ITT

Jarret Products

Engineered for life

HEAVY INDUSTRY PRODUCTS

Applications:

- Amusement ride emergency stops
- Transportation safety stops
- Ladle transfer cars
- Coil upenders/downenders
- Rolling mill chock separators
- Furnace slab bumpers
- Hot strip mill down-coiler
- Re-heat furnace entry end shock absorber
- Gantry/Stacker Cranes

Table of Contents
Product Selection

General

Jarret

Enidine, a preferred source for energy absorption and vibration isolation solutions, offers a full range of Jarret products, each designed to protect equipment from large impacts in applications where consistent deceleration and safety is required.

Need Assistance? Enidine is ready to answer your questions, feel free to contact us at:

Phone: Toll Free - 1.800.852.8508
Direct - 1.716.662.1900

Fax: General - 1.716.662.1909
Industrial -1.716.662.0406

Email: industrialsales@enidine.com

Online: www.enidine.com

Overview

With its world headquarters located in Orchard Park, New York, USA, **ENIDINE Incorporated** is a world leader in the design and manufacture of standard and custom energy absorption and vibration isolation product solutions within the Industrial, Aerospace, Defense, Marine and Rail markets. Product ranges include shock absorbers, gas springs, rate controls, air springs, wire rope isolators, heavy industry buffers and emergency stops. With facilities strategically located throughout the world and in partnership with our vast global network of distributors, Enidine Incorporated continues to strengthen its presence within marketplace.

Founded in 1966, Enidine Incorporated now has close to 600 employees located throughout the globe in the United States, Germany, France, Japan, China and Korea. With a team of professionals in engineering, computer science, manufacturing, production and marketing our employees provide our customers the very best in service and application solutions.

"Enidine is widely recognized as the preferred source for energy absorption and vibration isolation products."

From Original Equipment Manufacturers (OEM) to aftermarket applications, Enidine offers a unique combination of product selection, engineering excellence and technical support to meet even the toughest energy absorption application requirements.

Global Manufacturing and Sales Facilities offer our customers:

- ***Highly Trained Distribution Network***
- ***State-of-the Art Engineering Capabilities***
- ***Custom Solution Development***
- ***Customer Service Specialists***
- ***Multiple Open Communication Channels***

If you are unsure whether one of our standard products meets your requirements, feel free to speak with one of our technical representatives **toll-free at 1-800-852-8508**, or contact us via **e-mail at techsales@enidine.com**.

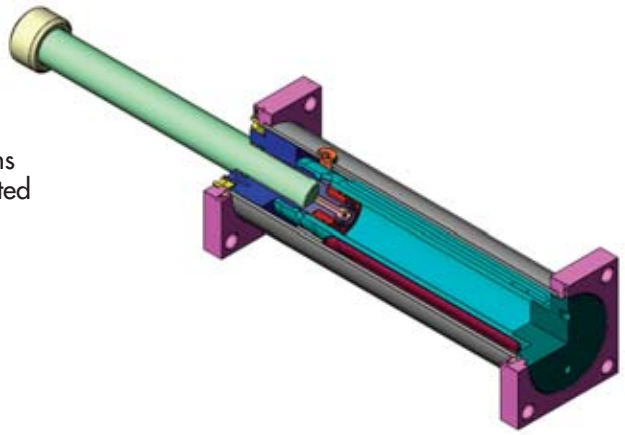
Products/Engineering/Technical Support

Enidine continually strives to provide the widest selection of shock absorbers and rate control products in the global marketplace. Through constant evaluation and testing, we bring our customers the most cost effective products with more features, greater performance and improved ease of use.

New Products and Services

Enidine engineers continue to monitor and influence trends in the motion control industry, allowing us to remain at the forefront of new energy absorption and vibration isolation product development.

Our experienced engineering team has designed custom solutions for a wide variety of challenging applications, including automated warehousing systems and shock absorbers for hostile industrial environments such as glass manufacturing, among others. These custom application solutions have proven to be critical to our customers' success. Let Enidine engineers do the same for you.



Custom designs are not an exception at Enidine, they are an integral part of our business. Should your requirements fit outside of our standard product range, Enidine engineers can assist in developing special finishes, components, hybrid technologies and new designs to ensure a "best-fit" product solution customized to your exact specifications.

A talented engineering staff works to design and maintain the most efficient energy absorption product lines available today, using the latest engineering tools:

- ***Solid Modeling***
- ***3-D CAD Drawings***
- ***3-D Soluble Support Technology***
- ***Finite Element Analysis***
- ***Complete Product Verification Testing Facility***

New product designs get to market fast because they can be fully developed in virtual environments before a prototype is ever built. This saves time and lets us optimize the best solution using real performance criteria.

Global Service and Support

Enidine offers its customers a global network of customer service staff technical sales personnel that are available to assist you with all of your application needs.

- Operating with lean manufacturing and cellular production, Enidine produces higher quality custom and standard products with greater efficiency and within shorter lead times.
- An authorized Global Distribution Network is trained regularly by ENIDINE staff on new products and services ensuring they are better able to serve you.
- Global operations in United States, Germany, China, and Japan.
- A comprehensive, website full of application information, technical data, sizing examples and information to assist in selecting the product that's right for you.

Our website also features a searchable worldwide distributor lookup to help facilitate fast, localized service. Contact us today for assistance with all of your application needs.

Our global customer service and technical sales departments are available to assist you find the solution that's right for your application needs. Call us at 1.800.852.8508 or e-mail us at industrialsales@enidine.com and let us get started today.

Overview

The design of Jarret Series 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**.

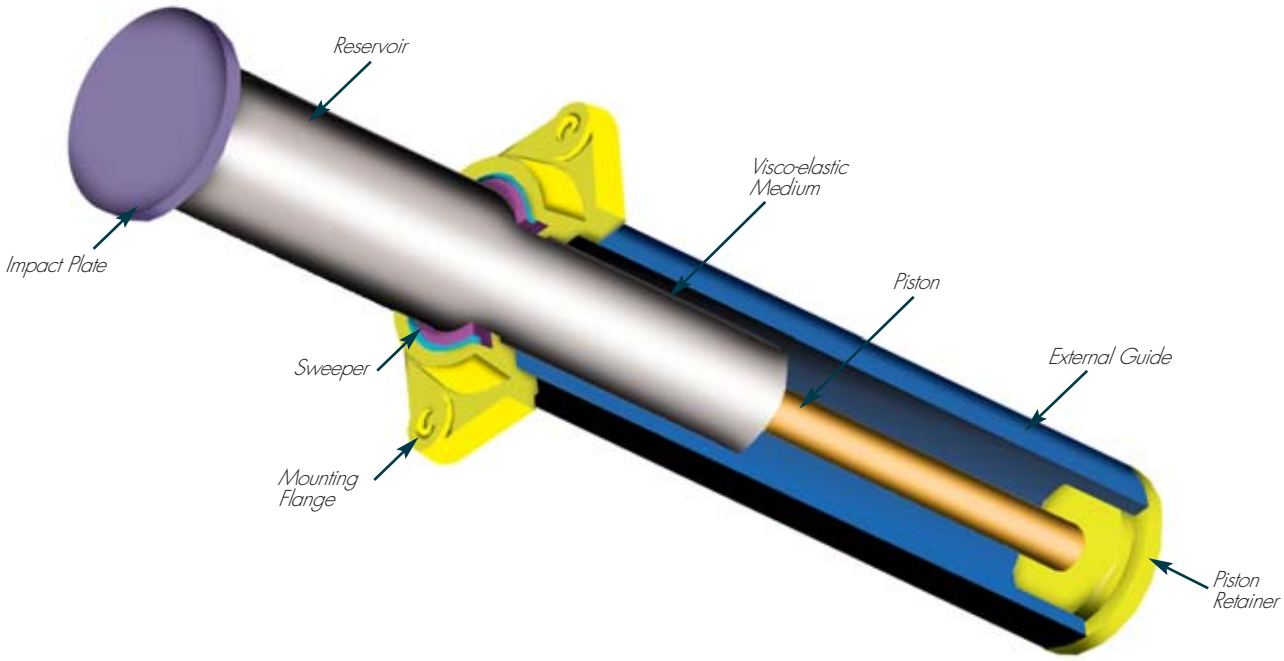
Applications

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

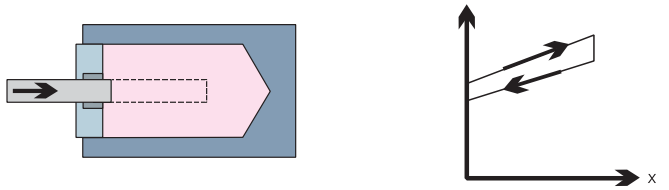
Advantages:

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

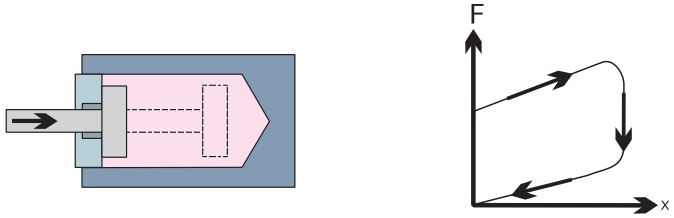
Visco-elastic Technology



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



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

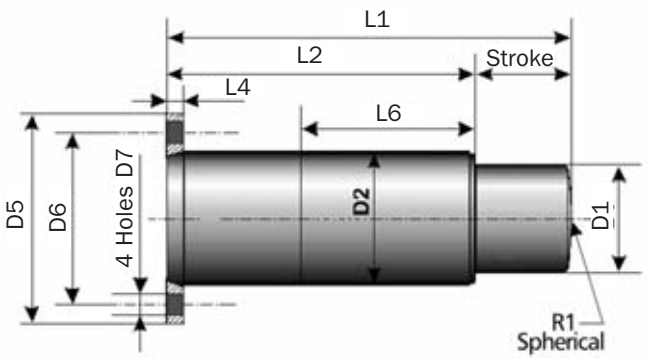
Shock Absorber Without Spring Return:
Shock Absorbing Function Only
- Dampening devices
- Blocking devices

Preloaded Spring Shock Absorbers:
Combine Spring and Shock Absorber Functions
- Dissipate between 30% and 100% of energy
- Force/stroke characteristics remain relatively unchanged between 15°F and 160°F (-10°C and + 70°C)

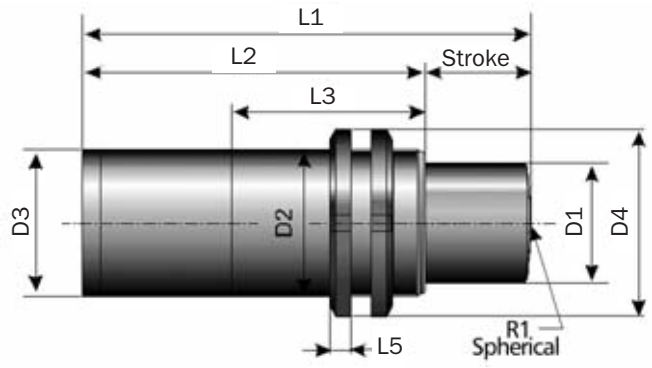
* Spring and shock absorber products are capable of functioning between 15°F and 160°F (-10°C and + 70°C). However, standard products are not intended for use over the full rated temperature range. Consult factory for special product considerations required to accommodate operation over a wide temperature range.

BC1ZN → BC1GN Series

Technical Data



Rear Flange Mounting - Fa



Threaded Body Mounting - Fc

Catalog No./ Model	Max Energy Capacity in-lbs. (kJ)	Stroke in. (mm)	Return Force		Rdy_0 lbs. (kN)	Rdymax Max Shock Force lbs. (kN)
			Extension lbs. (kN)	Compression lbs. (kN)		
BC1ZN	885 (0,1)	0.47 (12)	211 (0,94)	1,213 (5,4)	1,349 (6)	2,473 (11)
BC1BN	3,806 (0,43)	0.87 (22)	562 (2,5)	3,147 (14,0)	3,147 (14)	6,070 (27)
BC1DN	13,276 (1,5)	1.4 (35)	1,169 (5,2)	6474 (28,8)	6,295 (28)	13,489 (60)
BC1EN	30,093 (3,4)	1.8 (45)	1,753 (7,8)	9,666 (43,0)	10,116 (45)	22,481 (100)
BC1FN	61,955 (7)	2.4 (60)	3,057 (13,6)	17,220 (76,6)	20,233 (90)	33,721 (150)
BC1GN	123,910 (14)	3.1 (80)	4,271 (19,0)	29,225 (130,0)	29,225 (130)	51,706 (230)

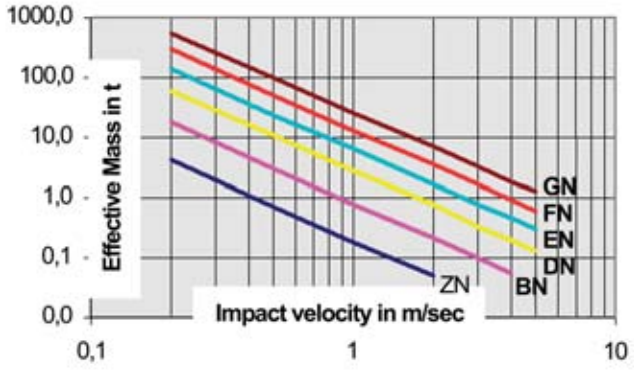
Catalog No./ Model	L1 in. (mm)	L2 in. (mm)	L3 in. (mm)	L4 in. (mm)	L5 in. (mm)	L6 in. (mm)	R1 in. (mm)	D1 in. (mm)	D2 in. (mm)	D3 in. (mm)	D4 in. (mm)	D5 in. (mm)	D6 in. (mm)	D7 in. (mm)	Weight lbs. (kg.)
BC1ZN	2.95 (75)	2.1 (53)	2.1 (52)	0.39 (10)	0.28 (7)	1.7 (43)	– –	0.75 (19)	M25 x 1,5	0.79 (20)	1.5 (38)	2.2 (57)	1.6 (41)	0.28 (7)	0.7 (0,3)
BC1BN	4.7 (120)	3.9 (98)	3.8 (96)	0.47 (12)	0.31 (8)	3.4 (86)	– –	1.0 (25)	M35 x 1,5	1.3 (32)	2.0 (52)	3.1 (80)	2.4 (60)	0.35 (9)	1.5 (0,7)
BC1BN-M	4.7 (120)	3.9 (98)	3.8 (96)	0.47 (12)	0.35 (9)	– -	– –	1.0 (25)	M40 x 1,5	1.3 (32)	2.3 (58)	– –	– –	– –	1.8 (0,8)
BC1DN-70	6.9 (175)	5.5 (140)	5.4 (138)	0.47 (12)	0.43 (11)	5.0 (128)	– –	1.5 (38)	M50 x 1,5	1.8 (45)	2.8 (70)	3.5 (90)	2.8 (70)	0.35 (9)	4.2 (1,9)
BC1DN-85	6.9 (175)	5.5 (140)	5.4 (138)	0.47 (12)	0.43 (11)	5.0 (128)	– –	1.5 (38)	M50 x 1,5	1.8 (45)	2.8 (70)	4.2 (106)	3.3 (85)	0.43 (11)	4.4 (2)
BC1DN-M	6.9 (175))	5.5 (140)	5.4 (138)	0.47 (12)	0.43 (11)	– –	– –	1.5 (38)	M60 x 2	1.8 (45)	2.8 (70)	– –	– –	– –	4.4 (2)
BC1EN	8.4 (213)	6.6 (168)	6.2 (158)	0.39 (10)	0.51 (13)	6.2 (158)	5.1 (130)	2.4 (60)	M75 x 2	2.8 (72)	3.9 (98)	4.8 (122)	4.0 (100)	0.43 (11)	11 (5)
BC1FN	10.6 (270)	8.3 (210)	5.1 (130)	0.47 (12)	0.63 (16)	5.1 (130)	5.9 (150)	2.9 (74,5)	M90 x 2	3.5 (90)	4.7 (120)	5.9 (150)	4.7 (120)	0.51 (13)	23.1 (10,5)
BC1GN	13.3 (337)	10.1 (257)	5.7 (145)	0.55 (14)	0.75 (19)	5.7 (145)	13.8 (350)	3.5 (90)	M110 x 2	4.3 (110)	5.7 (145)	6.9 (175)	5.6 (143)	0.70 (18)	37.5 (17)

Notes: Spring and shock absorber products are capable of functioning between 15°F and 160°F (-10°C and + 70°C). However, standard products are not intended for use over the full rated temperature range. Consult factory for special product considerations required to accommodate operation over a wide temperature range.

ENIDINE www.enidine.com Email: industrialsales@enidine.com Tel.: 1-800-852-8508 Fax: 1-716-662-0406

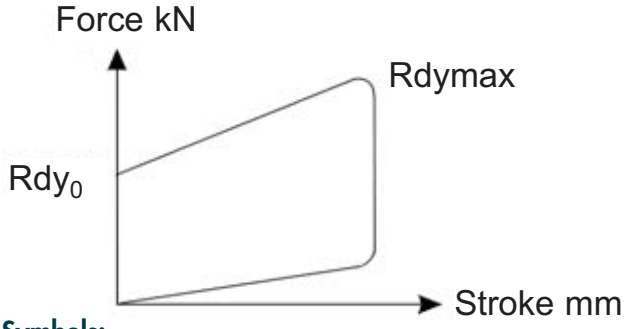
BC1ZN → BC1GN Series

1 - Selection Chart



Based On

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



Symbols:

En = Energy Capacity (kJ)
C = Maximum Stroke (mm)
Rdy = Dynamic Reaction Force (kN)

2 - Energy Calculation

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

3 - Allowable Impact Velocity

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

4 - Effective (Actual) Stroke Calculation

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

5 - Calculation of Effective Reaction Force Rdy_e

$$Rdy_e = \left[\left(\frac{Rdymax - Rdy_0}{C}\right) \times Ce + Rdy_0\right](0{,}1V + 0{,}8)$$

Sizing Example

6 - Application Example

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

1. Energy dissipated per impact: $E = \frac{1}{2}(15)(0{,}8) = 4{,}8$ kJ

2. BC1FN Selected

3. Allowable impact frequency $IF < 20x7/4.8 = 29$
$25 < 29$

4. Effective (Actual) Stroke:

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

$Ce = 49$ mm

5. Effective Reaction Force:

$$Rdy_e = [(150 - 90) \times 49 + 90)]\,(0{,}1 \times 0{,}8 + 0{,}8)$$

$$Rdy_e = 122 \text{ kN}$$

6. Compare standards to results:

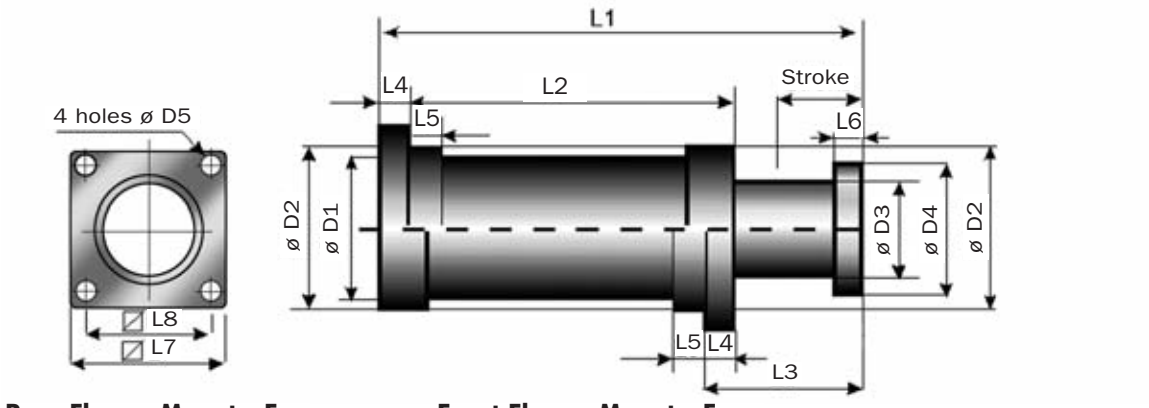
	BC1FN		APPLICATION
E (kJ) =	7	>	4,8
C (mm) =	60	>	49
Rdymax (kN)	150	>	122

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

Jarret Shock Absorbers
BC5 Series

BC5A → BC5E Series

Technical Data



Rear Flange Mount - Fa **Front Flange Mount - Fc**

Catalog No./ Model	Max Energy Capacity in-lbs. (kJ)	Stroke in. (mm)	Return Force		Rdy_0 lbs. (kN)	Rdymax Max Shock Force lbs. (kN)
			Extension lbs. (kN)	Compression lbs. (kN)		
BC5A-105	221,268 (25)	4.1 (105)	4,159 (18,5)	31,630 (140,7)	37,543 (167)	69,691 (310)
BC5B-130	442,537 (50)	4.7 (120)	13,039 (58,0)	58,416 (259,9)	69,691 (310)	121,397 (540)
BC5C-140	663,806 (75)	5.5 (140)	11,015 (49,0)	73,827 (328,4)	89,924 (400)	157,366 (700)
BC5D-160	885,075 (100)	6.3 (160)	13,376 (59,5)	85,427 (380,0)	105,660 (470)	184,343 (820)
BC5E-180	1,327,612 (150)	7.1 (180)	26,269 (117,0)	122,656 (546)	143,878 (640)	247,290 (1 100)

Catalog No./ Model	L1 in. (mm)	L2 in. (mm)	L3 in. (mm)	L4 in. (mm)	L5 in. (mm)	L6 in. (mm)	L7 in. (mm)	L8 in. (mm)	D1 in. (mm)	D2 in. (mm)	D3 in. (mm)	D4 in. (mm)	D5 in. (mm)	Weight lbs. (kg)
BC5A-105	16.3 (415)	10.8 (275)	5.5 (140)	0.79 (20)	1.2 (30)	0.59 (15)	5.3 (135)	4.1 (105)	4.6 (116)	4.6 (116)	3.4 (87)	4.7 (120)	0.55 (14)	55 (25)
BC5B-130	19.7 (500)	12.8 (325)	6.9 (175)	1.0 (25)	1.3 (33)	1.2 (30)	6.1 (155)	4.9 (125)	5.6 (142)	5.6 (142)	4.5 (115)	5.4 (138)	0.55 (14)	88 (40)
BC5C-140	20.5 (520)	12.4 (315)	8.1 (205)	1.2 (30)	1.4 (36)	1.4 (35)	6.9 (175)	5.5 (140)	6.3 (160)	6.3 (160)	5.2 (132)	6.2 (158)	0.70 (18)	99 (45)
BC5D-160	23 (585)	13.8 (350)	9.3 (235)	1.4 (35)	1.6 (40)	1.6 (40)	8.5 (215)	6.7 (170)	7.1 (180)	7.1 (180)	6.0 (153)	7.3 (185)	0.87 (22)	161 (73)
BC5E-180	26.4 (670)	15.9 (405)	10.4 (265)	1.6 (40)	1.8 (45)	1.8 (45)	9.8 (250)	7.7 (195)	8.5 (215)	8.5 (215)	7.2 (182)	8.7 (220)	1.0 (26)	258 (117)

Impact Speed: BC5 Series shock absorbers are designed for impact velocities of up to 4 m/sec. Higher impact velocities require custom modification.
Spring and shock absorber products are capable of functioning between 15°F and 160°F (-10°C and + 70°C). However, standard products are not intended for use over the full rated temperature range.
Consult factory for special product considerations required to accommodate operation over a wide temperature range.

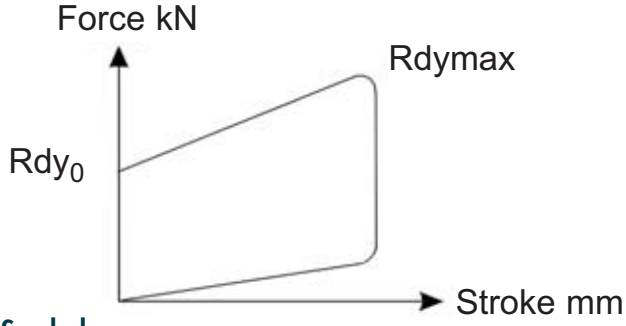
ENIDINE www.enidine.com Email: industrialsales@enidine.com Tel.: 1-800-852-8508 Fax: 1-716-662-0406

BC5A → BC5E Series

Sizing Example

Based On

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



Symbols:

En = Energy Capacity (kJ)
C = Maximum Stroke (mm)
Rdy = Dynamic Reaction Force (kN)

1 - Energy Calculation

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

2 - Allowable Impact Frequency (IF)

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

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

$$Rdy_e = \left[\left(\frac{Rdymax - Rdy_0}{C} \right) \times Ce + Rdy_0 \right] (0{,}1V + 0{,}8)$$

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

$E = \frac{1}{2} \left(\frac{1}{2} 300 \times 1{,}2^2 \right) = 108$ kJ

2. Selection BC5E-180

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

$$15 < 15 \times \frac{150}{108}$$

$$15 < 21$$

4. Effective (actual) stroke is 167 mm

$$Ce = 180 \times \left(\sqrt{\frac{108}{150\ (0{,}03 \times 0.6 + 0{,}24)}} + 1{,}36 - 1{,}17 \right) = 156 \text{ mm}$$

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

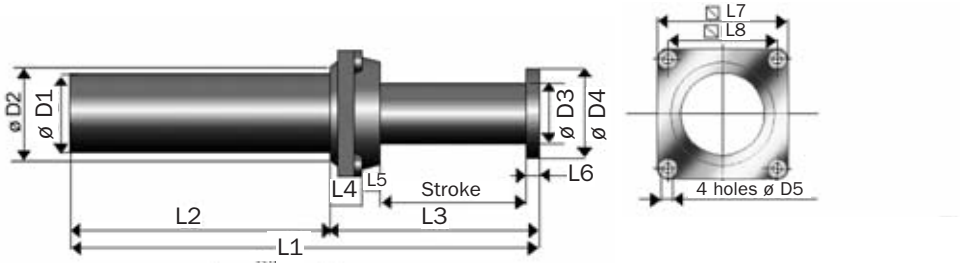
Rdye = 893 kN < 1000 kN

6. Compare standards to results:

	BC5E-180		APPLICATION
E (kJ) =	150	>	108
IF =	21	>	15
C (mm) =	180	>	156
Rdymax (kN)	1100	>	893

Note: maximum allowed structural load is 1 000 kN > 893 kN

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



XLR Series - Front Flange Mount- Fc

Catalog No./ Model	Max Energy Capacity in-lbs. (kJ)	Stroke in. (mm)	Return Force		Rdy_0 lbs. (kN)	Rdymax Max Shock Force lbs. (kN)
			Extension lbs. (kN)	Compression lbs. (kN)		
XLR6-150	53,104 (6)	5.9 (150)	652 (2,9)	4,609 (20,5)	5,620 (25)	11,240 (50)
XLR12-150	106,209 (12)	5.9 (150)	1,866 (8,3)	8,655 (38,5)	14,837 (66)	22,481 (100)
XLR12-200	106,209 (12)	7.9 (200)	1,259 (5,6)	6,744 (30,0)	9,442 (42)	17,535 (78)
XLR25-200	221,269 (25)	7.9 (200)	3,012 (13,4)	16,726 (74,4)	21,537 (95)	33,721 (150)
XLR25-270	221,269 (25)	10.6 (270)	2,495 (11,1)	11,555 (51,4)	14,837 (66)	25,179 (112)
XLR50-275	442,537 (50)	10.8 (275)	4,429 (19,7)	29,225 (130,0)	26,527 (118)	51,706 (230)
XLR50-400	442,537 (50)	15.7 (400)	2,900 (12,9)	18,839 (83,8)	16,861 (75)	33,721 (150)
XLR100-400	885,075 (100)	15.7 (400)	5,620 (25,0)	36,531 (162,5)	39,342 (175)	71,939 (320)
XLR100-600	885,075 (100)	23.6 (600)	2,608 (11,6)	29,765 (132,4)	19,109 (85)	51,706 (230)
XLR150-800	1,327,612 (150)	31.5 (800)	5,216 (23,2)	34,216 (152,2)	17,984 (80)	56,202 (250)

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

Catalog No./ Model	L1 in. (mm)	L2 in. (mm)	L3 in. (mm)	L4 in. (mm)	L5 in. (mm)	L6 in. (mm)	L7 in. (mm)	L8 in. (mm)	D1 in. (mm)	D2 in. (mm)	D3 in. (mm)	D4 in. (mm)	D5 in. (mm)	Weight lbs. (kg.)
XLR6-150	16.1 (410)	9.1 (231)	7.0 (179)	0.75 (19)	0 (0)	0.39 (10)	3.5 (90)	2.8 (70)	2.0 (50)	3.5 (90)	1.5 (38)	2.0 (50)	0.35 (9)	9.3 (4,2)
XLR12-150	18.9 (480)	11.2 (285)	7.7 (195)	0.71 (18)	0.60 (15)	0.47 (12)	4.3 (110)	3.3 (85)	3.0 (75)	3.5 (90)	2.2 (57)	3.1 (80)	0.43 (11)	24.3 (11)
XLR12-200	20.9 (530)	11.2 (285)	9.6 (245)	0.71 (18)	0.60 (15)	0.47 (12)	4.3 (110)	3.3 (85)	3.0 (75)	3.5 (90)	2.2 (57)	3.1 (80)	0.43 (11)	24.3 (11)
XLR25-200	24.4 (620)	14.6 (370)	9.8 (250)	0.79 (20)	0.71 (18)	0.47 (12)	5.3 (135)	4.1 (105)	3.5 (90)	4.3 (110)	2.8 (72)	4.0 (100)	0.6 (14)	44.1 (20)
XLR25-270	27.2 (690)	14.6 (370)	12.6 (320)	0.79 (20)	0.71 (180	0.47 (12)	5.3 (135)	4.1 (105)	3.5 (90)	4.3 (110)	2.8 (72)	4.0 (100)	0.6 (14)	55.1 (25)
XLR50-275	33.7 (855)	20.5 (520)	13.2 (335)	1.0 (25)	0.79 (20)	0.60 (15)	6.9 (175)	5.5 (140)	4.3 (110)	5.9 (150)	3.4 (87)	4.7 (120)	0.71 (18)	88.2 (40)
XLR50-400	38.6 (980)	20.5 (520)	18.1 (460)	1.0 (25)	0.79 (20)	0.60 (15)	6.9 (175)	5.5 (140)	4.3 (110)	5.9 (150)	3.4 (87)	4.7 (120)	0.71 (18)	88.2 (40)
XLR100-400	53.9 (1370)	35.8 (910)	18.1 (460)	1.0 (25)	0.79 (20)	0.60 (15)	6.9 (175)	5.5 (140)	4.3 (110)	5.9 (150)	3.4 (87)	4.7 (120)	0.71 (18)	143.3 (65)
XLR100-600	61.8 (1570)	35.8 (910)	26.0 (660)	1.0 (25)	0.79 (20)	0.60 (15)	6.9 (175)	5.5 (140)	4.3 (110)	5.9 (150)	3.4 (87)	4.7 (120)	0.71 (18)	143.3 (65)
XLR150-800	103.9 (2640)	70.1 (1780)	33.9 (860)	1.0 (25)	0.79 (20)	0.60 (15)	6.9 (175)	5.5 (140)	4.3 (110)	5.9 (150)	3.4 (87)	4.7 (120)	0.71 (18)	253.5 (115)

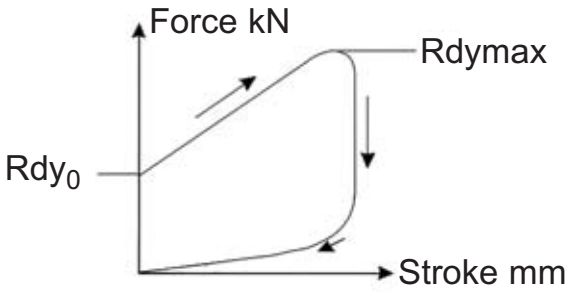
Rear Flange Mounting - Fa on Request.
Spring and shock absorber products are capable of functioning between 15°F and 160°F (-10°C and + 70°C). However, standard products are not intended for use over the full rated temperature range.
Consult factory for special product considerations required to accommodate operation over a wide temperature range.

XLR6-150 → XLR-800 Series

Sizing Example

Based On

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



Symbols:
En = Energy Capacity (kJ)
C = Maximum Stroke (mm)
Rdy = Dynamic Reaction Force (kN)

1 - Energy Calculation

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

2 - Allowable Impact Frequency (IF)

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

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

$$Rdy_e = \left[\left(\frac{Rdymax - Rdy_0}{C}\right) \times Ce + Rdy_0\right](0{,}1V + 0{,}8)$$

5 - Application Example Data:

Effective mass = 30 t
Effective impact speed = 2,2
Maximum allowable structural force = 350 kN
Impact frequency = 10/hr

1: Energy dissipated/impact is 72,6 kJ

$$E = \frac{1}{2} \times 15 \times (2{,}2)^2$$

E = 72,6 kJ

2: XLR100-400 selected

3: Maximum allowable impact frequency
IF < 8 x 100 / 72,6 = 11
(10<11 impacts/hour is acceptable)

4: Effective (actual) stroke:

$$Ce = 400 \times \left(\sqrt{\frac{72{,}6}{100\,(0{,}027 \times 2{,}7 + 0{,}22)}} + 1{,}83 - 1{,}35\right)$$

Ce = 290,3 mm

5: $$Rdye = \left[\left(\frac{320 - 175}{400}\right) 290{,}3 + 175\right](0{,}1 \times 2{,}2 + 0{,}8)$$

Rdye = 285,8 kN

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

6. Compare standards to results:

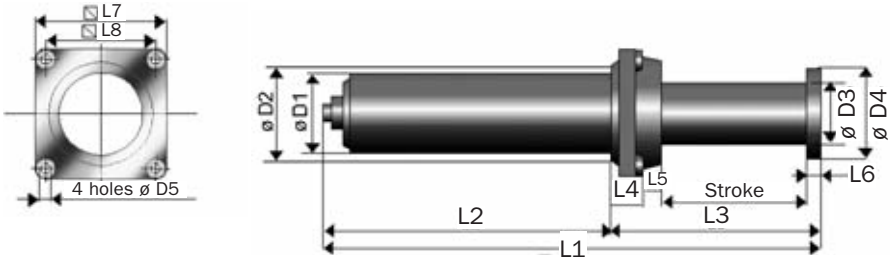
	XLR100-400		APPLICATION
E (kJ) =	100	>	72,6
IF =	11	>	10
C (mm) =	400	>	301,8
Rdymax (kN)	320	>	290,1

Note: maximum allowed structural load is 350 kN > 290,1 kN

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

BCLR-100 → BCLR-1000 Series

Technical Data



BCLR Series - Front Flange Mount- Fc

Catalog No./ Model	Max Energy Capacity in-lbs. (kJ)	Stroke in. (mm)	Return Force		Rdy_0 lbs. (kN)	Rdymax Max Shock Force lbs. (kN)
			Extension lbs. (kN)	Compression lbs. (kN)		
BCLR-100	885,075 (100)	15.7 (400)	6,744 (30,0)	36,403 (161,9)	42,714 (190)	69,691 (310)
BCLR-150	1,327,612 (150)	19.7 (500)	9,330 (41,5)	47,300 (201,4)	44,962 (200)	85,427 (380)
BCLR-220S	1,947,614 (220)	15.7 (400)	10,116 (45,0)	60,698 (270,0)	85,427 (380)	153,994 (685)
BCLR-250	2,212,686 (250)	25.6 (650)	10,116 (45,0)	56,877 (253,0)	60,698 (270)	110,156 (490)
BCLR-400	3,540,298 (400)	33.5 (850)	11,144 (49,6)	69,214 (307,9)	74,187 (330)	134,885 (600)
BCLR-600	5,310,477 (600)	41.3 (1050)	10,678 (47,5)	79,020 (351,5)	83,179 (370)	166,359 (740)
BCLR-800	7,080,597 (800)	47.2 (1200)	14,433 (64,2)	99,141 (441,0)	96,668 (430)	193,336 (860)
BCLR-1000	8,850,746 (1000)	51.2 (1300)	19,109 (85,0)	120,048 (534,0)	112,405 (500)	224,809 (1000)

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

Catalog No./ Model	L1 in. (mm)	L2 in. (mm)	L3 in. (mm)	L4 in. (mm)	L5 in. (mm)	L6 in. (mm)	L7 in. (mm)	L8 in. (mm)	D1 in. (mm)	D2 in. (mm)	D3 in. (mm)	D4 in. (mm)	D5 in. (mm)	Weight lbs. (kg.)
BCLR-100	44.1 (1120)	26.0 (660)	18.1 (460)	1.0 (25)	0.79 (20)	0.60 (15)	6.9 (175)	5.5 (140)	5.1 (130)	5.9 (150)	4.3 (110)	5.5 (140)	0.71 (18)	139.0 (63)
BCLR-150	53.1 (1350)	30.5 (775)	22.6 (575)	1.2 (30)	1.0 (25)	0.79 (20)	8.5 (215)	6.7 (170)	5.5 (140)	7.3 (185)	4.7 (120)	5.9 (150)	0.87 (22)	198.4 (90)
BCLR-220S	49.5 (1258)	30.8 (783)	18.7 (475)	1.2 (30)	1.0 (25)	0.79 (20)	8.5 (215)	6.7 (170)	6.3 (160)	N/A	5.3 (134)	6.3 (160)	0.87 (22)	243 (110)
BCLR-250	68.9 (1750)	40.4 (1025)	28.5 (725)	1.2 (30)	1.0 (25)	0.79 (20)	8.5 (215)	6.7 (170)	6.1 (155)	7.3 (185)	6.9 (135)	6.7 (170)	0.87 (22)	297.6 (135)
BCLR-400	86.0 (2185)	49.2 (1250)	36.8 (935)	1.4 (35)	1.0 (25)	1.0 (25)	10.4 (265)	8.3 (210)	6.9 (175)	9.3 (235)	5.9 (150)	7.5 (190)	1.1 (27)	480.6 (218)
BCLR-600	100.6 (2555)	55.9 (1420)	44.7 (1135)	1.4 (35)	1.0 (25)	1.0 (25)	10.4 (265)	8.3 (210)	7.9 (200)	9.3 (235)	6.9 (175)	8.5 (215)	1.1 (27)	650.4 (295)
BCLR-800	115.6 (2935)	64.2 (1630)	51.4 (1305)	1.6 (40)	1.4 (35)	1.2 (30)	11.8 (300)	9.4 (240)	8.7 (220)	10.6 (270)	7.5 (190)	9.3 (235)	1.2 (30)	926 (420)
BCLR-1000	127.0 (3225)	71.7 (1820)	55.3 (1405)	1.6 (40)	1.4 (35)	1.2 (30)	11.8 (300)	9.4 (240)	9.1 (230)	10.6 (270)	8.1 (205)	9.8 (248)	1.2 (30)	1036.2 (470)

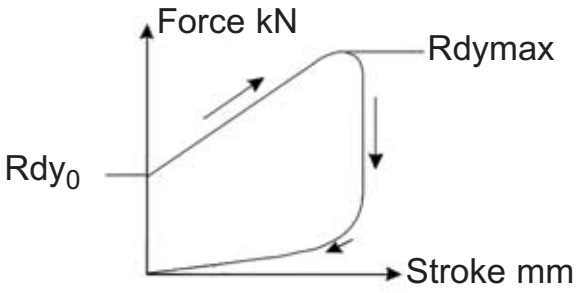
Rear Flange Mounting - Fa on Request.
Spring and shock absorber products are capable of functioning between 15°F and 160°F (-10°C and + 70°C). However, standard products are not intended for use over the full rated temperature range. Consult factory for special product considerations required to accommodate operation over a wide temperature range.

BCLR-100 → BCLR-1000 Series

Sizing Example

Based On

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



Symbols:

En = Energy Capacity (kJ)
C = Maximum Stroke (mm)
Rdy = Dynamic Reaction Force (kN)

1 - Energy Calculation

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

2 - Allowable Impact Frequency (IF)

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

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

$$Rdy_e = \left[\left(\frac{Rdymax - Rdy_0}{C}\right) \times Ce + Rdy_0\right](0{,}1V + 0{,}8)$$

5 - Application Example:

Effective mass = 75 t
Effective impact speed = 2,7
Maximum allowable structural force: 650 kN
Impact frequency = 10/hr

1: Energy dissipated/impact is 274 kJ

2: BCLR-400 selected

3: Maximum allowable impact frequency
IF < 8 x 400 / 274 = 12 (10 impacts/hour is acceptable)
10 < 12

4: Effective (actual) 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)

6. Compare standards to results:

	BCLR-400		APPLICATION
E (kJ) =	400	>	274
IF =	12	>	10
C (mm) =	850	>	587
Rdymax (kN)	600	>	556

Note: maximum allowed structural load is 650 kN > 556 kN

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

FAX NO.: _____

DATE: _____

ATTN: _____

COMPANY: _____

The Enidine Application Worksheet makes shock absorber sizing and selection easier.

Fax, phone, or mail worksheet data to Enidine headquarters or your nearest Enidine subsidiary/affiliate or distributor. (See catalog back cover for Enidine locations, or visit www.enidine.com for a list of Enidine distributors.)

Upon Enidine's receipt of this worksheet, you will receive a detailed analysis of your application and product recommendations. (For custom design projects, Enidine representatives will consult with you for specification requirements.)

GENERAL INFORMATION

CONTACT: _____

DEPT/TITLE: _____

COMPANY: _____

ADDRESS: _____

_____

TEL: _____ FAX: _____

EMAIL: _____

PRODUCTS MANUFACTURED: _____

_____

_____

_____

_____

APPLICATION DESCRIPTION

_____

_____

_____

_____

_____

_____

_____

_____

Motion Direction (Check One):

☐ Horizontal ☐ Vertical ☐ Up ☐ Down ☐ Incline Angle _____ Height _____

☐ Rotary Horizontal ☐ Rotary Vertical ☐ Up ☐ Down

Weight (Min./Max.): _____ (lbs.)(Kg)

Cycle Rate _____ (cycles/hour)

Additional Propelling Force (If Known) _____ (lbs.)(N)

☐ Air Cyl: Bore ____ (in.)(mm) Max. Pressure ____(psi)(bar) Rod Dia.____(in.)(mm)

☐ Hydraulic Cyl: Bore ____ (in.)(mm) Max. Pressure ____(psi)(bar)
Rod Dia.____ (in.)(mm)

☐ Motor _____ (hp)(kW) Torque _____(in-lbs.)(Nm)

Ambient Temp. _____°F (°C)

Environmental Considerations: _____

_____

SHOCK ABSORBER APPLICATION (All Data Taken at Shock Absorber)

Number of Shock Absorbers to Stop Load

Impact Velocity (min./max.)_____ (in./sec.)(m/sec.)

Shock Absorber Stroke Requirements: _____(in.)(mm)

G Load Requirements _____(G)(m/sec^2)

APPLICATION SKETCHES / NOTES

HEAVY DUTY SHOCK ABSORBERS

Applications:

- Control of bridge cranes
- Trolley platforms
- Large container transfer
- Automated aisle stacker cranes
- Cab operated bridge cranes
- Ship to shore container cranes
- Overhead bridge cranes
- Gantry cranes
- Ship to shore container cranes
- Transportation end stops

Enidine Incorporated
7 Centre Drive
Orchard Park, New York 14127
USA
Phone: 716-662-1900
Fax: 716-662-1909
Email: industrialsales@enidine.com
www.enidine.com

ITT Control Technologies GmbH
Werkstrasse 5
D-64732, Bad Koenig, Germany
Phone: +49 6063 9314 0
Fax: +49 6063 9314 44
Email: info@enidine.eu
www.enidine.eu

IND0555J1 7.5M 1/09