

# POLYURETHANE VERTEBRAE BEND RESTRICTORS



ABCO Subsea has manufactured and sold more than 1,200 Vertebrae Bend Restrictor (VBR) assemblies over the past 30 years. VBRs are available in polyurethane, steel or a hybrid combination of both materials. Polyurethane VBRs can accommodate lines with outside diameters ranging from 1/2" to 12" and steel VBRs can accommodate lines with outside diameters up to 16".

## Advantages:

- Custom designed
- In-house design and verification testing
- Resistant to biofouling
- Standard ANSI B16.5 flange bolt pattern at interface
- Omni-directional freedom of rotation

## Additional Custom Features (Available Upon Request):

- Different colors for line identification
- Hinged with fully retained locking mechanism
- Handling eyes
- Gripping segments
- Large bending range segments (only in X-series)
- Custom interface adapters



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# POLYURETHANE VERTEBRAE BEND RESTRICTORS

## Technical Data

\* All data below applies to polyurethane vertebrae bend restrictors.

ABCO Subsea also manufactures steel VBR assemblies.

### Material Specs:

Material Designation	70 D or 85 D, Ether-based Polyurethane
Manufacturing Process	Atmospheric Cast
Specific Gravity	1.16 – 1.20
Standard Color	Yellow

### Design Parameters for X-Series Vertebrae Bend Restrictor (VBR)

	X150	X300	X4000	X6000
Segment Weight in Air Range:	1 lbf [4.4 N]	~1.5 lbf [~7 N]	5 - 8 lbf [22 - 36 N]	10 - 14 lbf [44 - 62 N]
Maximum ID:	1.6 in. [40.6 mm]	3.13 in. [79.5 mm]	4.25 in. [108 mm]	6.25 in. [159 mm]
Segment OD:	5 in. [127 mm]	6.5 in. [217 mm]	8.9 in. [226 mm]	11.5 in. [292 mm]
Segment Pitch Length Range:	3.7 in. [94 mm]	3.8 in. [97 mm]	7.7 in. [196 mm] 11.6 in. [295 mm] 15.4 in. [391 mm]	9.2 in. [234 mm] 11.1 in. [282 mm] 15.4 in. [291 mm]
Flange Interface Options:	2 in. CL 150	4 in. CL 300	4 in. CL 150 4 in. CL 300 6 in. CL 300	6 in. CL 150 6 in. CL 300 8 in. CL 300
LBR Options:	30 in. [762 mm] 35 in. [889 mm]	58 in. [1.5 m] 90 in. [2.3 m] 120 in. [3.0 m] 162 in. [4.1 m]	40 in. [1 m] 60 in. [1.5 m] 80 in. [2.0 m]	48 in. [1.2 m] 58 in. [1.5 m] 80 in. [2.0 m]
Typical Maximum Static Moment:	355 ft*lbf [0.48 kN*m]	1.67 kip*ft [2.26 kN*m]	1.2 kip*ft [1.6 kN*m]	1.3 kip*ft [1.8 kN*m]
Typical Maximum Dynamic Moment:	500 ft*lbf [0.68 kN*m]	2.33 kip*ft [3.17 kN*m]	1.7 kip*ft [2.3 kN*m]	1.8 kip*ft [2.5 kN*m]
Typical Ultimate Moment:	875 ft*lbf [1.19 kN*m]	4.1 kip*ft [5.55 kN*m]	3 kip*ft [4 kN*m]	3.2 kip*ft [4.4 kN*m]

### Design Parameters For Standard M-Series Vertebrae Bend Restrictor (VBR)

	M5	M7	M9	M12
Segment Weight in Air Range:	16-39 lbf [71-174 N]	27-66 lbf [120-294 N]	49-88 lbf [218-391 N]	67-127 lbf [298-565 N]
Maximum Segment ID:	5.5 in. [140 mm]	7.1 in. [180 mm]	9.5 in. [241 mm]	12 in. [305 mm]
Segment OD:	13.2 in. [335 mm]	15.7 in. [399 mm]	18.4 in. [467 mm]	22.3 in. [566 mm]
Segment Pitch Length Range:	8-32 in. [215-813 mm]	10-35 in. [254-889 mm]	14-39 in. [356-991 mm]	16-45 in. [406-1140 mm]
Flange Interface Options:	8 in. ANSI CL 300	8 in. ANSI CL 300	10 in. ANSI CL 300	12 in. ANSI CL 300
LBR Options:	63-728 in. [1.6-18.5 m]	78-777 in. [2.6-19.7 m]	92-870 in. [2.3-22.1 m]	187-1029 in. [4.8-26.1 m]
Typical Maximum Static Moment:	19.6 kip*ft [26.6 kN*m]	25.1 kip*ft [34.1 kN*m]	51.4 kip*ft [69.7 kN*m]	95.1 kip*ft [129 kN*m]
Typical Maximum Dynamic Moment:	29.4 kip*ft [39.8 kN*m]	37.7 kip*ft [51.1 kN*m]	77.1 kip*ft [104.5 kN*m]	142.6 kip*ft [193.4 kN*m]
Typical Ultimate Moment:	40.2 kip*ft [54.4 kN*m]	51.5 kip*ft [69.8 kN*m]	105.4 kip*ft [142.8 kN*m]	190.6 kip*ft [258 kN*m]