Overview

The design of Jarret Industrial Shock Absorber utilizes the unique compression and shear characteristics of specially formulated silicone elastomers.

These characteristics allow the energy absorption and return spring functions to be combined into a single unit **without the need for an additional gas or mechanical spring stroke return mechanism**.

Applications:
Shock protection for all types of industries including:
Defense, Automobile, Railroad, Materials Handling, Marine, Pulp/Paper, Metal Producing and Processing.

Advantages:
- Simple design - High reliability
- High damping coefficient
- Low sensitivity to temperature variances

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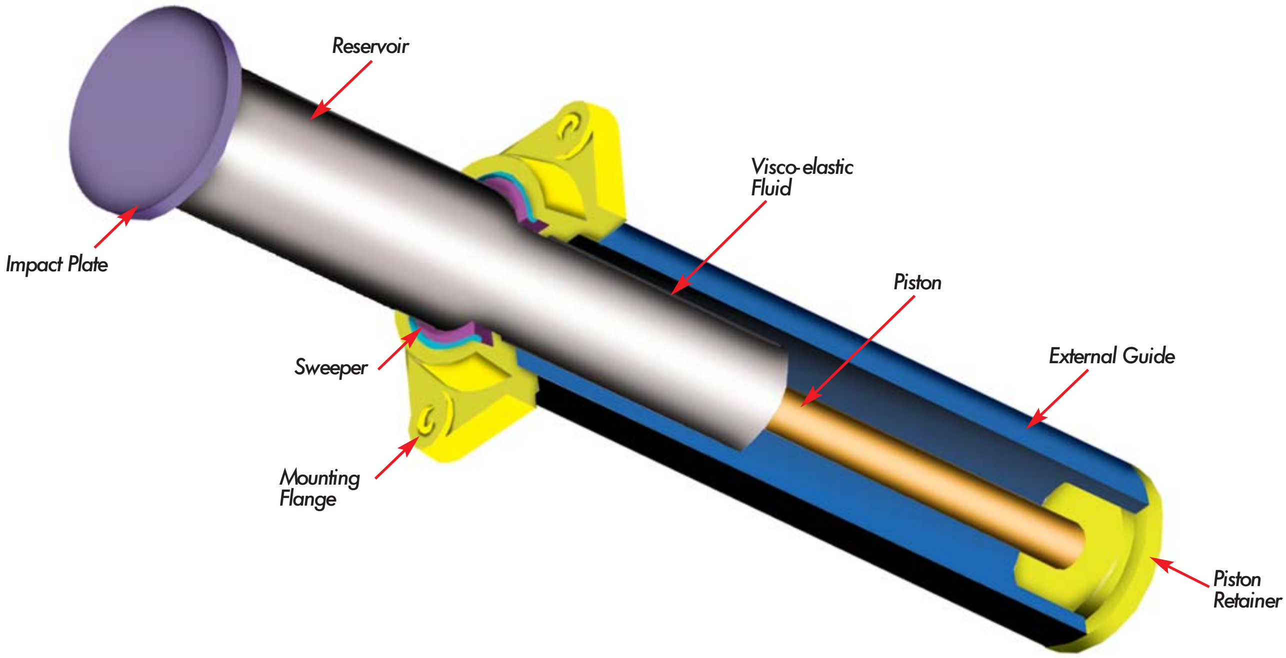
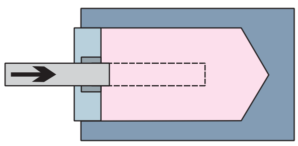
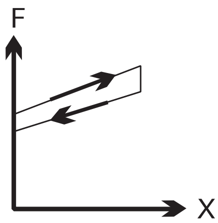
Visco-elastic Technology

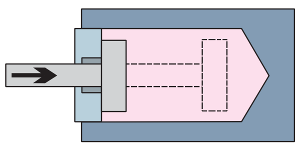


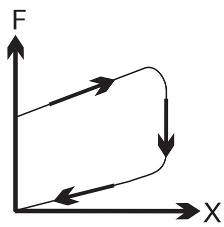
Visco-elastic technology makes use of the fundamental properties of specially formulated Jarret visco-elastic fluids.





Compressibility:
Preloaded spring function
- $F = F_0 + KX$





Viscosity:
Shock absorber function
- $F = F_0 + KX + CV^{\alpha}$ with α between 0,1 and 0,4

The two functions can be used separately or in combination, in the same product:

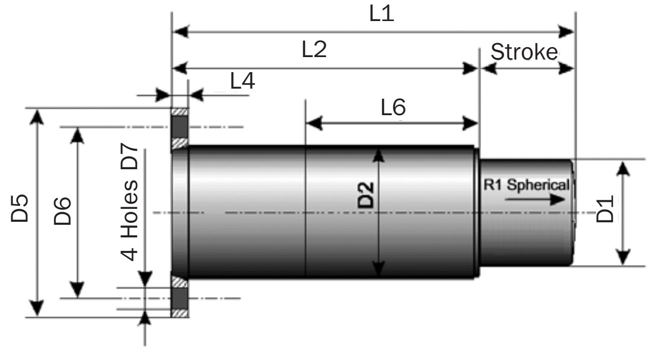
Preloaded Spring:
Spring Function Only
- Hysteresis of between 5% and 10%
- Reduced weight and space requirement
- Force/stroke characteristic is independent of actuation speed

Preloaded Spring Shock Absorbers:
Combine Spring and Shock Absorber Functions
- Dissipate between 30% and 100% of energy
- Force/stroke characteristics remain relatively unchanged between -10°C and + 70°C

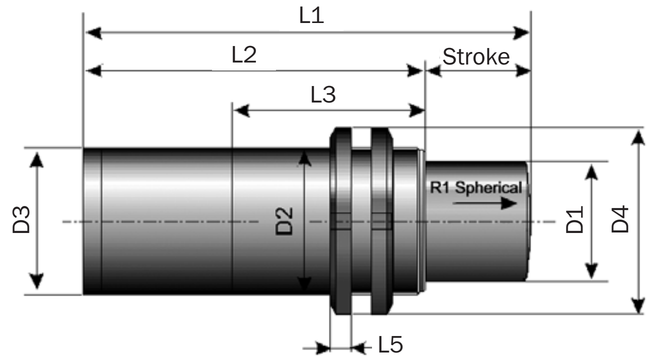
Shock Absorber Without Spring Return:
Shock Absorbing Function Only
- Dampening devices
- Blocking devices

BC1ZN → BC1GN Series

Technical Data



Rear flange mounting - Fa



Threaded body mounting - Fc

Catalog No./ Model	Max Energy Capacity kJ	Stroke mm	Return Force		Rdy0 kN	Rdymax Max Reaction Force kN
			Extension kN	Compression kN		
BC1ZN	0,1	12	0,94	5,4	6	11
BC1BN	0,43	22	2,5	14,0	14	27
BC1DN	1,5	35	5,2	28,8	28	60
BC1EN	3,4	45	7,8	43,0	45	100
BC1FN	7	60	13,6	76,6	90	150
BC1GN	14	80	19,0	130,0	130	230

Catalog No./ Model	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
BC1ZN	75	53	52	10	7	43	–	19	M25 x 1,5	20	38	57	41	7	0,3
BC1BN	120	98	96	12	8	86	–	25	M35 x 1,5	32	52	80	60	9	0,7
BC1BN-M	120	98	96	12	9	-	–	25	M40 x 1,5	32	58	–	–	–	0,8
BC1DN-70	175	140	138	12	11	128	–	38	M50 x 1,5	45	70	90	70	9	1,9
BC1DN-85	175	140	138	12	11	128	–	38	M50 x 1,5	45	70	106	85	11	2
BC1DN-M	175	140	138	12	11	–	–	38	M60 x 2	45	70	–	–	–	2
BC1EN	213	168	158	10	13	158	R.130	60	M75 x 2	72	98	122	100	11	5
BC1FN	270	210	130	12	16	130	R.150	74,5	M90 x 2	90	120	150	120	13	10,5
BC1GN	337	257	145	14	19	145	R.350	90	M110 x 2	110	145	175	143	18	17

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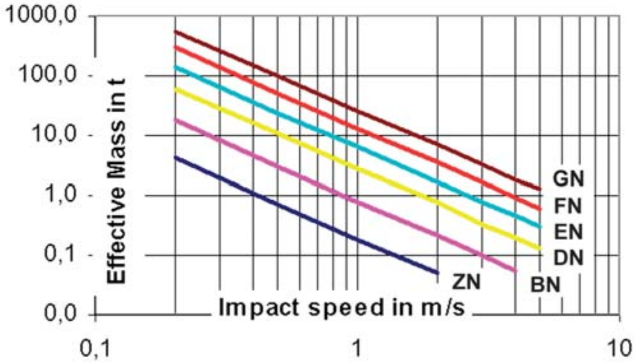
Application Worksheet

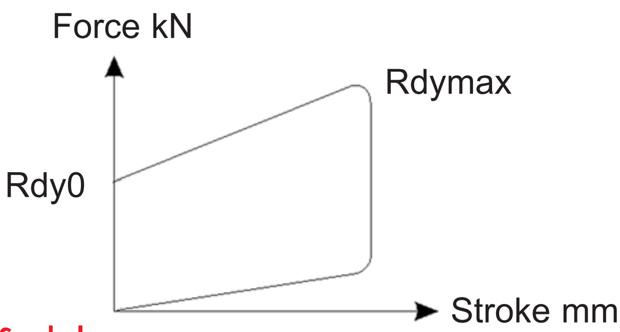
BC1ZN ➞ BC1GN Series

1 - Selection Chart



Based On

- ☐ Impact velocity : 2 m/s
- ☐ Operating temperature : - 20°C to + 40°C
- ☐ Surface protection : Electrolytic zinc
- ☐ Dynamic performance diagram



Symbols:

En = Energy Capacity
C = Maximum Stroke
Rdy = Dynamic Reaction

2 - Energy Calculation

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

3 - Allowable Impact Frequency

$$F < 20 \times \frac{En}{E} \text{ Impacts/hour}$$

4 - Effective Stroke Calculation

$$Ce = C\left(\sqrt{\frac{E}{En\,(0{,}03\,V + 0{,}24)}} + 1{,}36 - 1{,}17\right)$$

5 - Calculation of Effective Reaction Rdy_e

$$Rdy_e = \left[\left(\frac{Rdymax - Rdy0}{C}\right) \times Ce + Rdy0\right](0{,}1V + 0{,}8)$$

6 - Application Example

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

1: BC1FN Selected

2: Energy dissipated per impact is: 4,8 kJ

3: Allowable impact frequency < 20x7/4,8

4: Required stroke is 49 mm

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

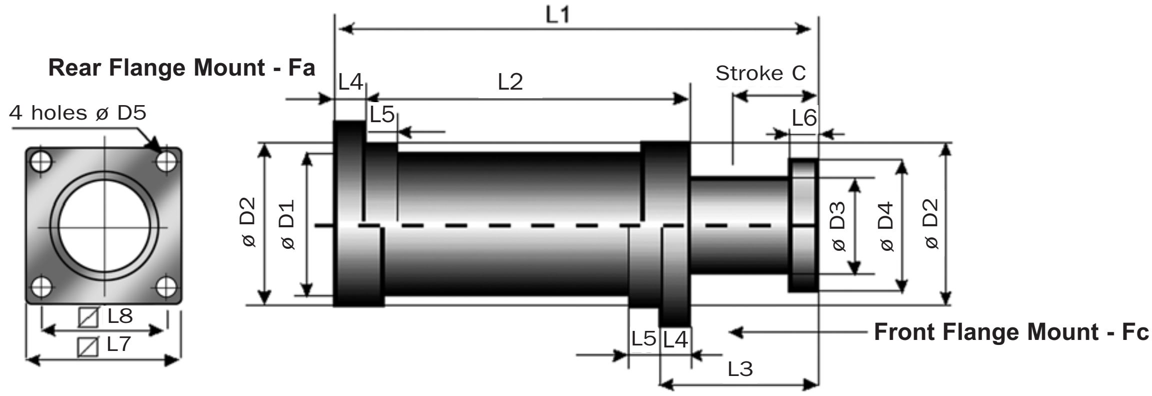
5: With an Rdy_e = [(150 - 90) x 49/60) + 90)] x (0,1 x 0,8 + 0,8) = 122 kN

Compare with standard mechanical characteristics:

En = 7 kJ, C = 60mm, Rdy0 = 90 kN and
Rdymax = 150 kN

All performance characteristics can be modified. Please advise us of your specific requirements.

BC5A → BC5E Series



Catalog No./ Model	Max Energy Capacity kJ	Stroke mm	Return Force		Rdy0 kN	Rdymax Max Reaction Force kN
			Extension kN	Compression kN		
BC5A-105	25	105	18,5	140,7	167	310
BC5B-130	50	130	33,0	221,0	260	500
BC5C-140	75	140	49,0	328,4	400	700
BC5D-160	100	160	59,5	380,0	470	820
BC5E-180	150	180	117,0	546	640	1 100

Catalog No./ Model	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
BC5A-105	415	275	140	20	30	15	135	105	116	116	87	120	14	25
BC5B-130	500	325	175	30	20	15	155	125	142	155	117	140	15	37
BC5C-140	520	315	205	30	36	35	175	140	160	160	132	158	18	45
BC5D-160	585	350	235	35	40	40	215	170	180	180	153	185	22	73
BC5E-180	670	405	265	40	45	45	250	195	215	215	182	220	26	117

Impact Speed: BC5 Series shock absorbers are designed for impact velocities of up to 4 m/s Higher impact velocities require custom modification.

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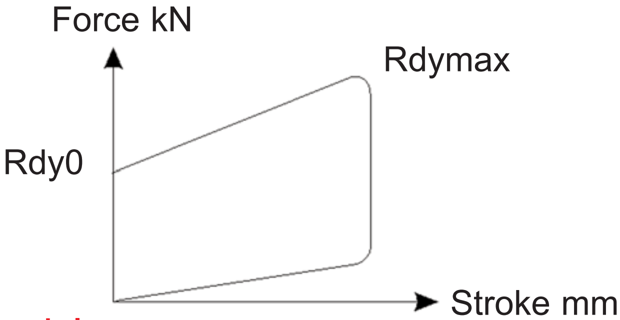
Application Worksheet

Based On

- ☐ Impact velocity : 2 m/s
- ☐ Operating temperature : - 20°C to + 40°C
- ☐ Surface protection : Electrolytic zinc
- ☐ Dynamic performance diagram



Symbols:

En = Energy Capacity
C = Maximum Stroke
Rdy = Dynamic Reaction

1 - Energy Calculation

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

2 - Allowable Impact Frequency

$$F < 15 \times \frac{En}{E} \text{ Impacts/hour}$$

3 - Effective Stroke Calculation

$$Ce = C\left(\sqrt{\frac{E}{En\,(0{,}03\,V + 0{,}24)}} + 1{,}36 - 1{,}17\right)$$

4 - Calculation of Effective Reaction Rdy_e

$$Rdy_e = \left[\left(\frac{Rdymax - Rdy0}{C}\right) \times Ce + Rdy0\right](0{,}1V + 0{,}8)$$

5 - Application Example

Data: Two shock absorbers in series, Effective mass m =300 t, Impact speed v = 1,2 m/s (which is an impact of 0,6 m/s on each shock absorber), Impact frequency = 15 impacts/hour, Maximum allowable structural load 1000 kN

1: $E = \frac{1}{2}\left(\frac{1}{2} mV^2\right)$ - Selection BC5-E

2: Maximum allowable impact frequency is $15 \times \frac{150}{108}$ 21 impacts/hour. Therefore 15 impacts/hour is acceptable.

3: Required stroke is 167 mm

$$Ce = 180 \times \left(\sqrt{\frac{108}{150\,(0{,}03 \times 0{,}6 + 0{,}24)}} + 1{,}36 - 1{,}17\right) = 156 \text{ mm}$$

4: $$Rdye = \left[(1\,100 - 640) \times \frac{156}{180} + 640\right](0{,}1 \times 0{,}6 + 0{,}8)$$

= 893 kN < 1000 kN, maximum allowable impact frequency

Compare with standard mechanical characteristics for each shock absorber:

En = 150 kJ, C = 180 mm, Rdy0 = 640 kN and Rdy_{max} = 1100 kN

All performance characteristics can be modified.
Please advise us of your specific requirements.

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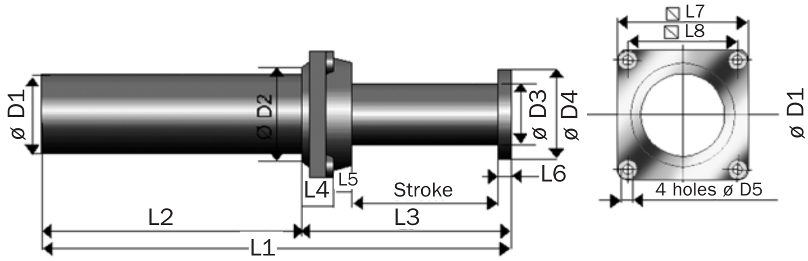
XLR6-150 → XLR-800 Series

Technical Data



XLR Series - Front Flange Mount- Fc

Catalog No./ Model	Max Energy Capacity kJ	Stroke mm	Return Force		Rdy0 kN	Rdymax Max Reaction Force kN
			Extension kN	Compression kN		
XLR6-150	6	150	2,9	20,5	25	50
XLR12-150	12	150	8,3	38,5	66	100
XLR12-200	12	200	5,6	30,0	42	78
XLR25-200	25	200	13,4	74,4	95	150
XLR25-270	25	270	11,1	51,4	66	112
XLR50-275	50	275	19,7	130,0	118	230
XLR50-400	50	400	12,9	83,8	75	150
XLR100-400	100	400	25,0	162,5	175	320
XLR100-600	100	600	11,6	132,4	85	230
XLR150-800	150	800	23,2	152,2	80	250

Impact Speed: Types XLR and BCLR Series shock absorbers are designed for impact velocities of up to 2 m/s
Higher impact velocities require custom modification.

Catalog No./ Model	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
XLR6-150	410	231	179	19	0	10	90	70	50	90	38	50	9	4,2
XLR12-150	480	285	195	18	15	12	110	85	75	90	57	80	11	11
XLR12-200	530	285	245	18	15	12	110	85	75	90	57	80	11	11
XLR25-200	620	370	250	20	18	12	135	105	90	110	72	100	14	20
XLR25-270	690	370	320	20	18	12	135	105	90	110	72	100	14	25
XLR50-275	855	520	335	25	20	15	175	140	110	150	87	120	18	40
XLR50-400	980	520	460	25	20	15	175	140	110	150	87	120	18	40
XLR100-400	1370	910	460	25	20	15	175	140	110	150	87	120	18	65
XLR100-600	1570	910	660	25	20	15	175	140	110	150	87	120	18	65
XLR150-800	2640	1780	860	25	20	15	175	140	110	150	87	120	18	115

Rear Flange Mounting - Fa on Request.

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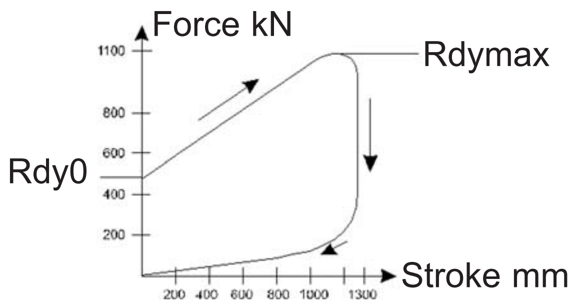
XLR6-150 → XLR-800 Series

Application Worksheet

Based On
- ☐ Impact velocity : 2 m/s
- ☐ Operating temperature : - 20°C to + 40°C
- ☐ Surface protection : Electrolytic zinc & Painting
- ☐ Dynamic performance diagram



Symbols:
En = Energy Capacity
C = Maximum Stroke
Rdy = Dynamic Reaction

1 - Energy Calculation

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

2 - Allowable Impact Frequency

$$F < 8 \times \frac{En}{E} \text{ Impacts/hour}$$

3 - Required Stroke Calculation

$$Ce = C\left(\sqrt{\frac{E}{En\,(0{,}027\,V + 0{,}22)}} + 1{,}83 - 1{,}35\right)$$

4 - Calculation of Effective Reaction Rdy_e

$$Rdy_e = \left[\left(\frac{Rdymax - Rdy0}{C}\right) \times Ce + Rdy0\right](0{,}1V + 0{,}8)$$

5 - Application Example

Data: Effective mass = 30 t
Effective impact speed = 2,2 m/s
Maximum allowable structural force: 350 kN
Impact Frequency = 8/hr

1: XLR100-400 selected

2: Energy dissipated/impact is 72,6 kJ

3: Maximum allowable impact frequency
8 x 100 / 72,6 = 11 (Therefore 8 impacts/hr is acceptable)

4: Effective stroke:

$$Ce = 400 \times \left(\sqrt{\frac{72{,}6}{100\,(0{,}027 \times 2{,}2 + 0{,}22)}} + 1{,}83 - 1{,}35\right)$$

Ce = 301,8mm

5: Rdye = 284,4 (0,1 x 2,2 + 0,8) = 290,1 kN

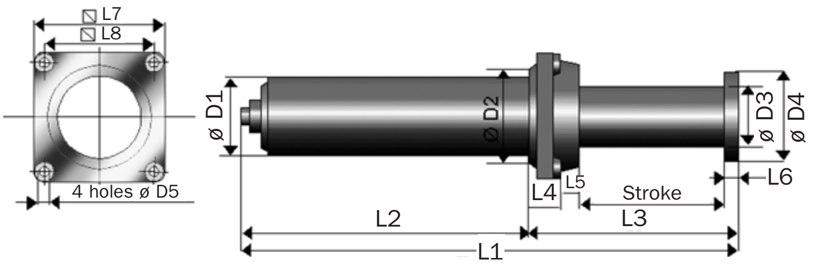
(which is less than maximum allowable reaction force of 350 kN)

Compare with standard performance characteristics:

En = 100 kJ, C = 400 mm,
Rdymax = 320 kN
Rdy0 = 175 kN

All performance characteristics can be modified.
Please advise us of your specific requirements.

BCLR-100 → BCLR-1000 Series



BCLR Series - Front Flange Mount - Fc

Catalog No./ Model	Max Energy Capacity kJ	Stroke mm	Return Force		Rdy0 kN	Rdymax Max Reaction Force kN
			Extension kN	Compression kN		
BCLR-100	100	400	30,0	161,9	190	310
BCLR-150	150	500	41,5	201,4	200	380
BCLR-220S	220	400	45,0	270,0	380	685
BCLR-250	250	650	45,0	253,0	270	490
BCLR-400	400	850	49,6	307,9	330	600
BCLR-600	600	1050	47,5	351,5	370	740
BCLR-800	800	1200	64,2	441,0	430	860
BCLR-1000	1000	1300	85,0	534,0	500	1000

Impact Speed: Types XLR and BCLR Series shock absorbers are designed for impact velocities of up to 2 m/s
Higher impact velocities require custom modification.

Catalog No./ Model	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
BCLR-100	1120	660	460	25	20	15	175	140	130	150	110	140	18	63
BCLR-150	1350	775	575	30	25	20	215	170	140	185	120	150	22	90
BCLR-220S	1258	783	475	30	25	20	215	170	140	185	120	150	22	100
BCLR-250	1750	1025	725	30	25	20	215	170	155	185	135	170	22	135
BCLR-400	2185	1250	935	35	25	25	265	210	175	235	150	190	27	218
BCLR-600	2555	1420	1135	35	25	25	265	210	200	235	175	215	27	295
BCLR-800	2935	1630	1305	40	35	30	300	240	220	270	190	235	30	420
BCLR-1000	3225	1820	1405	40	35	30	300	240	230	270	205	248	30	470

Rear Flange Mounting - Fa on Request.

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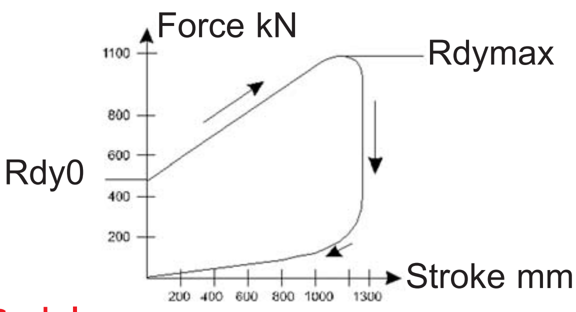
BCLR-100 → BCLR-1000 Series

Application Worksheet

Based On

- ☐ Impact velocity : 2 m/s
- ☐ Operating temperature : - 20°C to + 40°C
- ☐ Surface protection : Electrolytic zinc & Painting
- ☐ Dynamic performance diagram



Symbols:

En = Energy Capacity
C = Maximum Stroke
Rdy = Dynamic Reaction

1 - Energy Calculation

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

2 - Allowable Impact Frequency

$$F < 8 \times \frac{En}{E} \text{ Impacts/hour}$$

3 - Required Stroke Calculation

$$Ce = C\left(\sqrt{\frac{E}{En\ (0{,}027\ V + 0{,}22)}} + 1{,}83 - 1{,}35\right)$$

4 - Calculation of Effective Reaction Rdy_e

$$Rdy_e = \left[\left(\frac{Rdymax - Rdy0}{C}\right) \times Ce + Rdy0\right](0{,}1V + 0{,}8)$$

5 - Application Example

Data: Effective mass = 75 t
Effective impact speed = 2,7 m/s
Maximum allowable structural force: 650 kN
Impact Frequency = 8/hr

1: BCLR400 selected

2: Energy dissipated/impact is 274 kJ

3: Maximum allowable impact frequency
8 x 400 / 274 = 12 (Therefore 8 impacts/hr is acceptable)

4: Effective stroke:

$$Ce = 850 \times \left(\sqrt{\frac{274}{400\ (0{,}027 \times 2{,}7 + 0{,}22)}} + 1{,}83 - 1{,}35\right)$$

Ce = 587mm

5: Rdye = 520 (0,1 x 2,7 + 0,8) = 556 kN

(which is less than maximum allowable reaction force of 650 kN)

Compare with Standard
Performance characteristics are:
En = 400 kJ, C = 850 mm,
Rdymax = 600 kN
Rdy0 = 330 kN

All performance characteristics can be modified.
Please advise us of your specific requirements.