

# Viscoelastic Shock Absorbers

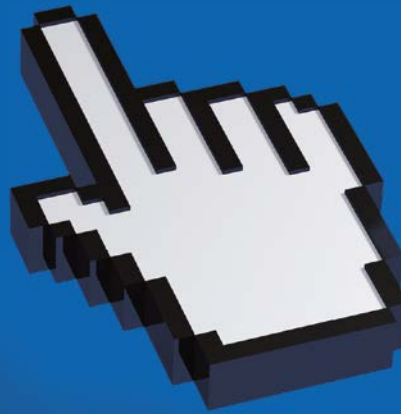
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# Viscoelastic Shock Absorbers

## Simple Design – High reliability

The self-adjusting Viscoelastic Shock Absorbers are designed on the principals of hydrostatic compression to combine the funtions of a shock absorber and a spring.

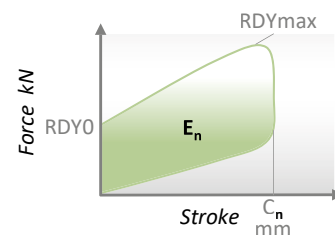
The advantages are a high damping coefficient, a low sensitivity to temperature changes and increased security by integrated static preload.

Viscoelastic shock absorbers are being used across a wide range of applications within heavy industry. Examples include, Material Handling, Rolling Mills, Defense, Waterways and Paper production.



Based on following data:

- Impact speed: 2 m/s
- Operating temperature: -20°C to +40°C



Symbols:

- $E_n$  = nominal energy capacity
- $C_n$  = maximum stroke
- RDY = dynamic reaction

## Technical Data

**Energy capacity:** 0,1 kJ/cycle to 1000 kJ/cycle

**Impact velocity range:** 0,5 m/s to 5 m/s. Other speeds on request.

**Operating temperature range:** - 20 °C to +50 °C. Other temperatures on request.

**Stroke:** 12mm to 1300mm

**Mounting:** In any position

**Positive stop:** Integrated

**Material:** Steel or stainless steel

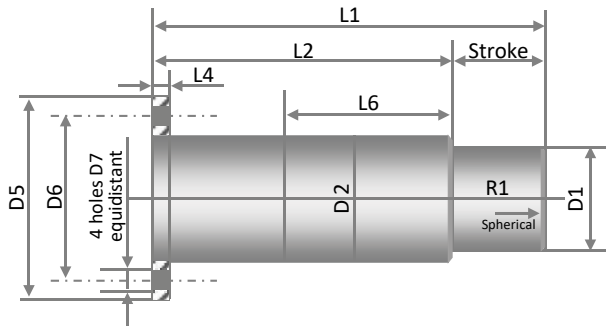
**Damping medium:** Visco elastic fluid

**Application field:** Industry, Material Handling, Rolling Mill, Defense, Waterways, Paper Industries

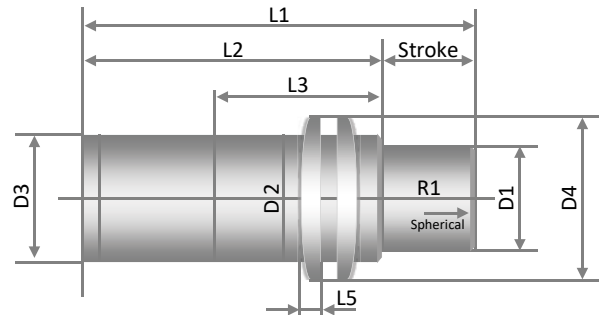
**On request:** special dimensions or other specifications

## BA1 - range from 0,1 kJ to 14 kJ

### Automatic stroke return



BA1: Rear flange mounting



BA1: Nuts mounting

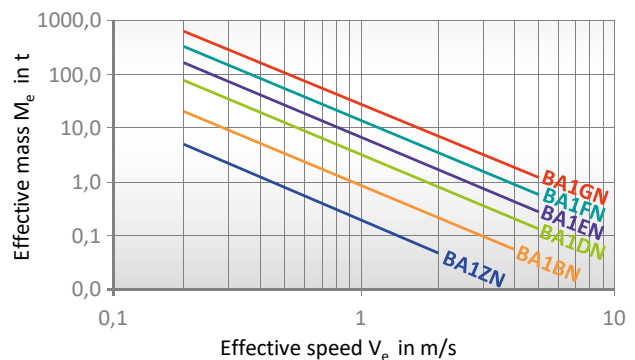
#### DIMENSIONAL CHARACTERISTICS

	L1 mm	L2 mm	L3 mm	L4 mm	L5 mm	L6 mm	R1 mm	D1 mm	D2 mm	D3 mm	D4 mm	D5 mm	D6 mm	D7 mm	Mass kg
BA1ZN	75	53	52	10	7	43	/	∅ 19	M25 x 1,5	∅ 20	∅ 38	∅ 57	∅ 41	∅ 7	0,3
BA1BN	120	98	96	12	8	86	/	∅ 25	M35 x 1,5	∅ 32	∅ 52	∅ 80	∅ 60	∅ 9	0,7
BAB1NM	120	98	96	12	9	/	/	∅ 25	M40 x 1,5	∅ 32	∅ 56	/	/	/	0,8
BA1DN	175	140	138	12	11	128	/	∅ 38	M50 x 1,5	∅ 45	∅ 70	∅ 90 ∅ 106	∅ 70 ∅ 85	∅ 9 ∅ 11	1,9 2
BA1DNM	175	140	138	12	11	/	/	∅ 38	M60 x 2	∅ 45	∅ 81	/	/	/	2
BA1EN	213	168	158	10	13	158	R.130	∅ 60	M75 x 2	∅ 72	∅ 98	∅ 122	∅ 100	∅ 11	5
BA1FN	270	210	130	12	16	130	R.150	∅ 74,5	M90 x 2	∅ 90	∅ 120	∅ 150	∅ 120	∅ 13	10,5
BA1GN	337	257	145	14	19	145	R.350	∅ 90	M110 x 2	∅ 110	∅ 145	∅ 175	∅ 143	∅ 18	17

External protection: Zn6CFe

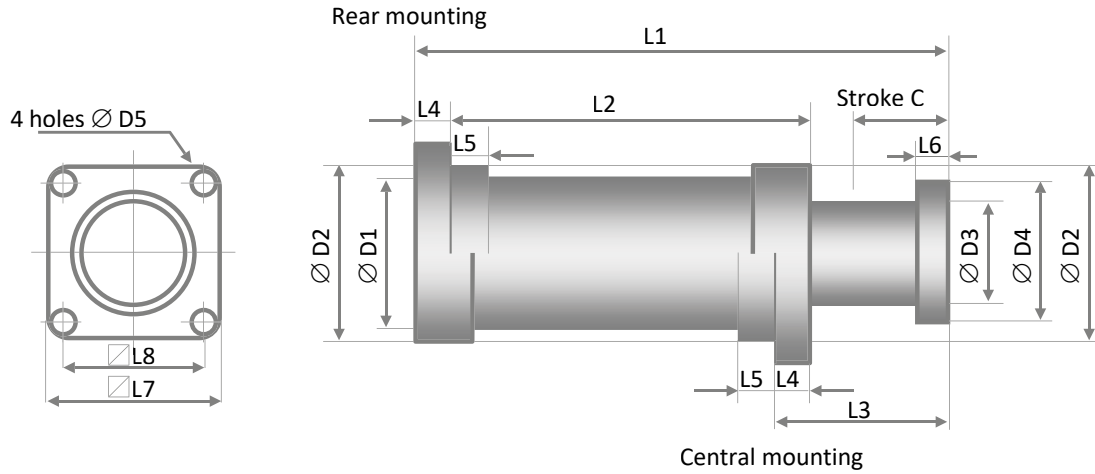
#### MECHANICAL CHARACTERISTICS

	En kJ	Stroke mm	RDY0 kN	RDYmax kN
BA1ZN	0,1	12	6	11
BA1BN	0,43	22	14	27
BA1BNM				
BA1DN	1,5	35	28	60
BA1DNM				
BA1EN	3,4	45	45	100
BA1FN	7	60	90	150
BA1GN	14	80	130	230



### BA5 - range from 25 kJ to 150 kJ

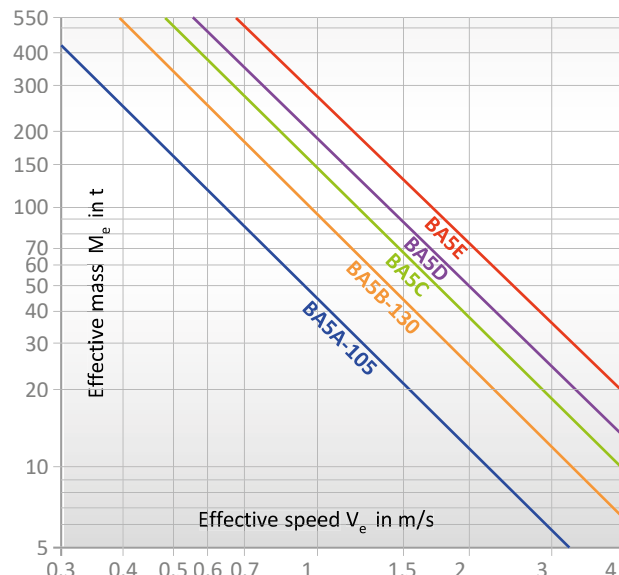
#### Automatic stroke return



DIMENSIONAL CHARACTERISTICS														
	L1	L2	L3	L4	L5	L6	L7	L8	D1	D2	D3	D4	D5	Mass
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
BA5A-105	415	275	140	20	30	15	135	105	/	116	87	120	14	25
BA5B-130	500	325	175	30	30	15	155	125	139	142	117	140	15	40
BA5C	520	315	205	30	36	35	175	140	160	160	132	158	18	45
BA5D	585	350	235	35	40	40	215	170	180	180	153	185	22	73
BA5E	670	405	265	40	45	45	250	195	215	215	182	220	26	117

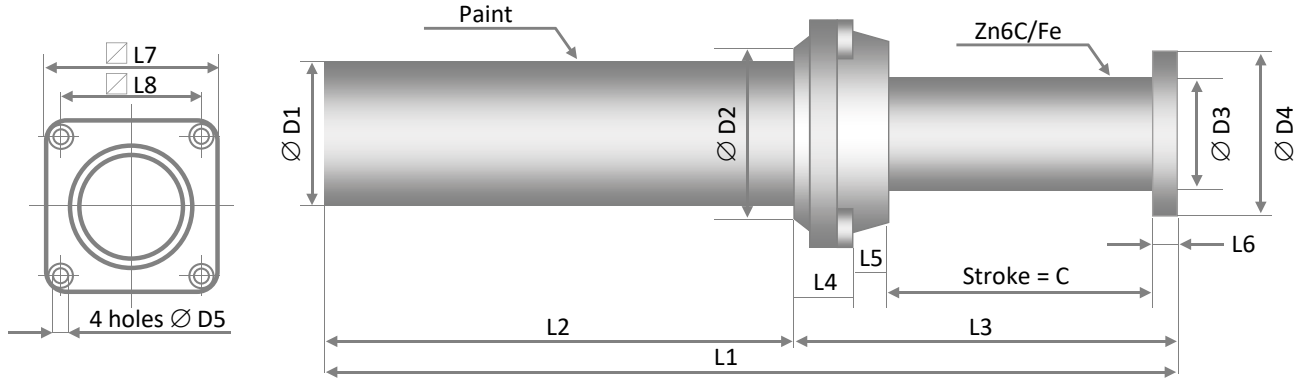
- **Impact speed:** BA5 series shock absorbers are designed for impact velocities up to 4 m/s. Higher velocities require custom modification.
- **External protection:** painting – Reservoir: Zn6CFe

MECHANICAL CHARACTERISTICS				
	En	Stroke	RDY0	RDYmax
	kJ	mm	kN	kN
BA5A-105	25	105	167	310
BA5B-130	50	130	280	500
BA5C	75	140	400	700
BA5D	100	160	470	820
BA5E	150	180	640	1100



## BXLR - range from 6 kJ to 150 kJ

### Automatic stroke return



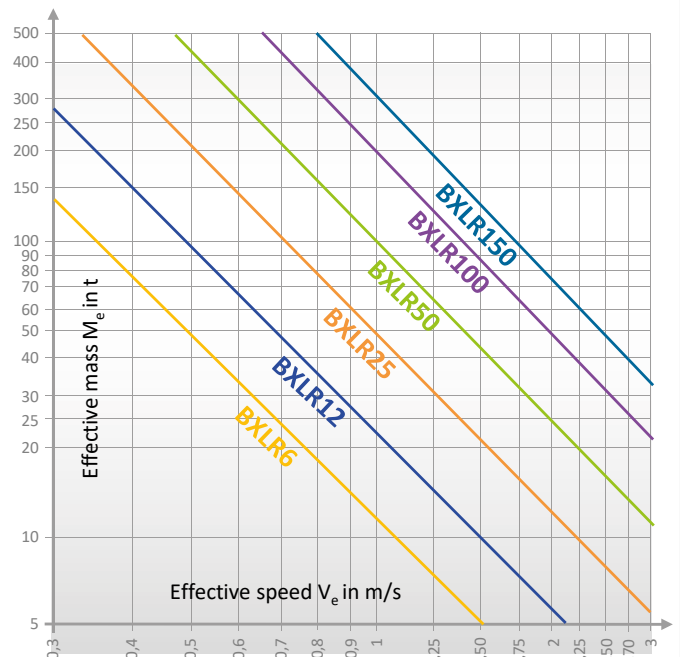
#### DIMENSIONAL CHARACTERISTICS

	L1 mm	L2 mm	L3 mm	L4 mm	L5 mm	L6 mm	L7 mm	L8 mm	D1 mm	D2 mm	D3 mm	D4 mm	D5 mm	Mass kg
BXLR6-150	410	231	179	19	0	10	∅ 90	∅ 70	50	∅ 90	38	50	9	4,2
BXLR12-150	480	285	195	18	15	12	110	85	75	90	57	80	11	11
BXLR12-200	530	285	245	18	15	12	110	85	75	90	57	80	11	11
BXLR25-200	620	370	250	20	18	12	135	105	90	110	72	100	14	20
BXLR25-270	690	370	320	20	18	12	135	105	90	110	72	100	14	25
BXLR50-275	855	520	335	25	20	15	175	140	110	150	87	120	18	40
BXLR50-400	980	520	460	25	20	15	175	140	110	150	87	120	18	40
BXLR100-400	1370	910	460	25	20	15	175	140	110	150	87	120	18	65
BXLR100-600	1570	910	660	25	20	15	175	140	110	150	87	120	18	65
BXLR150-800	2640	1780	860	25	20	15	175	140	110	150	87	120	18	115

- Front or rear flange mounting type on request
- External protection: paint and reservoir Zn6CFe

#### MECHANICAL CHARACTERISTICS <sup>(1)</sup>

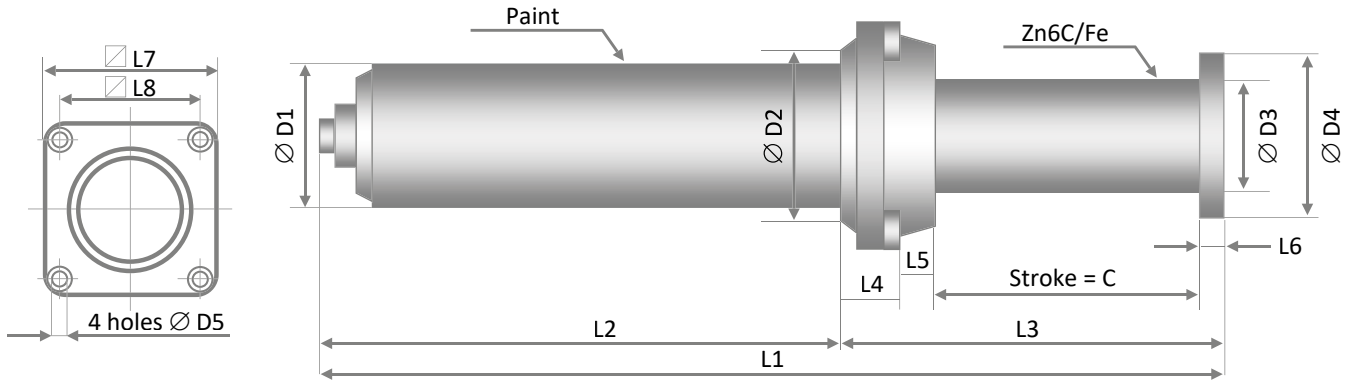
	En kJ	Stroke mm	RDY0 kN	RDYmax kN
BXLR6-150	6	150	25	50
BXLR12-150	12	150	66	100
BXLR12-200	12	200	42	78
BXLR25-200	25	200	95	150
BXLR25-270	25	270	66	112
BXLR50-275	50	275	118	230
BXLR50-400	50	400	75	150
BXLR100-400	100	400	175	320
BXLR100-600	100	600	85	230
BXLR150-800	150	800	80	250



- Impact speed: BXLR range shock absorbers are designed for impact velocities of 2 m/s. Higher velocities require custom modification.

### BALR - range from 100 kJ to 1000 kJ

#### Automatic stroke return



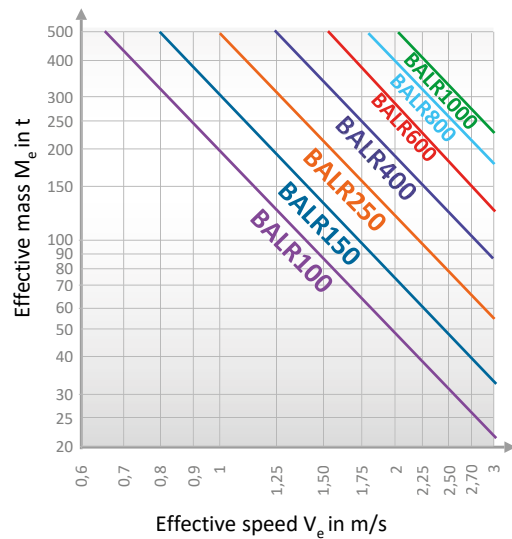
#### DIMENSIONAL CHARACTERISTICS

	L1 mm	L2 mm	L3 mm	L4 mm	L5 mm	L6 mm	L7 mm	L8 mm	D1 mm	D2 mm	D3 mm	D4 mm	D5 mm	Mass kg
BALR-100	1120	660	460	25	20	15	175	140	130	150	110	140	18	63
BALR-150	1350	775	575	30	25	20	215	170	140	185	120	150	22	90
BALR-220S	1258	783	475	30	25	20	215	170	140	185	120	150	22	100
BALR-250	1750	1025	725	30	25	20	215	170	155	185	135	170	22	135
BALR-400	2185	1250	935	35	25	25	265	210	175	235	150	190	27	218
BALR-600	2555	1420	1135	35	25	25	265	210	200	235	175	215	27	295
BALR-800	2935	1630	1305	40	35	30	300	240	220	270	190	235	30	420
BALR-1000	3225	1820	1405	40	35	30	300	240	230	270	205	248	30	470

- Front or rear flange mounting type on request
- External protection: paint and reservoir Zn6CFe

#### MECHANICAL CHARACTERISTICS <sup>(1)</sup>

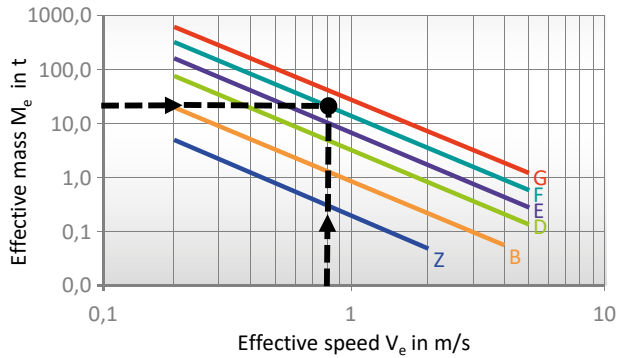
	En kJ	Stroke mm	RDY0 kN	RDYmax kN
BALR-100	100	400	190	310
BALR-150	150	500	200	380
BALR-220S	220	400	380	685
BALR-250	250	650	270	490
BALR-400	400	850	330	600
BALR-600	600	1050	370	740
BALR-800	800	1200	430	860
BALR-1000	1000	1300	500	1000



- Impact speed: BALR range shock absorbers are designed for impact velocities of 2 m/s. Higher velocities require custom modification.

## Selection of a standard shock absorber

### 1 SELECTION CHART



### 2 EFFECTIVE ENERGY CALCULATION

$$E_e = \frac{1}{2} M_e V_e^2$$

### 3 ALLOWABLE IMPACT FREQUENCY

$$F < 20 \times \frac{E_n}{E_e} \text{ impacts/hour}$$

### 4 EFFECTIVE STROKE CALCULATION

$$C_e = C_n \left( \sqrt{\frac{E_e}{E_n(0,03V_e + 0,24)}} + 1,36 - 1,17 \right)$$

### 5 EFFECTIVE REACTION Rdy\_e CALCULATION

$$Rdy_e = \left[ \left( \frac{Rdy_{max} - Rdy_0}{C_n} \right) \times C_e + Rdy_0 \right] (0,1V_e + 0,8)$$

### 6 APPLICATION EXAMPLE

Given data:

- Effective mass = 15 t
- Effective speed = 0,8 m/s
- Impact frequency = 25 impacts/hour

① Selection chart gives BA1FN.

The mechanical characteristics are:

- $E_n$  = 7 kJ
- $C_n$  = 60 mm
- $Rdy_{max}$  = 150 kN
- $Rdy_0$  = 90 kN

② The energy  $E_e$  to dissipate per impact is 4,8 kJ.

③ The allowable impact frequency  $F$  is  $< 20 \times 7/4,8$

④ The effective stroke  $C_e$  will be 49 mm

$$60 \left( \sqrt{\frac{4,8}{7(0,03 \times 0,8 + 0,24)}} + 1,36 - 1,17 \right)$$

⑤  $Rdy_e = [(150-90) \times (49/60) + 90] \times (0,1 \times 0,8 + 0,8) = 122 \text{ kN}$

**All performance characteristics can be modified.**

**Please advise us of your specific requirements.**

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## Viscoelastic Springs

**Extremely compact – High energy storing**

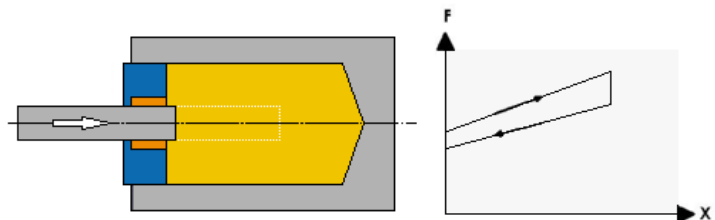
The self-adjusting Viscoelastic Springs are designed on the principals of hydrostatic compression to act as high energy storing device.

The advantages are greater reliability, extremely compact design and an easy installation.

Viscoelastic Springs are being used for work rolls of the steel industry.



**Additional information available upon request.**



### Technical Data

**Operating temperature range:** - 20 °C to +50 °C. Other temperatures on request.

**Mounting:** In any position

**Positive stop:** Integrated

**Material:** Steel or stainless steel

**Damping medium:** Visco elastic fluid

**Applications:** Rolling mills, Hot strip mills, Cold strip mills, Skin pass mills, Tin mills, Temper mills, Plate mills, Slab/Bloom mills, Bar mills, Rod mills, Sluices, Ports

## ACE Germany

The shortest way to the perfect shock absorber



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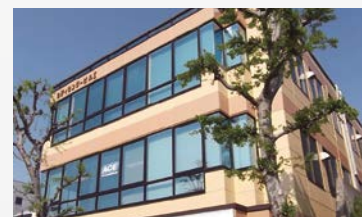
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