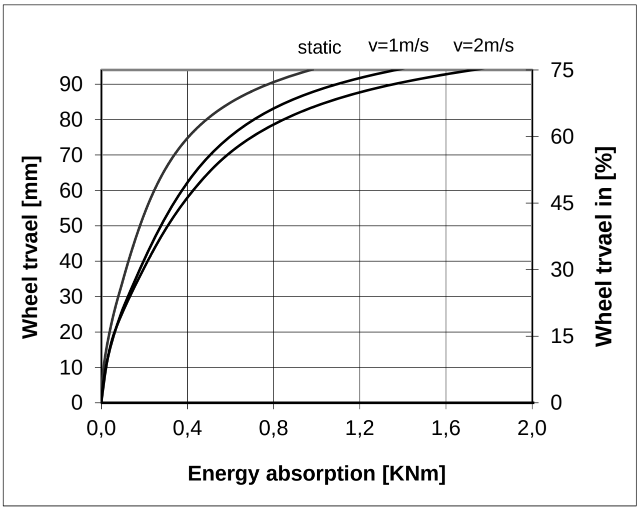
Bump stop KPZ 100



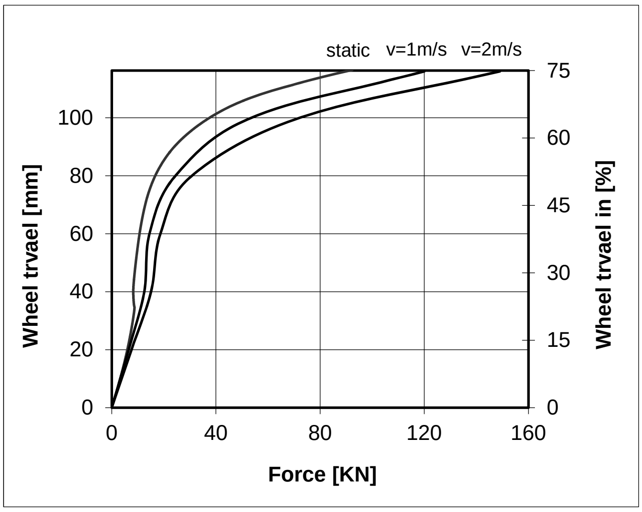


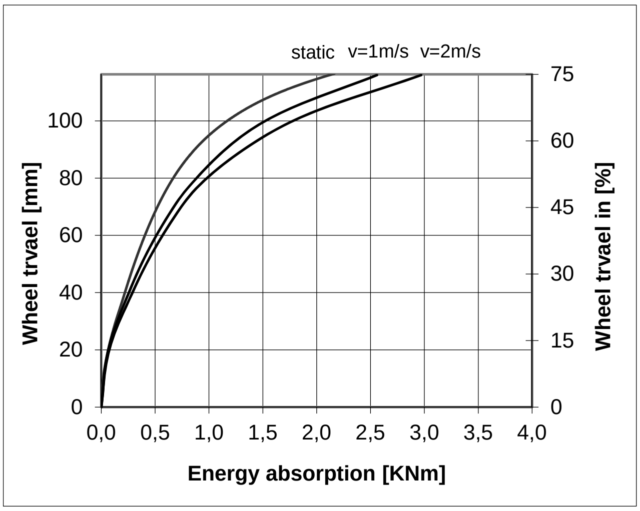
Bump stop KPZ 130



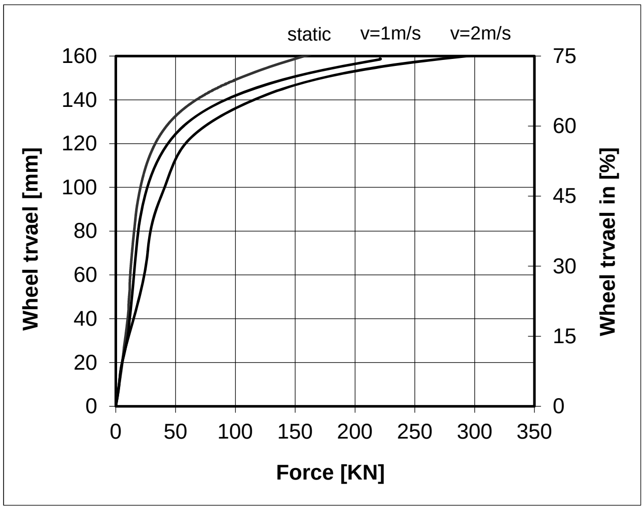


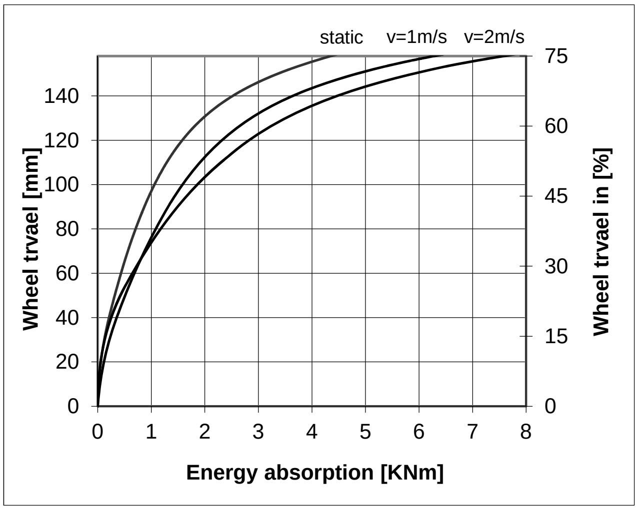
Bump stop KPZ 160





Bump stop KPZ 210





Example for the calculation of the kinetic energy [KNm] and the selection process of a bump stop

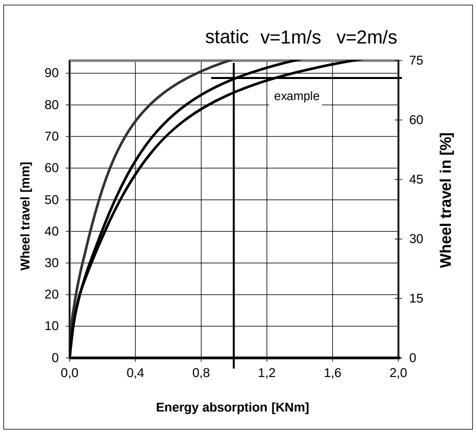
Application: Mass against impact

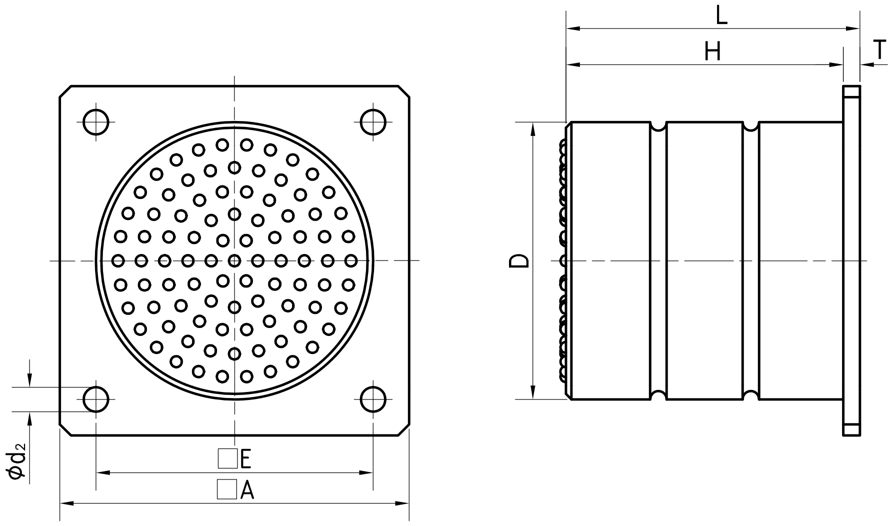
Calculation formula: $W = \frac{1}{2} m v^2$

Characteristics:
Mass m = 2000 Kg
Velocity v = 1.0 m/s
Deformation % = 70%

Calculation: $W = \frac{1}{2} \times 2000 \times 1.0$
= 1000 Nm
= 1.0 KNm

Selection: Bump stop
KPZ 130





label: ZPP D x H/L

Size							Energy absorption characteristic		Wheel travel	End force	Weight
D	H	L	E	A	d2	T	kJ**	kJ (max)	mm*	kN*	kg
80	80	90	80	110	12,5	10	1,4	1,5	56,0	43	1,3
100	100	110	100	125	12,5	10	2,6	3,2	70,0	70	2,0
	150	160					3,8	4,6	105,0		3,8
125	125	137	125	160	17,0	12	5,5	6,6	87,5	118	3,1
160	160	172	160	200	17,0	12	10,7	12,4	112,0	180	5,5
	240	252					16,0	18,5	168,0		6,4
200	200	214	200	250	21,0	14	20,0	25,0	140,0	270	10,0
	300	314					30,0	37,0	210,0		11,8
250	250	265	250	320	21,0	15	43,0	49,0	175,0	460	16,5
315	315	330	315	400	21,0	15	86,0	96,0	220,5	730	27,5
	475	490					128,0	142,0	332,5		49,0
400	400	420	400	500	25	20	188,0	190,0	300,0	1250	66,0
	600	620					282,0	290,0	450,0		81,0

* recommended maximal deformation
** at recommended max. deformation

Reliabilities:

Polyetherurethane is in the temperature range -40 ° C to +80 ° C max.

Transient temperature peaks up to +110 °C are possible.

Polyetherurethane is resistant to oils, fats and other chemicals and has good resistance to hydrolysis, too.

Material buffer:

Mixed cellular polyetherurethane 500 – 600 kg/m³

Material symbol >PUR<

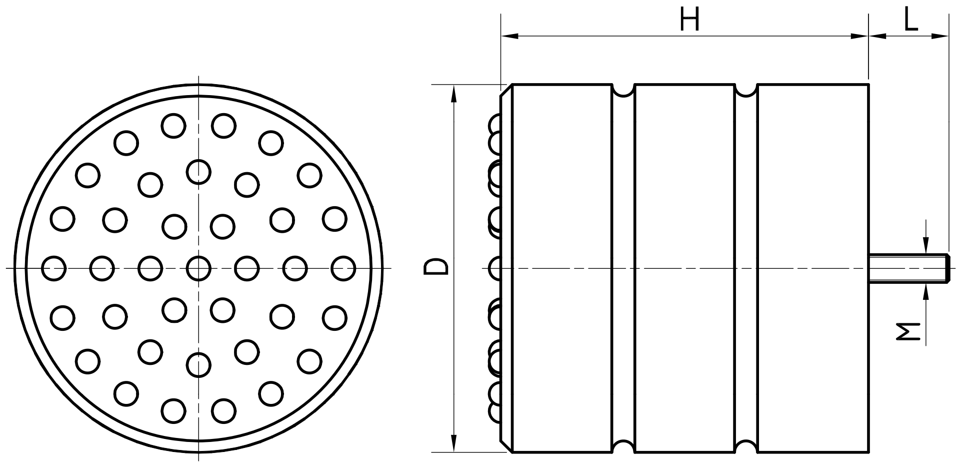
Material Plate:

S 235 JR

These buffers aren't usable as springs.

Usage of buffer against buffer H max. <= 1,5 x D

Cellular Buffer ZPZ



label: ZPZ D x H

Size				Energy absorption characteristic		Wheel travel	End force	Weight
D	H	L	M	kJ**	kJ (max)	mm*	kN*	kg
80	80	35	M12	1,4	1,5	56,0	43	0,35
100	100			2,6	3,2	70,0	70	0,55
	150			3,8	4,6	105,0		0,80
125	125			5,5	6,6	87,5	118	1,00
160	160			10,7	12,4	112,0	180	1,90
	240			16,0	18,5	168,0		2,80
200	200			20,0	25,0	140,0	270	3,50
	300			30,0	37,0	210,0		5,20
250	250	80	M24	43,0	49,0	175,0	460	8,60
315	315			86,0	96,0	220,5	730	14,80
	475			128,0	142,0	332,5		21,00
400	400		M30	188,0	190,0	300,0	1250	29,10
	600			282,0	290,0	450,0		41,60

* recommended maximal deformation
** at recommended max. deformation

Reliabilities:

Polyetherurethane is in the temperature range -40 ° C to +80 ° C max.
Transient temperature peaks up to +110 °C are possible.
Polyetherurethane is resistant to oils, fats and other chemicals and has good resistance to hydrolysis, too.

Material buffer:

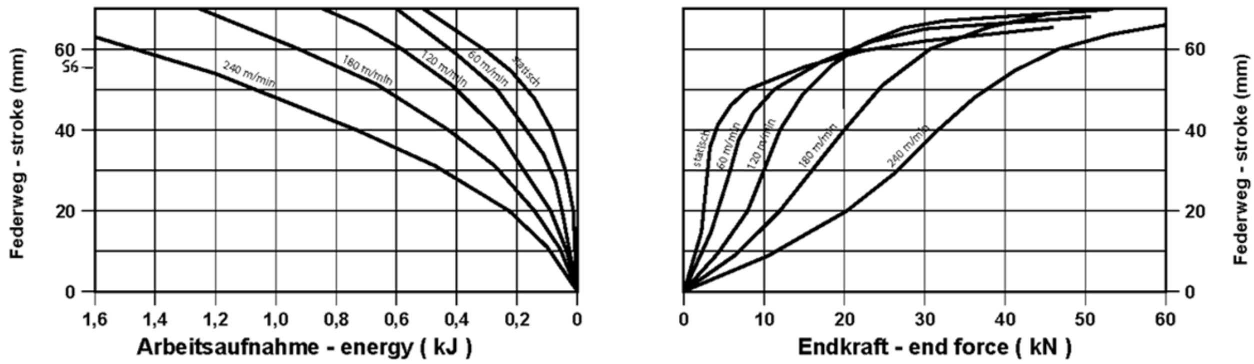
Mixed cellular polyetherurethane 500 – 600 kg/m³
Material symbol >PUR<

Pin: 8.8

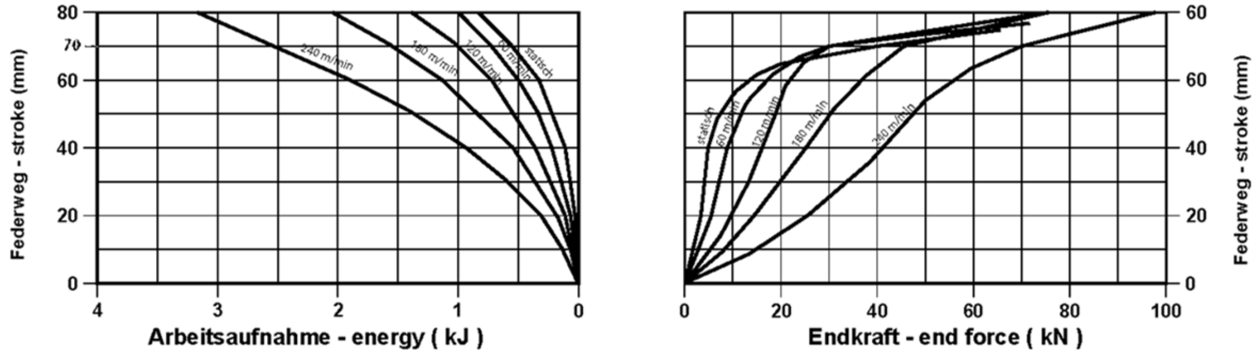
These buffers aren’t usable as springs.

Usage of buffer against buffer H max. <= 1,5 x D

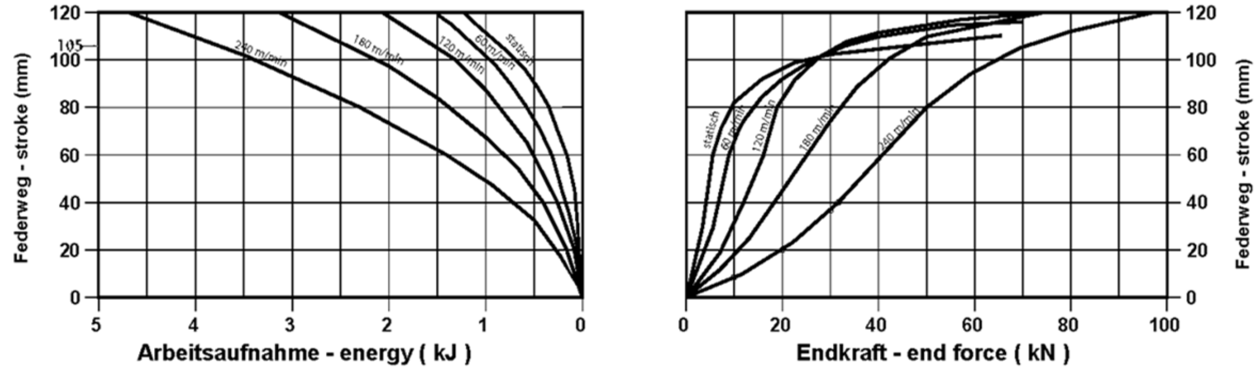
ZPP/ZPZ 80x80/90



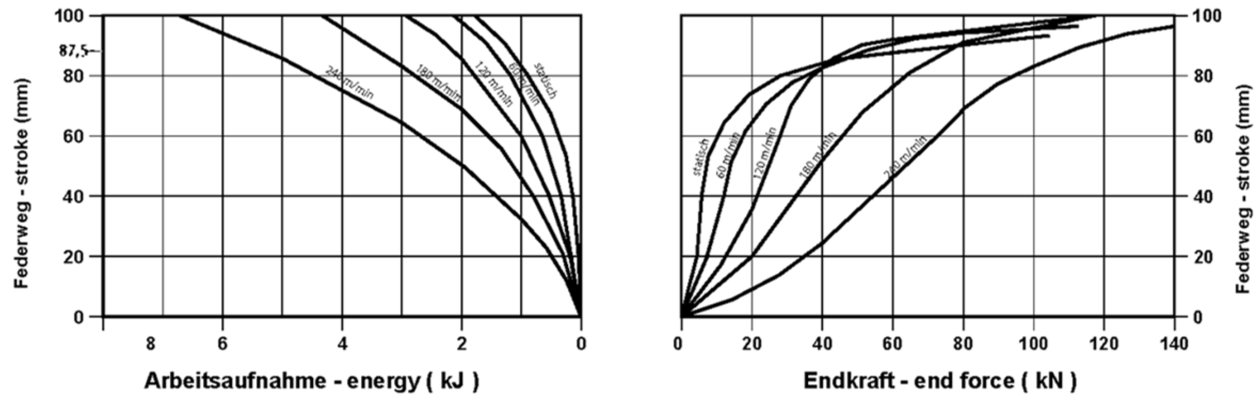
ZPP/ZPZ 100x100/110



ZPP/ZPZ 100x150/160



ZPP/ZPZ 125x125/137



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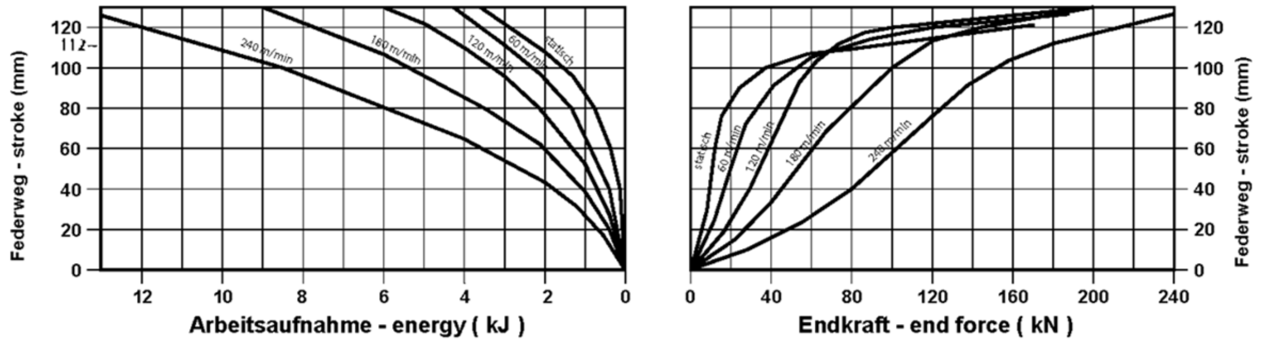
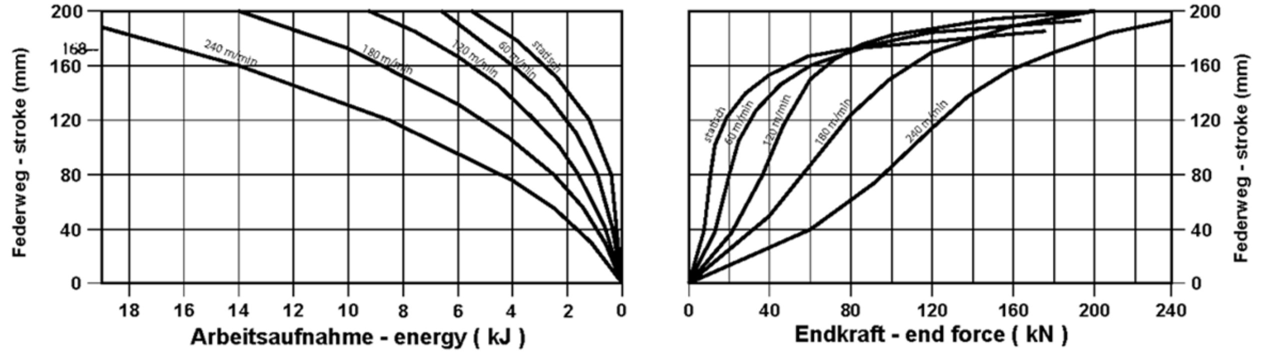
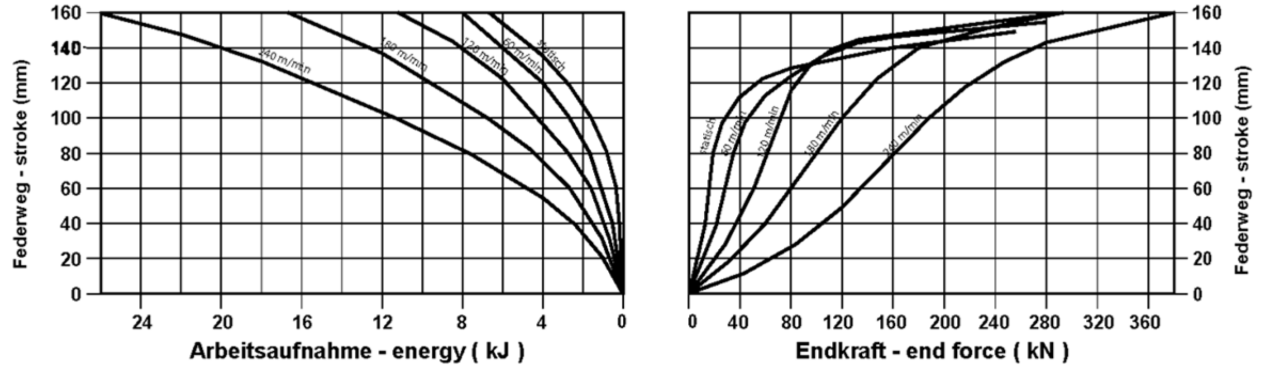


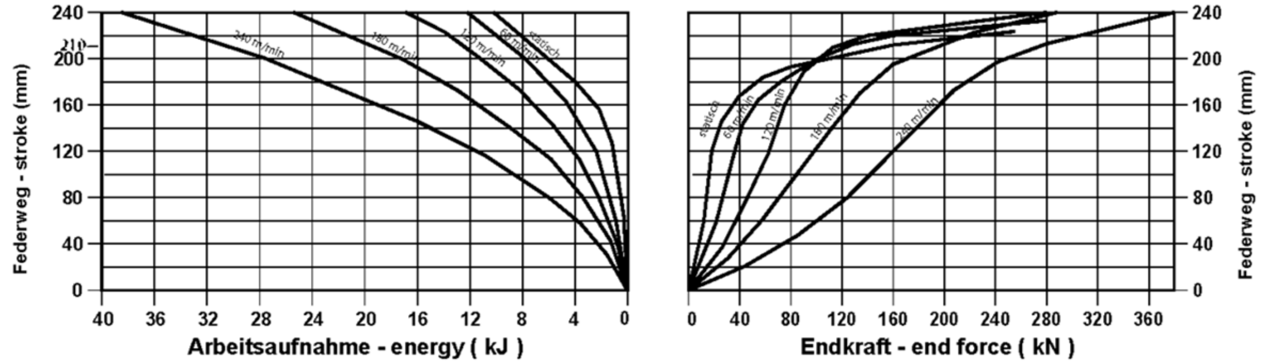
ZPP/ZPZ 160x240/252



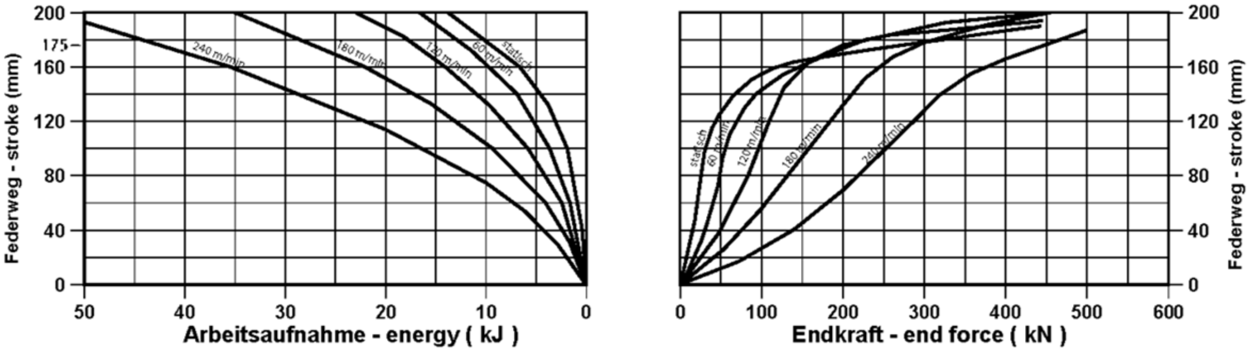
ZPP/ZPZ 200x200/214



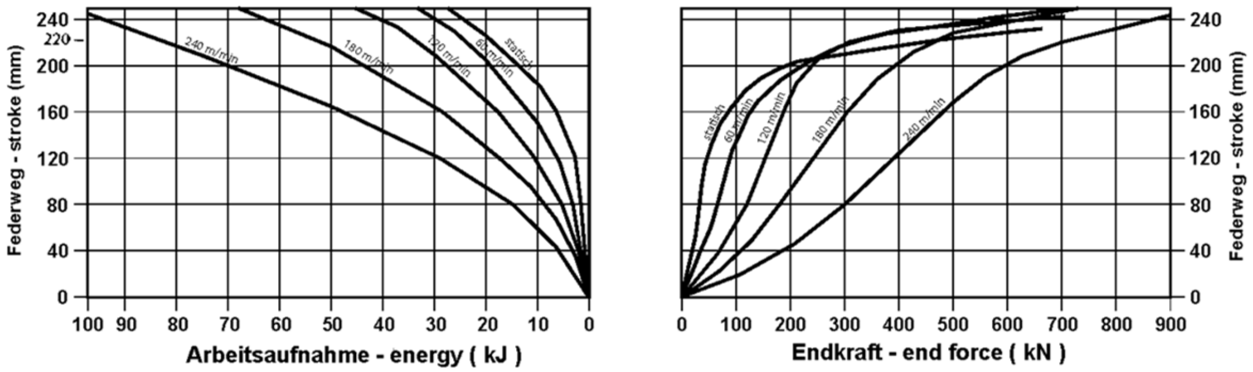
ZPP/ZPZ 200x300/314



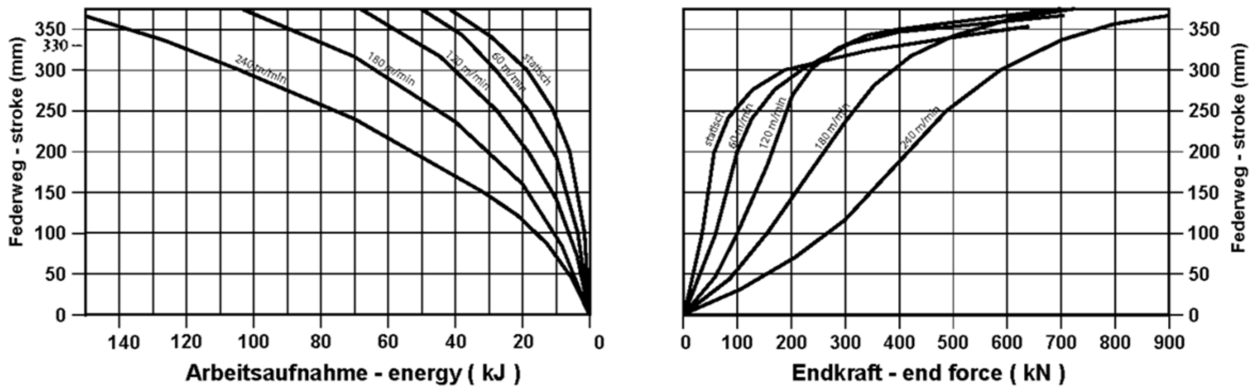
ZPP/ZPZ 250x250/265



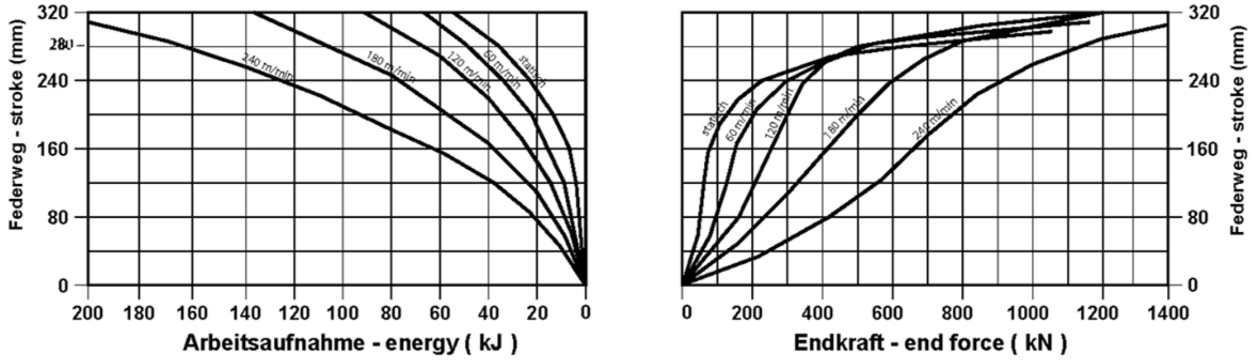
ZPP/ZPZ 315x315/330



ZPP/ZPZ 315x475/490



ZPP/ZPZ 400x400/420



Material:

Mixed cellular polyetherurethane

Material symbol >PUR<

The integral foam system is used for the production of flexible integral foam with body panel densities of 500 – 600 kg/m^3

Hardnesses of 25 – 75 Shore A can be accomplished.

Reliabilities:

Polyetherurethane is in the temperature range -40 ° C to +80 ° C max.

Transient temperature peaks up to +110 °C are possible.

Polyetherurethane is resistant to oils, fats and other chemicals and has good resistance to hydrolysis, too.

Safety instructions:

Our recommendation for the max. permissible deformation of the impact buffer is around 70% of the buffer height. The buffer has to be precautionary replaced in case of exceedance of the respective max. permissible load range. Energy storing buffers are not suited for usage in which the rated speed is higher than 4m/s.

The buffers are safety components and are subject to a natural aging process. Therefore, they have to be checked regularly, e.g. in the context of the annual crane examination acc. to BGV D6 resp. UVV/VBG 9 and 9a (see also VDI 3575).

Security and Environment:

The buffer do not contain substances with hazardous characteristics according to Chem/GefStoffV and can be disposed with the usual trash.Country-specific regulations might have to be regarded.The details of this technical data sheet are based on our current level of knowledge and apply as nonbinding advices. Therefore, the user is not freed of an examination for suitability for the intended use. Hence, the application-oriented possibility lies in the field of responsability of the recipients of our products, as well as eventual trademark rights of third parties, existing laws and regulations. Apart from that apply the requirements of our general sales and delivery conditions.

1 General remarks

Buffer calculation acc. to DIN 15 018

The determination of buffers for crane and jack operation is made for one side of the system. The respective unfavourable load position has to be assessed.
The following applies for:
Crane => jack in smallest start dimension
Jack => consideration of the center of mass S

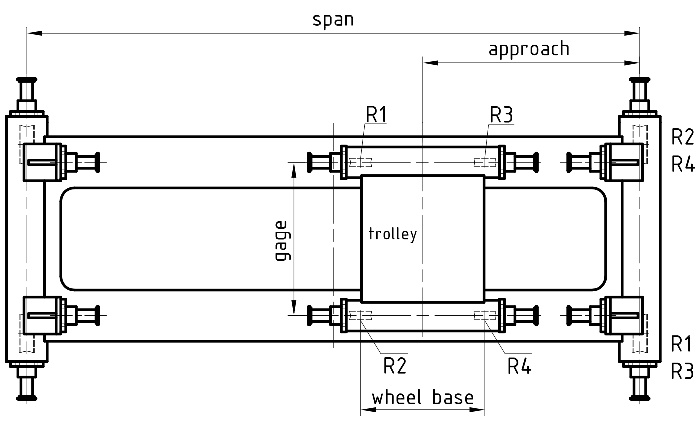
2 Naming, formula symbols, units and calculations

R1 ... R4	[kg]	wheel loads resulting from deadweight and rigidly carried along loads
m_{pu}	[kg]	mass acting on one buffer
v	[m/s]	max. travel speed
E_{pu}	[Nm]	energy acting on one buffer
F_{pu}	[kN]	buffer end force

2.1 Determination of the masses acting on the buffer m_{pu}

For cranes:
$m_{pu} = R1 + R2 + (R3 + R4 + ... Rn)$ [1])

For jack:
m_{pu} = max. from (R1 + R3) or (R2 + R4)



1) for cranes with more than 4 wheels/side

2.2 Determination of the energy acting on the buffer E_{pu}

System	Installation for reduction of the velocity	Energy acting on buffer E_{pu}		
		Stroke against rigid fence	Stroke against fence with buffer [2])	Collision of two systems with equal buffers
Crane	without	$E_{pu}=\frac{m_{pu}*v^2}{2,768}$	$E_{pu}=\frac{m_{pu}*v^2}{5,536}$	$E_{pu}=\frac{m_{pu1}* m_{pu2}*(v_1+v_2)^2}{5,536*(m_{pu1}+m_{pu2})}$
	with	$E_{pu}=\frac{m_{pu}*v^2}{4,082}$	$E_{pu}=\frac{m_{pu}*v^2}{8,164}$	$E_{pu}=\frac{m_{pu1}* m_{pu2}*(v_1+v_2)^2}{5,536*(m_{pu1}+m_{pu2})}$
Jack	without	$E_{pu}=\frac{m_{pu}*v^2}{2}$	$E_{pu}=\frac{m_{pu}*v^2}{4}$	$E_{pu}=\frac{m_{pu1}* m_{pu2}*(v_1+v_2)^2}{5,536*(m_{pu1}+m_{pu2})}$
	with	$E_{pu}=\frac{m_{pu}*v^2}{4,082}$	$E_{pu}=\frac{m_{pu}*v^2}{8,164}$	$E_{pu}=\frac{m_{pu1}* m_{pu2}*(v_1+v_2)^2}{5,536*(m_{pu1}+m_{pu2})}$

2) applies for equally sized buffer

Mixed cellular polyetherurethane integral foam (Polyetegral)

SYSTEM DESCRIPTION	Polyol-Component: (A-Component)	Mixture from Polyol, activators, stabilizers, and if necessary colours
	Isocyanat- Component:: (B- Component)	Preparation from Diphenlymethandiisocyanat (MDI)
APPLICATION PURPOSE	The integral foam system assigned for the production of soft - flexibly integral foam parts with shaped part densities of 250 - 700 kg/m³ and Shore A hardnesses of 25 - 70. Inserts can be over foamed.	
LABORATORY VALUES	The testing bodies were produced with a high pressure reaction injection machine with defined production parameters in a steel mould in the dimensions 200x200x40 mm. Density 1) 250 kg/m³ and 2) 500 kg/m³	

TESTS	**Measures**		**Dimension**	**Test provision**
To Part	**1)**	**2)**		
Total density	250	500	kg/m³	DIN 53 420
Shore hardness	50	70	A	DIN 53 505
Compression set				
(Area temperature, 72 hrs,				
30 minutes after decompression)	1,9	1,7	%	DIN 53572
Related to the skin (d=1 mm)				
Density	950	970	kg/m³	DIN 53 479
Tensile strength	6,5	7,6	N/mm²	DIN 53 504
Elongation at break	145	175	%	DIN 53 504
Tear propagation resistance	3,5	6	N/mm	DIN 53 515
At the foam				
Density	172	430	kg/m³	DIN 53 420
Tensile strength	48	125	N/cm²	DIN 53 571
Elongation at break	110	145	%	DIN 53 571
Tear propagation resistance	17,2	32	N/cm	DIN 53 575