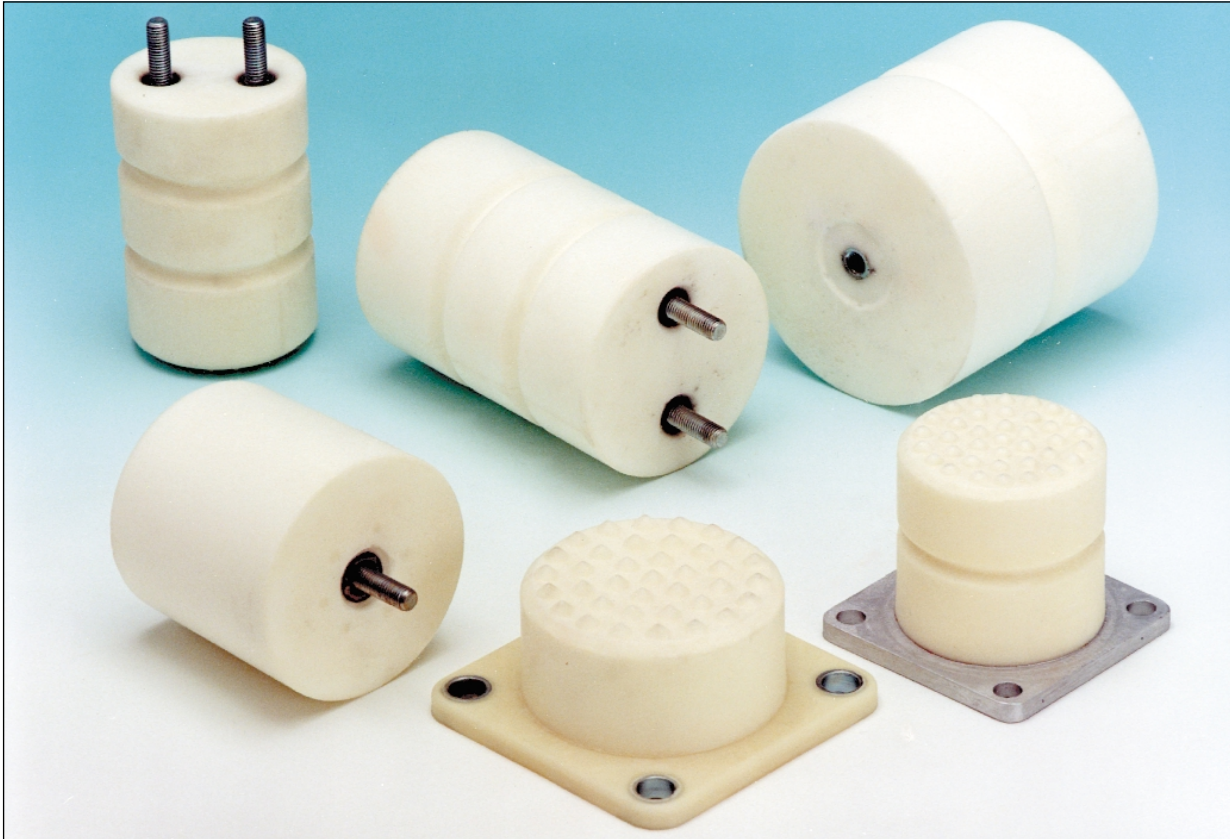


Impact buffers

made of Diepocell®

P+S Polyurethan-Elastomere

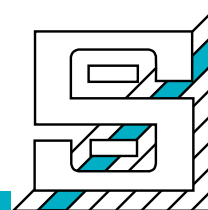


Impact buffers made of Diepocell®

Especially suitable for application

- in the construction of cranes
- in general mechanical engineering
- in conveyor belt technology

Impact buffers



made of Diepocell®

Standard Range of Impact buffers

Impact buffers made of the cellular polyurethane elastomere Diepocell® are available from a standard range of products. They are used in general mechanical engineering and in the construction of cranes. The buffers are supplied with a central mounting or square fixing plate. Dimensions are given in the tables on the pages 3, 4 and 5.

Our standard range of buffers have a specific gravity of 0,5 to 0,55 g/cm³ and are mainly available from stock. Other hardness may be produced on request depending on the field of application. For each diameter of buffer there are different heights available in the following diameter to height ratios:
1:0,5 (buffer size 1, cylinder shape)
1.1 (buffer size 2, conical shape)
1:1,5 (buffer size 3, cylinder shape)

The impact surface of size 2 buffers upto 200 mm are smooth. The buffer sizes of 1 and 3 are studded.

Diameter sizes larger than 250 mm are generally studded. The studding provides grip enabling slip-free impact. The working capacity and impact forces of each buffer may be taken from the table on page 8 or from the curves on the pages 9 to 19. If the buffers are used for cranes it is possible to arrange one buffer at the crane and one at the endstop.

This will further reduce the final forces. In order to avoid buckling of the buffer only the following combinations are recommended:

for buffer size 1, counter buffer sizes 1,2,3

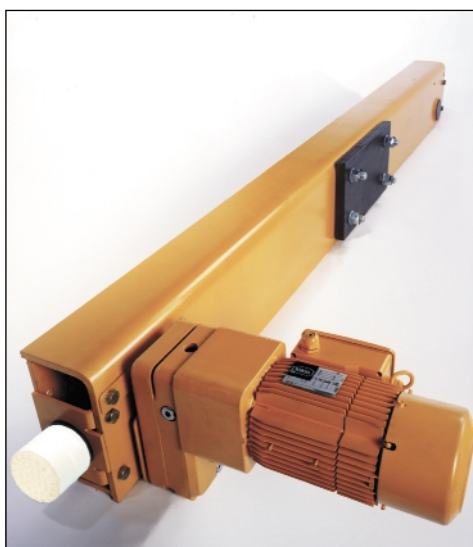
for buffer size 2, counter buffer sizes 1,2

for buffer size 3, counter buffer size 1

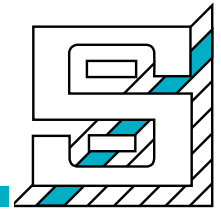
Diepocell® is resistant to oil, grease, ozone, UV and ageing. The material can be used within a temperature range of -20°C to +80°C. Short temperature peaks of upto 100°C do not impair the material. At -20°C a hardening of the material will occur which has, however, no negative effects on the consistency of the material.

For mounting note clearance:

1. max. buffer compression (70%)
2. max. cross extension upto 40% of buffer dia.
3. counter surface of buffer made of tear plate and min. 1,2 x buffer dia. in case there is no cellular plastic buffer of same dia. used as counter buffer.

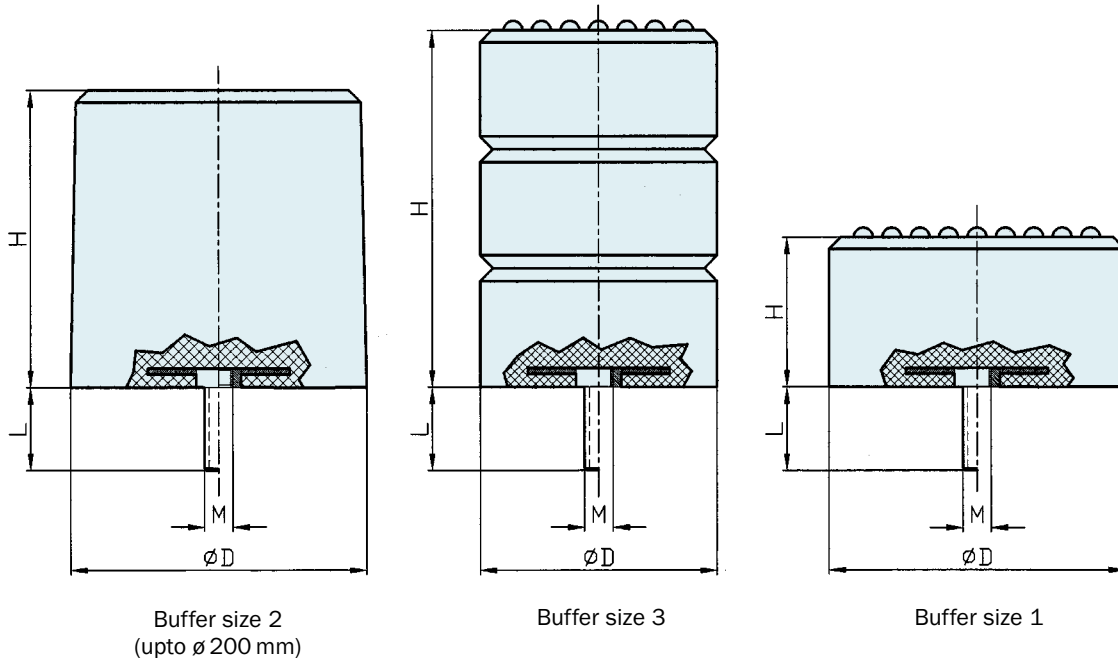


Impact buffers



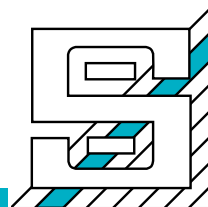
P+S Polyurethan-Elastomere

made of Diepocell®
with central mounting bolt and internal thread



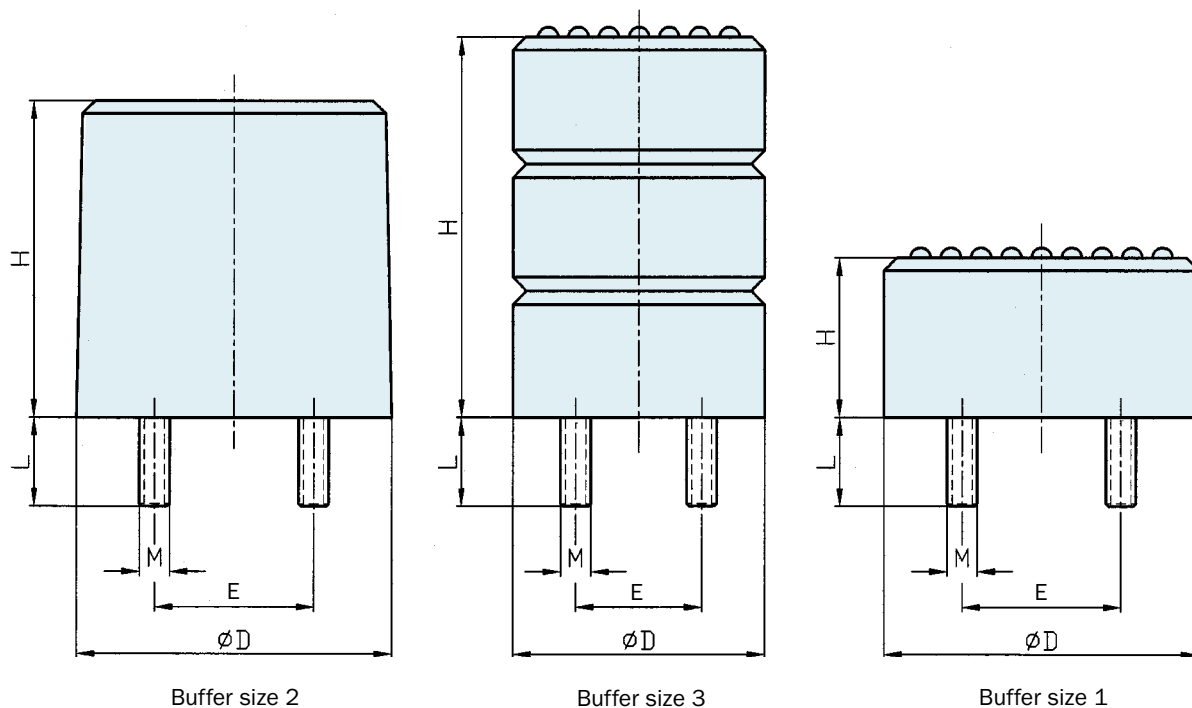
Buffer No.	Buffer Size	Dimensions Ø D x H (mm)	Mounting bolt		Internal thread		Weight (kg)
			M x L (mm)	Product No.	M	Product No.	
0	2	70 x 70	M 12 x 35	233 701 045	M 12	235 701 045	0,25
1	1	80 x 40	M 12 x 35	233 801 045	M 12	235 801 045	0,21
2	2	80 x 80	M 12 x 35	233 802 045	M 12	235 802 045	0,31
3	3	80 x 120	M 12 x 35	233 803 045	M 12	235 803 045	0,42
4	1	100 x 50	M 12 x 35	233 101 045	M 12	235 101 045	0,31
5	2	100 x 100	M 12 x 35	233 102 045	M 12	235 102 045	0,52
6	3	100 x 150	M 12 x 35	233 103 045	M 12	235 103 045	0,73
7	1	125 x 63	M 12 x 35	233 121 045	M 12	235 121 045	0,51
8	2	125 x 125	M 12 x 35	233 122 045	M 12	235 122 045	0,92
9	3	125 x 190	M 12 x 35	233 123 045	M 12	235 123 045	1,32
10	1	160 x 80	M 12 x 35	233 161 045	M 12	235 161 045	0,95
11	2	160 x 160	M 12 x 35	233 162 045	M 12	235 162 045	1,80
12	3	160 x 240	M 12 x 35	233 163 045	M 12	235 163 045	2,66
13	1	200 x 100	M 12 x 35	233 201 045	M 12	235 201 045	1,76
14	2	200 x 200	M 12 x 35	233 202 045	M 12	235 202 045	3,43
15	3	200 x 300	M 12 x 35	233 203 045	M 12	235 203 045	5,10
16	1	250 x 125	M 24 x 80	233 251 045	M 24	235 251 045	5,40
17	2	250 x 250	M 24 x 80	233 252 045	M 24	235 252 045	8,50
18	3	250 x 375	M 24 x 80	233 253 045	M 24	235 253 045	11,50
19	1	315 x 158	M 24 x 80	233 311 045	M 24	235 311 045	8,50
20	2	315 x 315	M 24 x 80	233 312 045	M 24	235 312 045	14,65
21	3	315 x 475	M 24 x 80	233 313 045	M 24	235 313 045	20,80
22	1	400 x 200	M 30 x 80	233 401 045	M 30	235 401 045	16,50
23	2	400 x 400	M 30 x 80	233 402 045	M 30	235 402 045	29,10
24	3	400 x 600	M 30 x 80	233 403 045	M 30	235 403 045	41,60

Impact buffers



P+S Polyurethan Elastomere

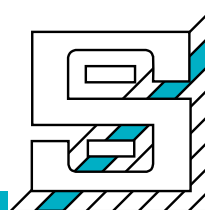
made of Diepocell®
with double mounting bolt



Size with double mounting bolt

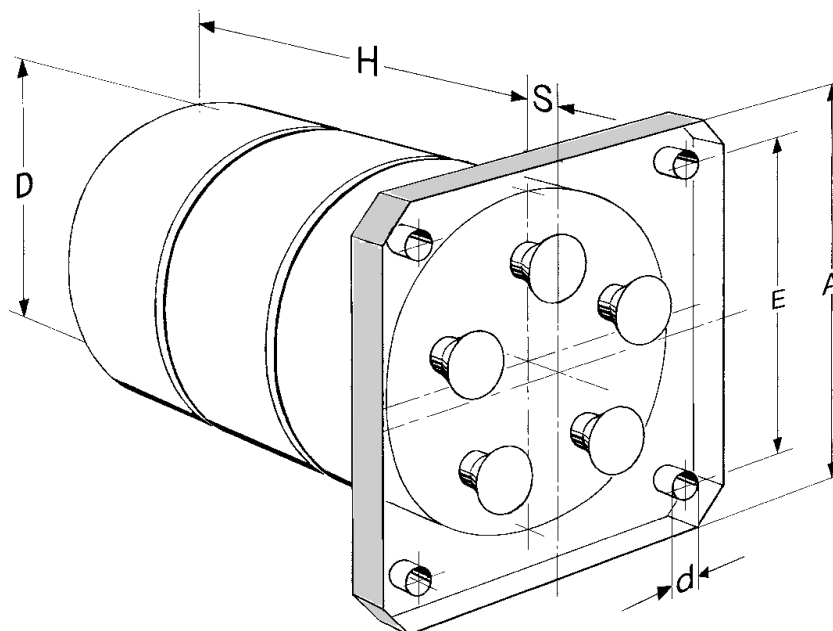
Buffer No.	Buffer Size	Product No.	Dimensions (mm)		Weight (kg)
			Ø D x H/Thread M x L	Distance E	
1	1	234 101 045	100 x 50/M 12 x 35	50	0,44
2	2	234 102 045	100 x 100/M 12 x 35	50	0,67
3	3	234 103 045	100 x 150/M 12 x 35	50	0,86
4	1	234 121 045	125 x 63/M 12 x 35	63	0,64
5	2	234 122 045	125 x 125/M 12 x 35	63	1,05
6	3	234 123 045	125 x 190/M 12 x 35	63	1,45
7	1	234 161 045	160 x 80/M 12 x 35	80	1,08
8	2	234 162 045	160 x 160/M 12 x 35	80	1,93
9	3	234 163 045	160 x 240/M 12 x 35	80	2,79
10	1	234 201 045	200 x 100/M 12 x 35	100	2,17
11	2	234 202 045	200 x 200/M 12 x 35	100	3,84
12	3	234 203 045	200 x 300/M 12 x 35	100	5,51
13	1	234 251 045	250 x 125/M 24 x 80	125	6,79
14	2	234 252 045	250 x 250/M 24 x 80	125	9,89
15	3	234 253 045	250 x 375/M 24 x 80	125	12,89
16	1	234 311 045	315 x 158/M 24 x 80	160	9,89
17	2	234 312 045	315 x 315/M 24 x 80	160	16,04
18	3	234 313 045	315 x 475/M 24 x 80	160	22,19
19	1	234 401 045	400 x 200/M 30 x 80	200	17,89
20	2	234 402 045	400 x 400/M 30 x 80	200	30,49
21	3	234 403 045	400 x 600/M 30 x 80	200	43,00

Impact buffers

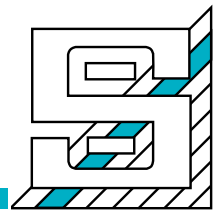


P+S Polyurethan-Elastomere

made of Diepocell®
with square plates



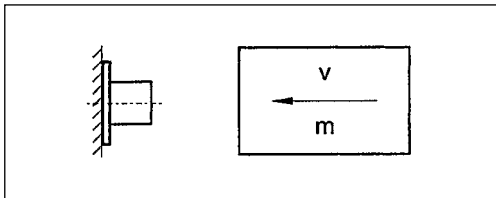
Buffer No.	Buffer Size	Product No.	Dimensions (mm)		Weight (kg)	Type of the square plates	Options
			Ø D x H	A x E x S x Ø d			
1	1	202 801 045	80 x 40 x 10	110 x 80 x 10 x 12,5	0,40	Available with aluminium plates! Also available with plastic plates (Polyamid PA6GF 20) on request!	
2	2	202 802 045	80 x 80 x 10	110 x 80 x 10 x 12,5	0,60		
3	3	202 803 045	80 x 120 x 10	110 x 80 x 10 x 12,5	0,70		
4	1	202 101 045	100 x 50 x 10	125 x 100 x 10 x 12,5	0,60		
5	2	202 102 045	100 x 100 x 10	125 x 100 x 10 x 12,5	0,90		
6	3	202 103 045	100 x 150 x 10	125 x 100 x 10 x 12,5	1,15		
7	1	202 121 045	125 x 63 x 12	160 x 125 x 12 x 17,0	1,20		
8	2	202 122 045	125 x 125 x 12	160 x 125 x 12 x 17,0	1,65		
9	3	202 123 045	125 x 190 x 12	160 x 125 x 12 x 17,0	2,25		
10	1	202 161 045	160 x 80 x 12	200 x 160 x 12 x 17,0	2,20		
11	2	202 162 045	160 x 160 x 12	200 x 160 x 12 x 17,0	3,10		
12	3	202 163 045	160 x 240 x 12	200 x 160 x 12 x 17,0	4,00		
13	1	202 201 045	200 x 100 x 12	250 x 200 x 14 x 21,0	4,00		
14	2	202 202 045	200 x 200 x 14	250 x 200 x 14 x 21,0	5,80		
15	3	202 203 045	200 x 300 x 14	250 x 200 x 14 x 21,0	7,50		
16	1	202 251 045	250 x 125 x 15	315 x 250 x 15 x 21,0	7,50	Only available with steel-plates!	Available with a cable safety system (to bind the buffer and the square plate) on request!
17	2	202 252 045	250 x 250 x 15	315 x 250 x 15 x 21,0	11,00		
18	3	202 253 045	250 x 375 x 15	315 x 250 x 15 x 21,0	15,00		
19	1	202 311 045	315 x 158 x 15	400 x 315 x 15 x 21,0	26,00		
20	2	202 312 045	315 x 315 x 15	400 x 315 x 15 x 21,0	33,00		
21	3	202 313 045	315 x 475 x 15	400 x 315 x 15 x 21,0	41,00		
22	1	202 401 045	400 x 200 x 20	500 x 400 x 20 x 25,0	51,00		
23	2	202 402 045	400 x 400 x 20	500 x 400 x 20 x 25,0	66,00		
24	3	202 403 045	400 x 600 x 20	500 x 400 x 20 x 25,0	81,00		
25	1	202 501 045	500 x 250 x 20	630 x 500 x 20 x 25,0	88,00		
26	2	202 502 045	500 x 500 x 20	630 x 500 x 20 x 25,0	116,00		
27	3	202 503 045	500 x 750 x 20	630 x 500 x 20 x 25,0	146,00		
28	1	202 601 045	600 x 300 x 20	730 x 600 x 20 x 25,0	129,00		
29	2	202 602 045	600 x 600 x 20	730 x 600 x 20 x 25,0	178,00		
30	3	202 603 045	600 x 900 x 20	730 x 600 x 20 x 25,0	233,00		



Impact buffers

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Calculation and selection

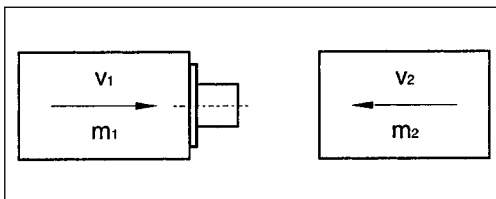
Mass against stop



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

The calculation method
is on the next page

Mass against mass

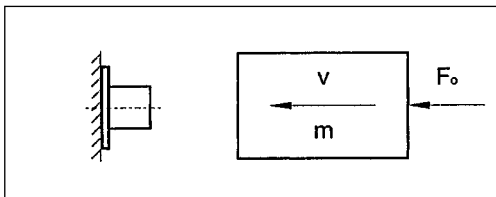


$$W = \frac{m_1 m_2 (v_1 + v_2)^2}{2(m_1 + m_2)}$$

$$m_1 = m_2 \text{ und } v_1 = v_2$$

$$W = m v^2$$

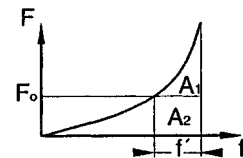
Mass with drive against stop



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

$$W_2 = F_0 f'$$

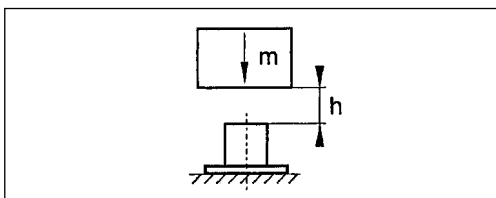
Buffer-force-compression diagram



$$A_1 \triangleq W_1$$

$$A_2 \triangleq W_2$$

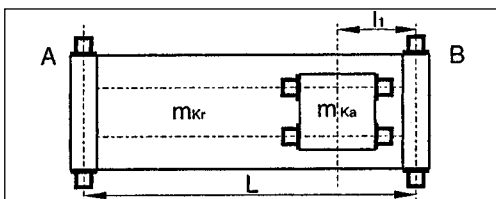
Mass in free fall



$$W = m g h$$

This formula is **not**
applicable to lifts

Crane-buffer-calculation



$$W_B = \frac{1}{2} m_B v^2$$

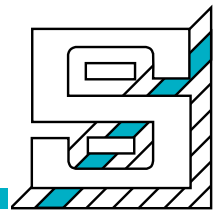
$$m_B = \frac{m_{Kr} m_{Ka} (L - l_1)}{2L}$$

- pendular movement of the load is not required
- rotation energy from motor drive is required
- reduced speed in accordance with DIN 15018
 - $v = 100\%$ of nominal speed for cars
 - $v = 85\%$ of nominal speed for cranes
 - $v = 70\%$ of nominal speed for cranes with breaking devices

Formulae of calculating the deceleration

$$a_{\text{mitt}} = \frac{v^2}{2f} \quad a_{\text{max}} = \frac{F}{m}$$

a_{mitt}	- average deceleration	m/s ²	h	- length of drop	m	m_B	- mass at rail B	kg
a_{max}	- maximum deceleration	m/s ²	L	- distance between rails A and B	m	v	- operating speed	m/s
F_0	- drive force	kN	l	- distance m_{Ka} to B	m	$v_{1/2}$	- speed of body 1 or 2	m/s
F	- final force	kN	m	- mass	kg	W	- kinetic energy	kNm
f	- compression of the buffer	mm	m_{Kr}	- mass of crane without car	kg	W_1	- kinetic energy	kNm
f'	- operating compression	mm	m_{Ka}	- mass of car	kg	W_2	- energy of F_0	kNm
g	- gravity	9,81 m/s ²	$m_{1/2}$	- mass of body 1 or 2	kg	W_{zul}	- permitted energy input	kNm



Impact buffers

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P+S Polyurethan-Elastomere

Method of calculating the size of buffer required

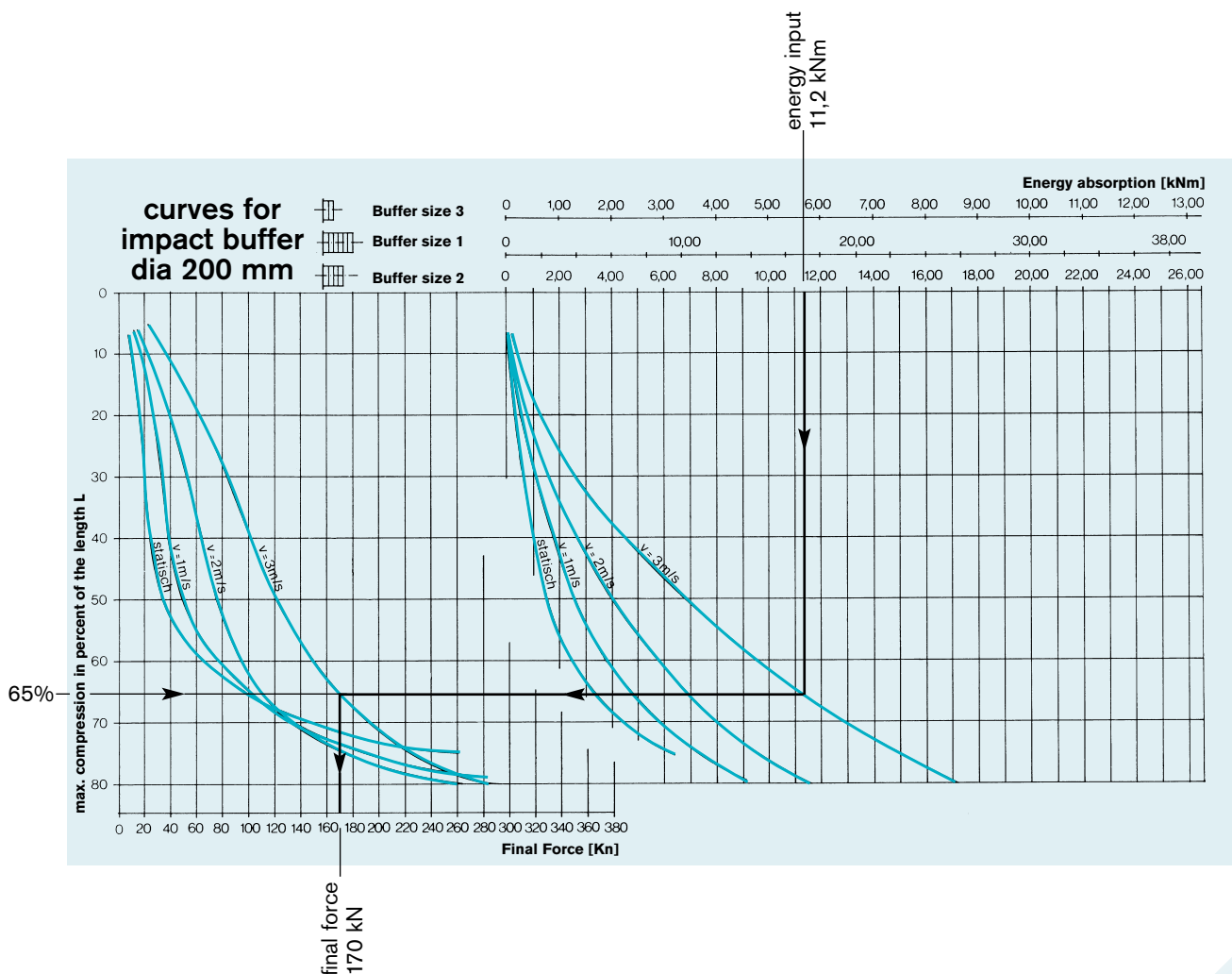
Application: Mass against a stop

Formula: $W = \frac{1}{2} m V^2$

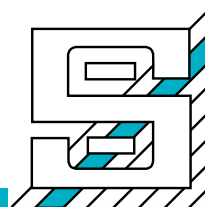
Performance Criteria: $m = 2490 \text{ kg}$
 $V = 9,0 \text{ m/s}$
compression = 65% of the buffer length

Calculation: $W = \frac{1}{2} \cdot 2490 \cdot 9,0$
 $\cong 11200 \text{ Nm}$
 $= 11,2 \text{ KNm}$

Selection of the size: No. 14, Size 2
 $\varnothing 200 \times 200 \text{ mm}$



Impact buffers



P+S Polyurethan-Elastomere

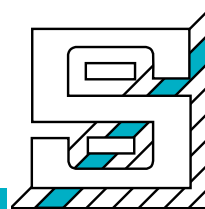
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Forces and energy absorption

Data			max. compression in percent of the length L											
Buffer No.	Buffer-Size	Dimensions ø D x L (mm)	50 %				65 %				75 %			
			Final force F (kN) energy absorption W (kJNm)				Final force F (kN) energy absorption W (kJNm)				Final force F (kN) energy absorption W (kJNm)			
			V (m/s)				V (m/s)				V (m/s)			
			0	1	2	3	0	1	2	3	0	1	2	3
0	2	70 x 70	4,3 0,08	6,9 0,12	10 0,19	17 0,33	14 0,18	15 0,25	16,5 0,35	25 0,58	39 0,33	28 0,39	26 0,48	32 0,76
1	1	80 x 40	5 0,05	8 0,08	12 0,13	20 0,22	15 0,11	16 0,15	18 0,22	27 0,36	42 0,20	30 0,24	28 0,30	35 0,47
2	2	80 x 80	5 0,10	8 0,16	12 0,26	20 0,44	15 0,22	16 0,30	18 0,44	27 0,71	42 0,40	30 0,48	28 0,60	35 0,95
3	3	80 x 120	5 0,15	8 0,24	12 0,39	20 0,66	15 0,32	16 0,45	18 0,66	27 1,70	42 0,60	30 0,72	28 0,90	35 1,42
4	1	100 x 50	8 0,10	12 0,16	18 0,25	30 0,43	23 0,20	24 0,29	27 0,42	42 0,69	65 0,40	48 0,47	42 0,57	55 0,92
5	2	100 x 100	8 0,20	12 0,33	18 0,50	30 0,86	23 0,40	24 0,57	27 0,84	42 1,38	65 0,80	48 0,95	42 1,15	55 1,85
6	3	100 x 150	8 0,3	12 0,49	18 0,75	30 1,29	23 0,60	24 0,85	27 1,27	42 2,07	65 1,20	48 1,42	42 1,72	55 2,77
7	1	125 x 63	12 0,20	20 0,32	30 0,50	50 0,82	37 0,40	38 0,57	42 0,82	65 1,28	105 0,77	75 0,90	70 1,15	85 1,80
8	2	125 x 125	12 0,40	20 0,65	30 1,00	50 1,65	37 0,80	38 1,12	42 1,64	65 2,70	105 1,55	75 1,80	70 2,30	85 3,60
9	3	125 x 190	12 0,60	20 0,97	30 1,50	50 2,47	37 1,22	38 1,70	42 2,50	65 4,10	105 2,32	75 2,70	70 3,45	85 5,40
10	1	160 x 80	20 0,40	30 0,67	50 1,10	80 1,75	61 0,85	64 1,20	69 1,70	107 2,85	165 1,65	120 1,95	110 2,40	140 3,80
11	2	160 x 160	20 0,80	30 1,35	50 2,20	80 3,50	61 1,70	64 2,40	69 3,50	107 5,70	165 3,30	120 3,90	110 4,80	140 7,60
12	3	160 x 240	20 1,20	30 2,02	50 3,30	80 5,25	61 2,60	64 3,70	69 5,20	107 8,70	165 4,95	120 5,85	110 7,20	140 11,40
13	1	200 x 100	35 0,80	50 1,30	75 2,10	120 3,45	97 1,65	100 2,40	110 3,40	170 5,60	260 3,20	190 3,75	170 4,70	220 7,50
14	2	200 x 200	35 1,60	50 2,60	75 4,20	120 6,90	97 3,40	100 4,80	110 6,80	170 11,20	260 6,40	190 7,50	170 9,60	220 15,00
15	3	200 x 300	35 2,40	50 5,90	75 6,30	120 10,35	97 4,60	100 7,20	110 10,10	170 16,80	260 9,60	190 11,25	170 14,10	220 22,50
16	1	250 x 125	50 1,50	75 2,50	120 4,00	190 6,75	150 3,40	155 4,80	169 6,70	262 10,90	410 6,25	300 7,25	270 9,00	350 14,50
17	2	250 x 250	50 3,00	75 5,00	120 8,00	190 13,50	150 6,80	155 9,20	169 13,40	262 21,90	410 12,50	300 14,50	270 18,00	350 29,00
18	3	250 x 375	50 4,50	75 7,50	120 12,00	190 20,25	150 10,05	155 13,75	169 20,00	262 33,50	410 18,75	300 21,75	270 27,00	350 43,50
19	1	315 x 158	80 3,10	120 5,00	180 8,25	300 13,50	235 6,50	245 9,20	268 13,30	415 21,60	650 12,50	480 15,00	440 18,50	550 29,00
20	2	315 x 315	80 6,20	120 10,00	180 16,50	300 27,00	235 13,00	245 18,00	268 26,50	415 43,00	650 25,00	480 30,00	440 37,00	550 58,00
21	3	315 x 475	80 9,30	120 15,00	180 24,75	300 40,50	235 19,50	245 28,00	268 39,50	415 65,00	650 37,50	480 45,00	440 55,50	550 87,00
22	1	400 x 200	125 6,25	190 10,50	300 16,50	490 27,50	385 12,00	400 26,00	440 39,00	670 44,00	1050 25,50	750 30,00	700 27,50	880 60,00
23	2	400 x 400	125 12,50	190 21,00	300 33,00	490 55,00	385 19,00	400 38,00	440 57,00	670 88,00	1050 51,00	750 60,00	700 75,00	880 120,00
24	3	400 x 600	125 18,75	190 31,50	300 49,50	490 82,50	385 27,00	400 55,00	440 82,00	670 132,00	1050 76,50	750 90,00	700 112,50	880 180,00
25	1	500 x 250	210 11,00	300 20,00	435 32,00	750 53,00	600 27,00	615 38,00	680 53,00	1045 88,00	1600 49,00	1150 57,00	1060 75,00	1385 117,00
26	2	500 x 500	210 24,00	300 40,00	435 63,00	750 108,00	600 53,00	615 72,00	680 107,00	1045 175,00	1600 99,00	1150 115,00	1060 150,00	1385 233,00
27	3	500 x 750	210 44,00	300 78,00	435 120,00	750 200,00	600 100,00	615 144,00	680 198,00	1045 327,00	1600 180,00	1150 215,00	1060 265,00	1385 440,00
28	1	600 x 300	265 17,00	380 25,00	590 40,00	955 70,00	585 33,00	820 48,00	1300 71,00	1990 117,00	2060 65,00	1500 75,00	1380 96,00	1770 153,00
29	2	600 x 600	265 30,00	380 52,00	590 81,00	955 138,00	585 68,00	820 97,00	1300 138,00	1990 226,00	2060 128,00	1500 148,00	1380 193,00	1770 307,00
30	3	600 x 900	265 50,00	380 89,00	590 141,00	955 242,00	585 115,00	820 168,00	1300 245,00	1990 397,00	2060 225,00	1500 260,00	1380 340,00	1770 535,00

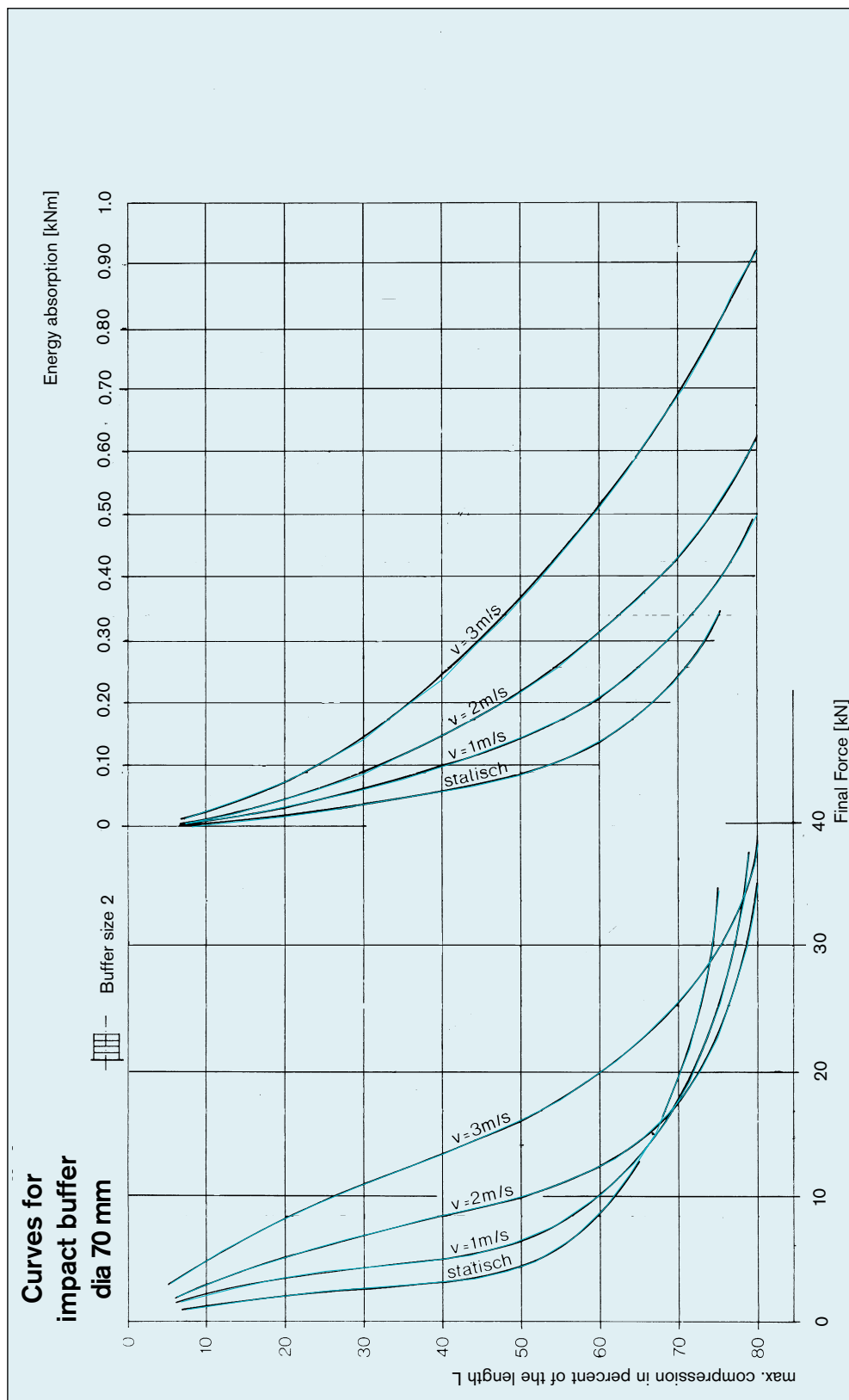
Impact buffers

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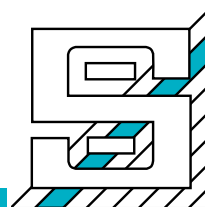
P+S Polyurethan-Elastomere

Curves for Diepocell® - Impact buffers



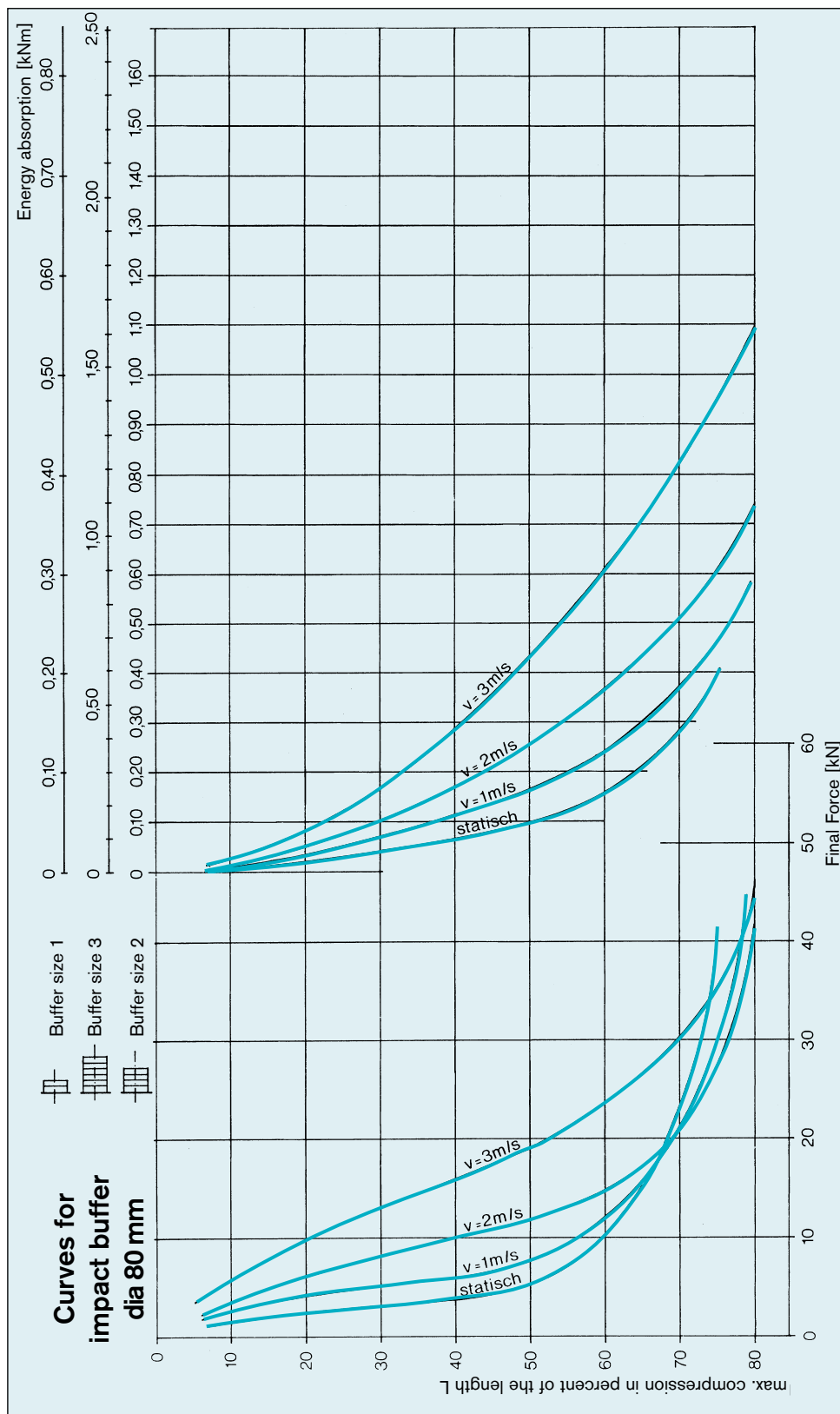
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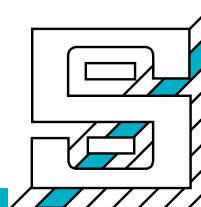
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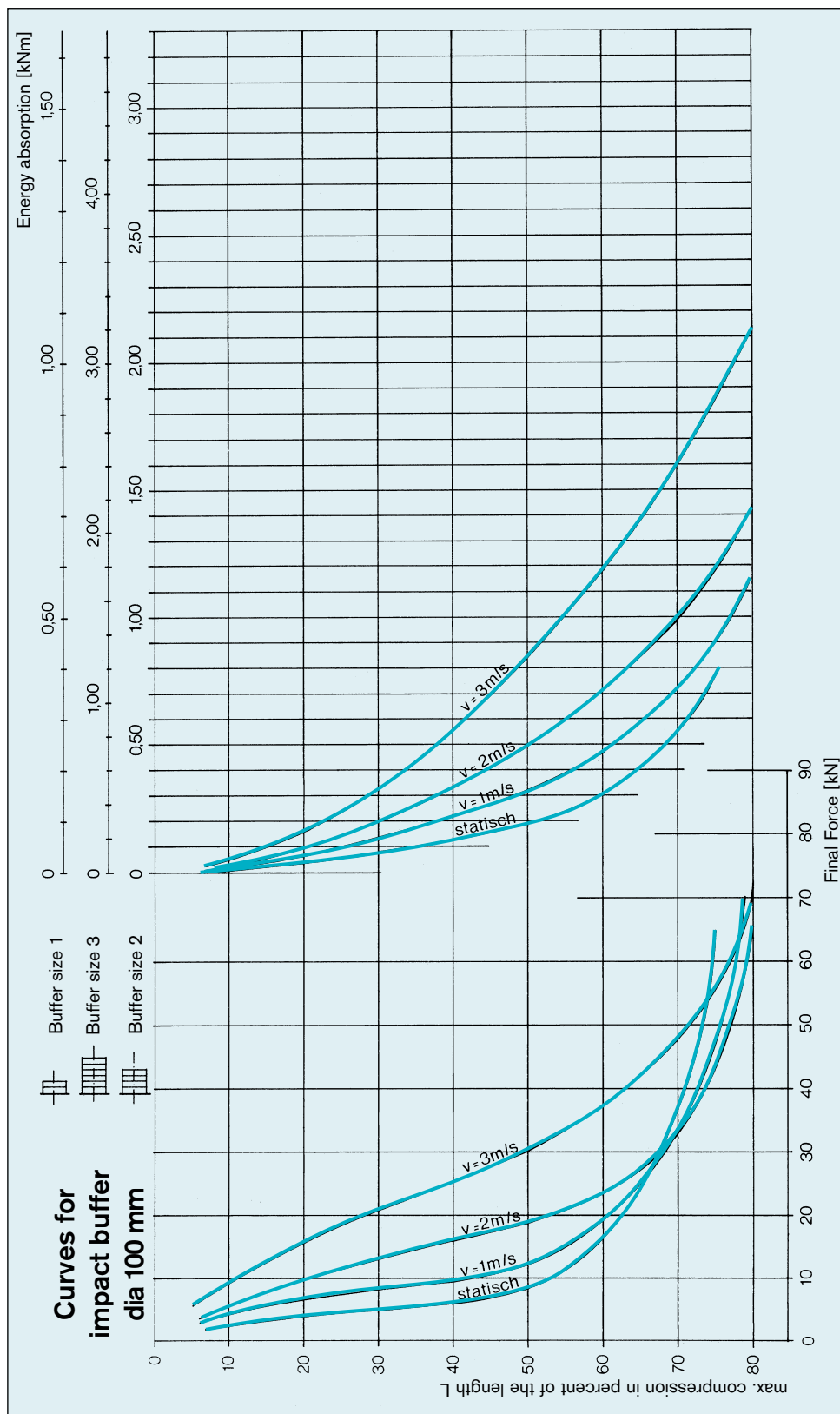
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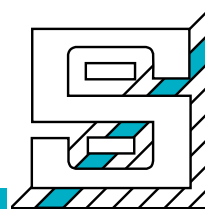
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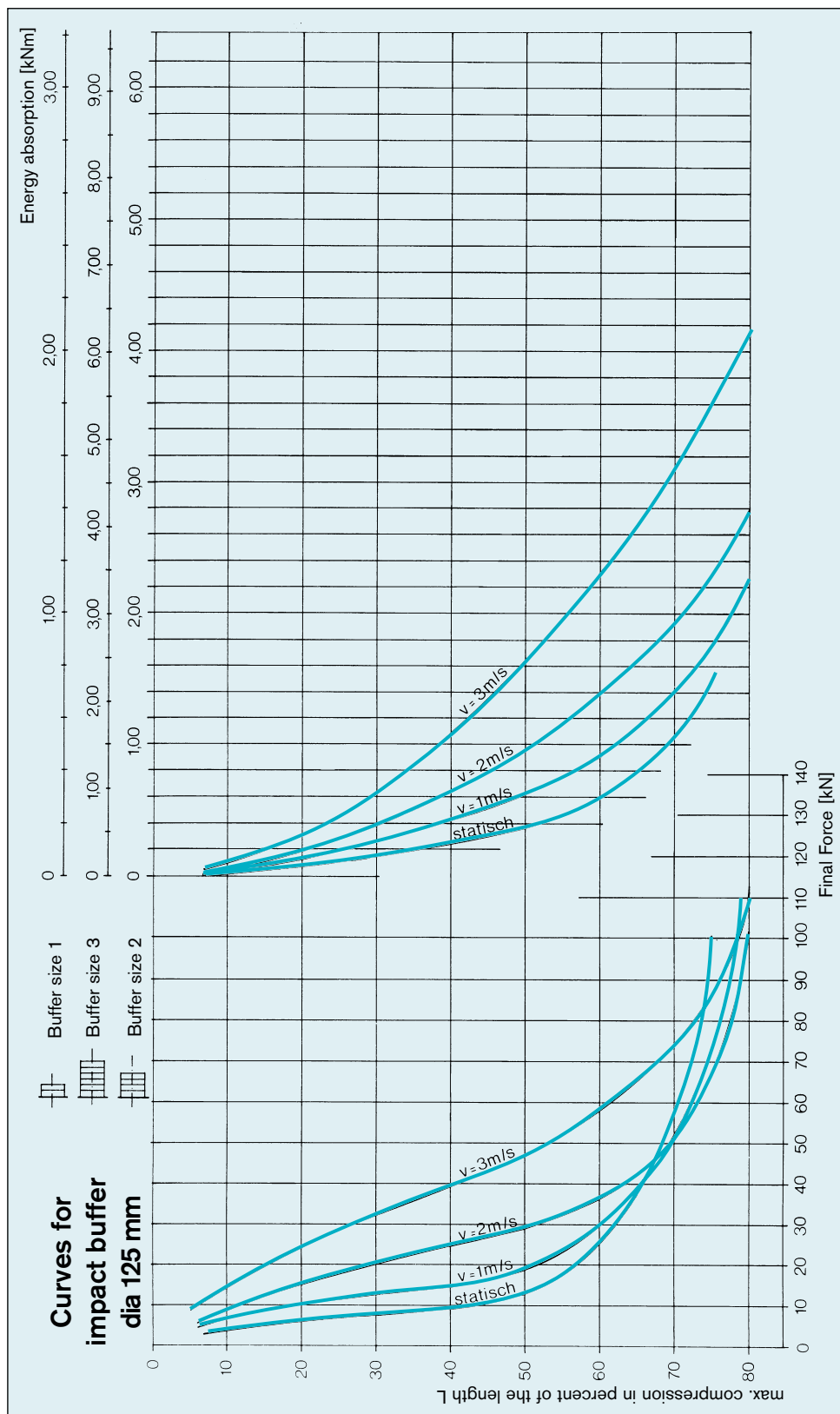
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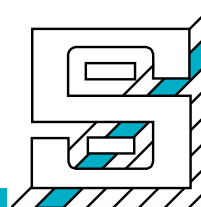
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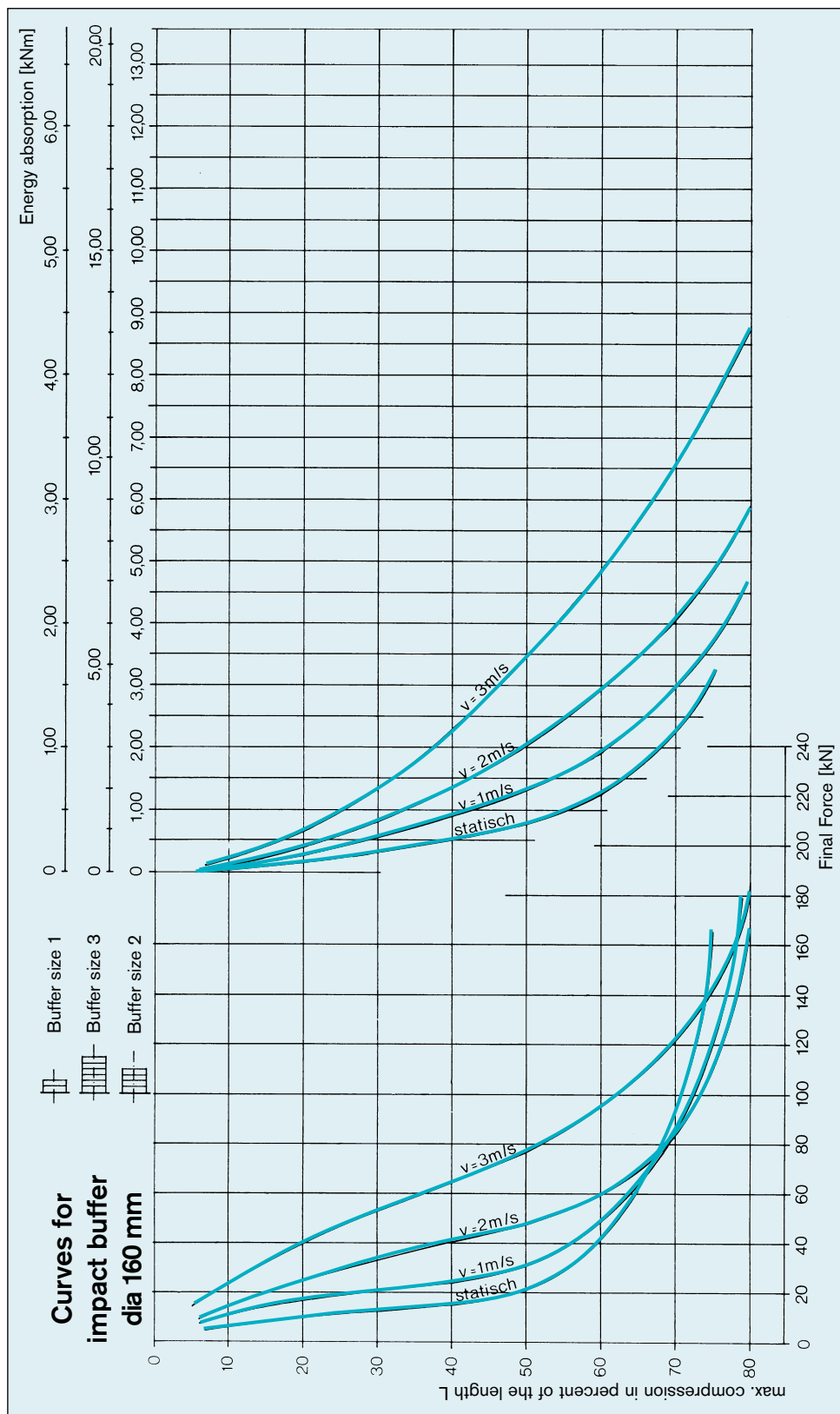
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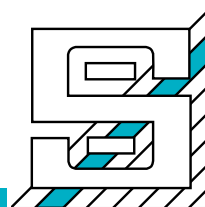
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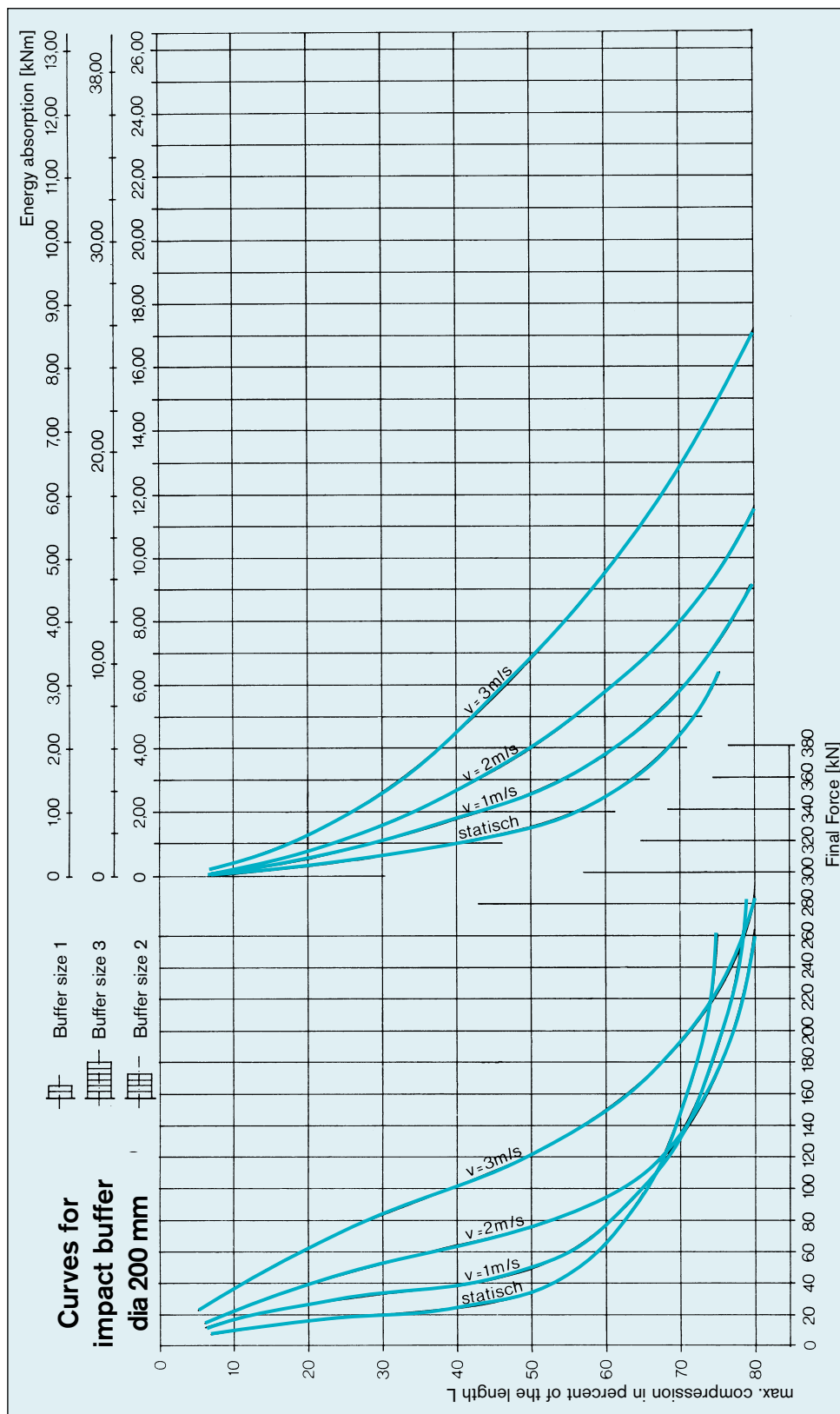
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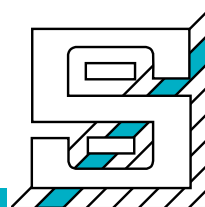
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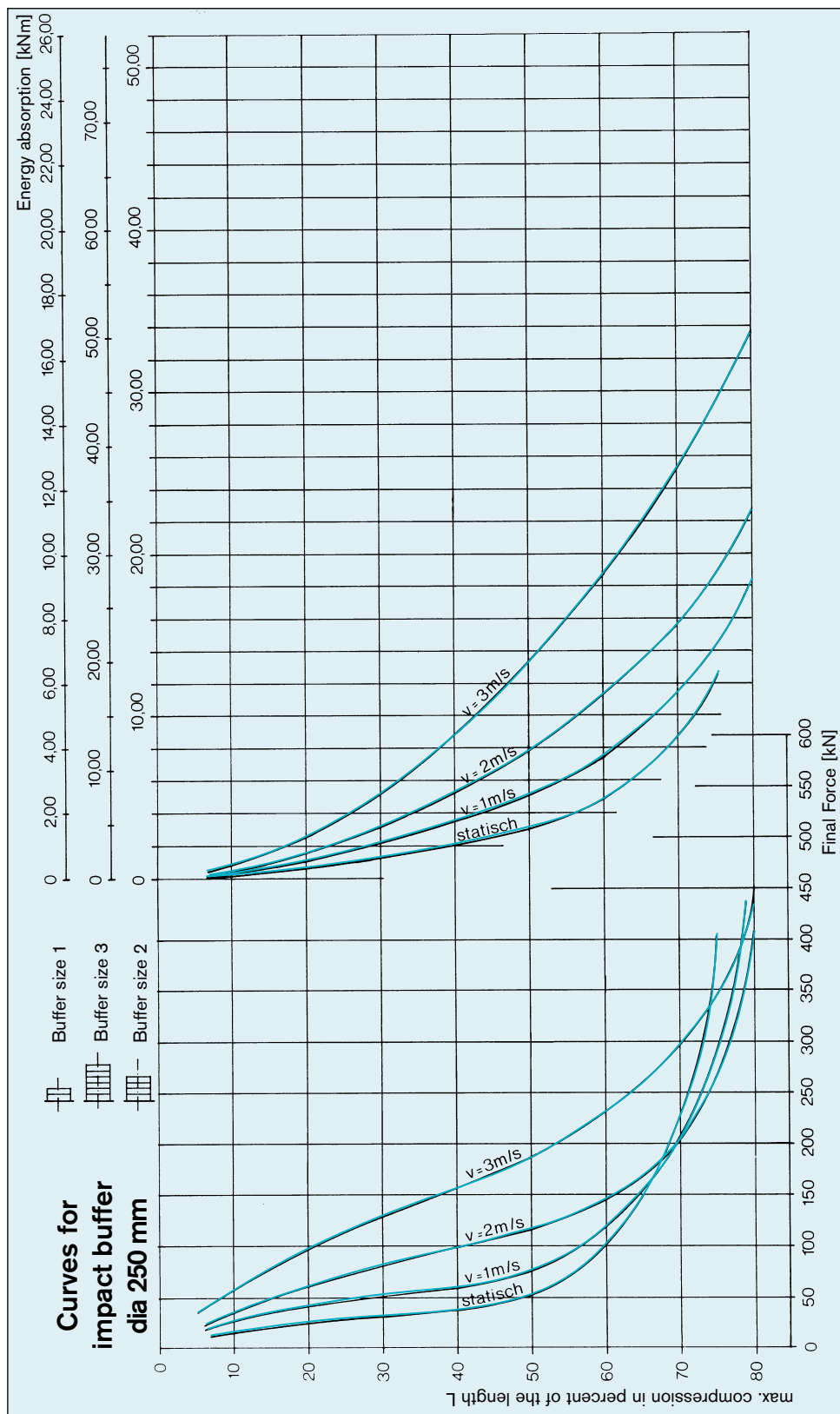
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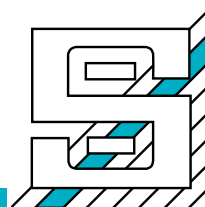
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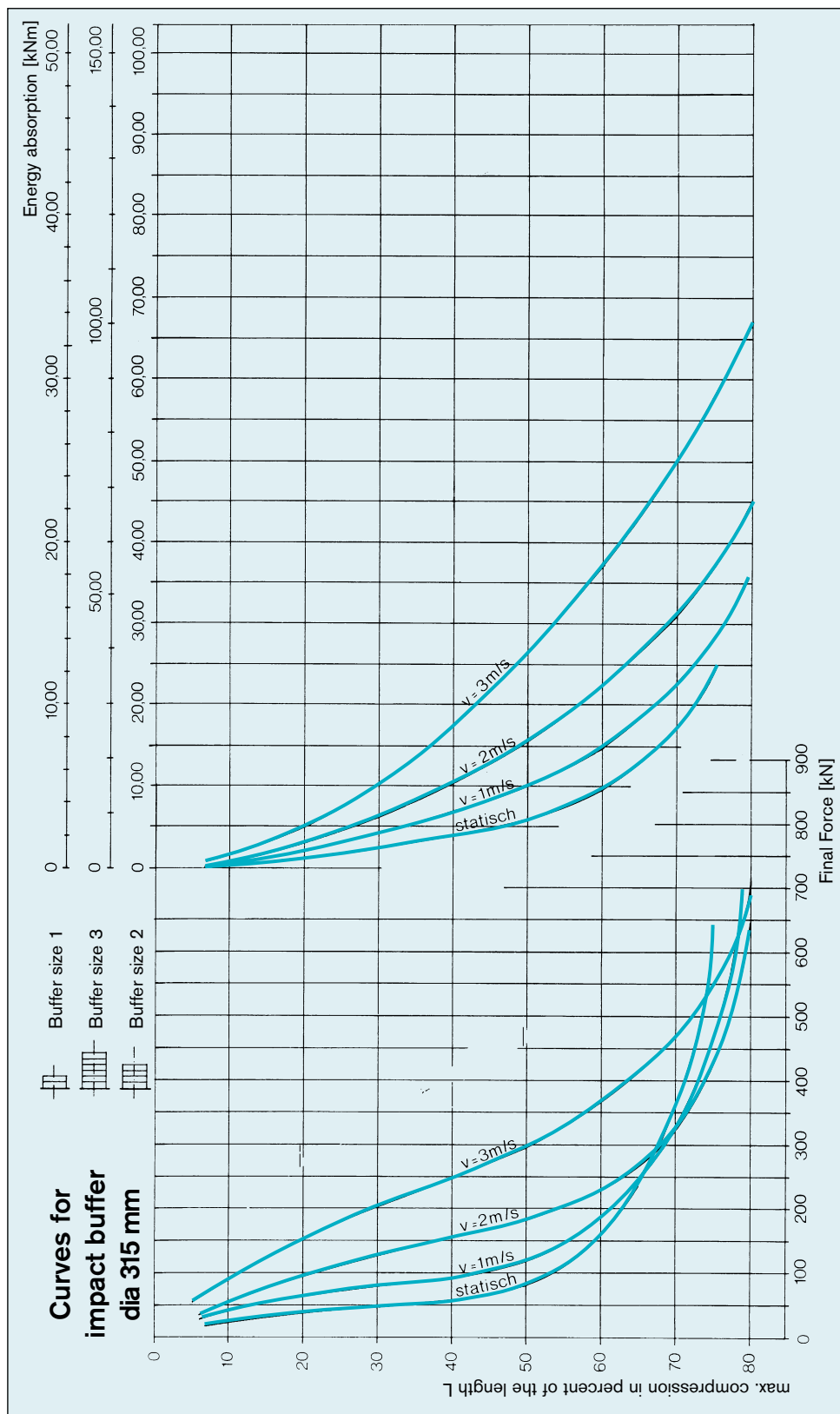
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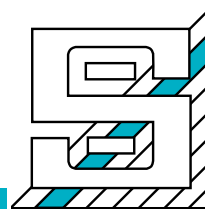
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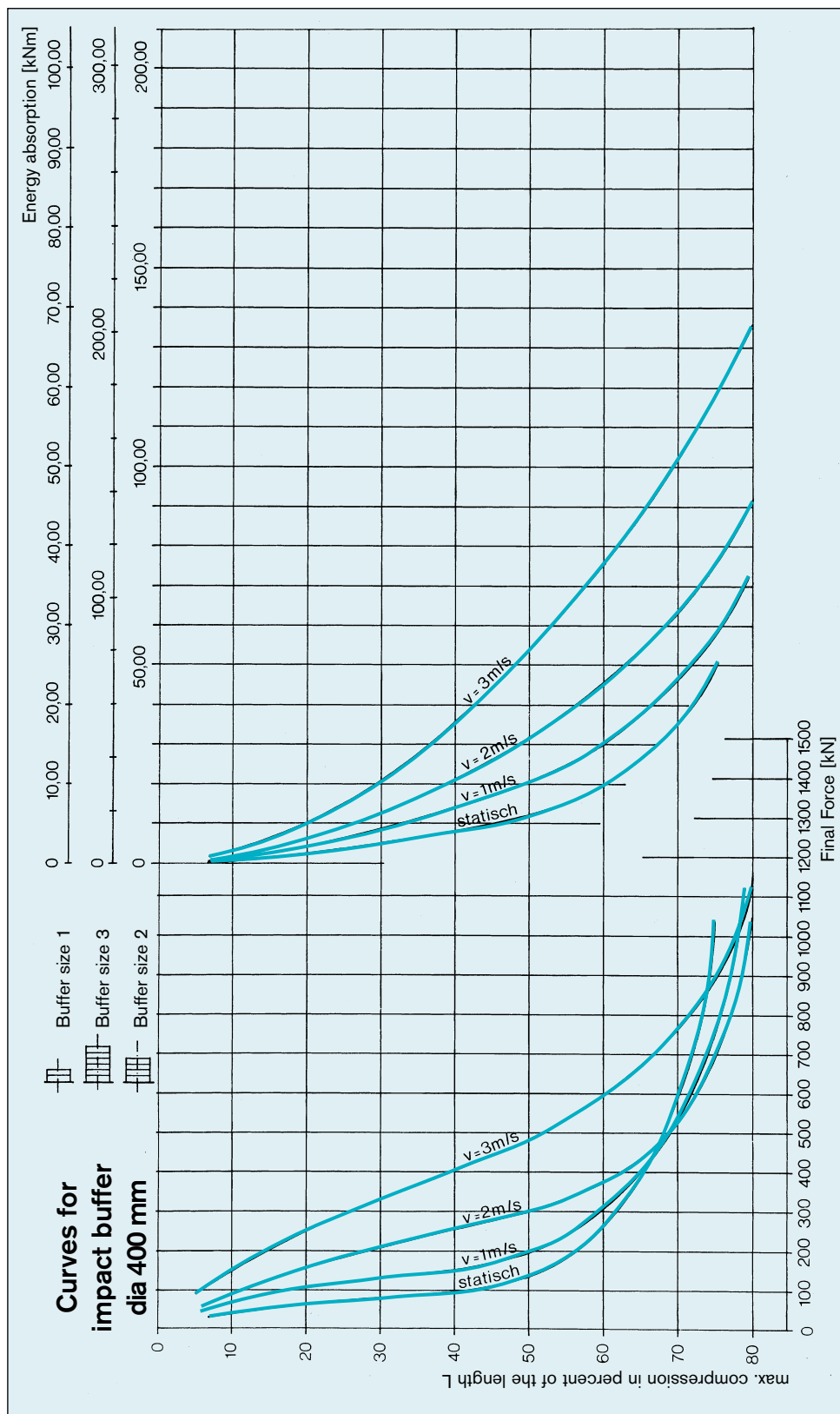
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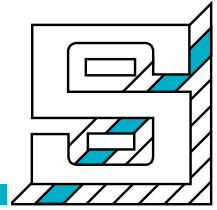
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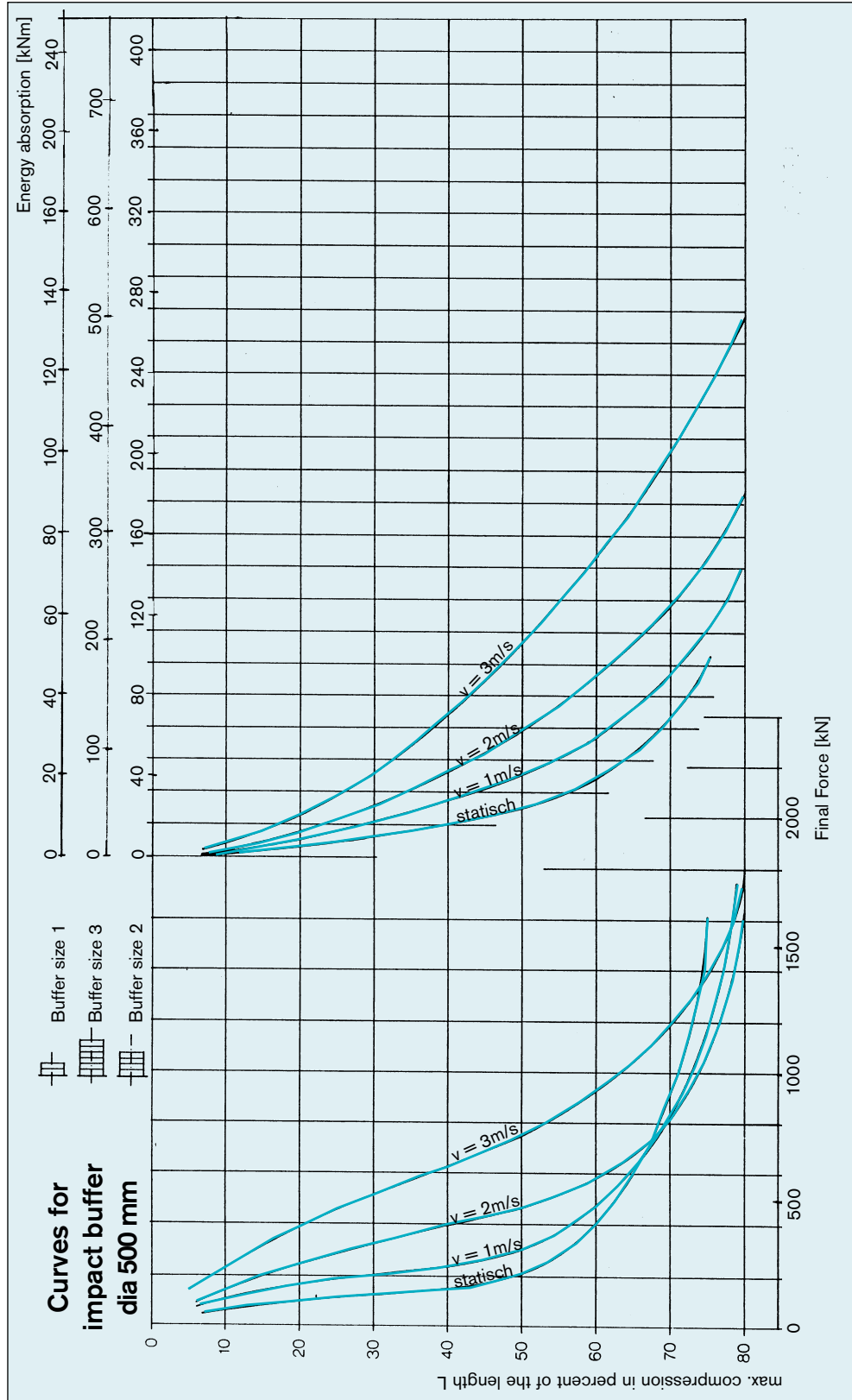
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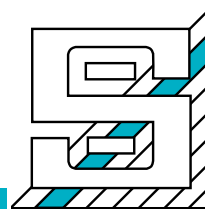
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