PRODUCT DATASHEET

POLARIS SHOCK ABSORBER

Reduce your dynamic loads and costs

The Polaris shock absorber is the new state-of-the-art shock absorber from Norwegian Dynamics. It allows clients, within segments such as piling, wind turbine installation and heavy lifting, to significantly reduce dynamic loads that can damage cranes, lifting gear and valuable payloads. Users will be pleasantly surprised by the compact design, with reduced length and especially weight compared to existing solutions. The finance departments will also be pleasantly surprised by the significantly lower rental rates and sales prices compared to existing solutions.

Key features

- Spring-damper system based on gas compression and hydraulic damping
  - Self-contained, no external connections required during usage
  - No electronics, a fully passive system
  - Extremely robust due to simple and reliable construction
  - Significantly better efficiency than existing solutions
- Developed in Norway
  - Classification according to DNV ST-0378 and DNV RP-N202
  - SWL range 10t to 4000t
  - Stroke range 1m to 8m
- Easy to use, adjustment in a fraction of the time compared to existing solutions
  - Can be operated by anyone that knows how to fill a car tire and read a manometer
  - Easy to use filling connections with high flow rate
  - Training provided with purchase of a shock absorber
- Lower costs
  - Does not need dedicated personnel, which significantly reduces operating costs
  - Much lower sales prices and rental rates than existing solutions

NORWEGIAN DYNAMICS

Contents

Application areas

- Pile drop protection, ensure that the piling hammer will not be damaged during a sudden pile run
- Lifting heavy components during bad weather conditions. The shock absorber ensures low dynamic loads and avoids damage to both crane and payload
- General heavy duty shock absorption

Figure 1 – Vessel that could have benefitted by having a shock absorber

How does it work?

The shock absorber is a spring-damper that converts the kinetic energy of a falling payload into heat via hydraulic friction. The hydraulic friction, also called damping, is accurately controlled and adjustable by the user and is tuned to the weight of the payload being lifted. In general, the energy balance for this scenario is:

$$mgh = \frac{1}{2}mv^2 = \eta\mu Smg(\psi - 1)$$

Where:

m	–	Payload mass	η	–	Shock absorber efficiency
g	–	Acceleration of gravity	μ	–	Shock absorber stroke utilization
h	–	Free fall distance	S	–	Shock absorber stroke
v	–	Payload velocity	ψ	–	Dynamic amplification factor

The energy balance can be visualized as below illustration:

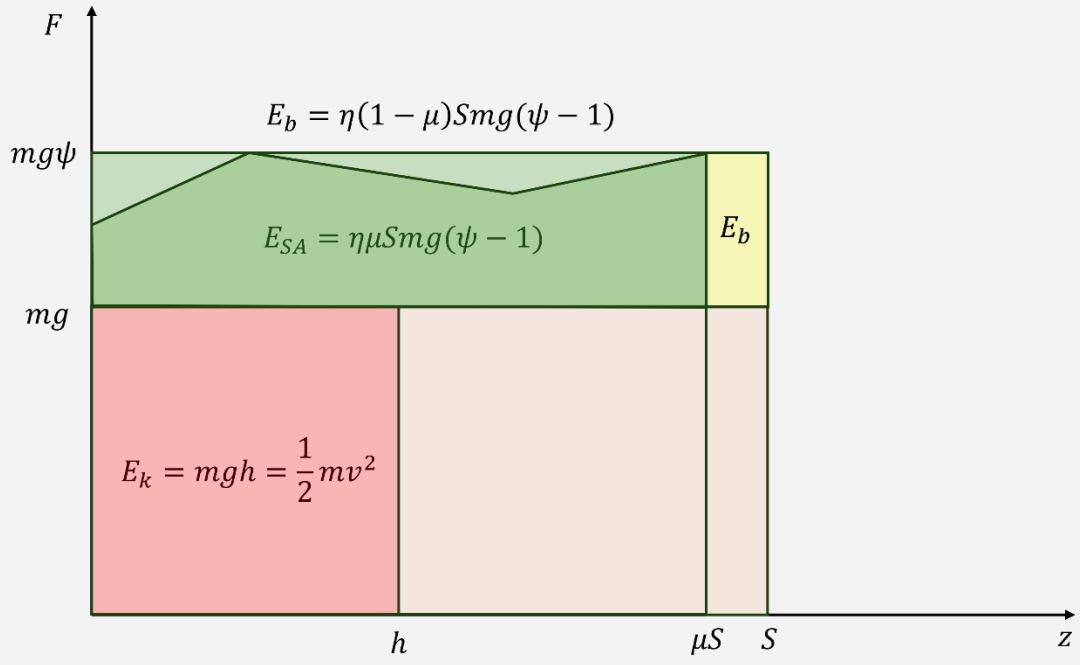


Figure 2 – Energy balance

Notes!

- The shock absorber can only reduce the kinetic energy of the payload whilst the force acting upon the payload from the shock absorber is larger than the force of gravity mg.
- ψ is the peak dynamic amplification factor exerted by the shock absorber, the peak force from the shock absorber is hence ψmg.
- The efficiency η is the ratio of the dark green area to the sum of the dark and light green area. The closer the value of η is to 1 the less stroke is required to absorb the kinetic energy.
- The yellow area is the energy that can be absorbed if the stroke was fully utilized. μ is hence a safety factor that is used to have some spare absorption capacity available, with a recommended minimum value of 0.9.

What is the difference between Polaris and a normal shock absorber?

The main difference is that Polaris is a pure shock absorber with very high performance for shock absorption, while older solutions are multipurpose units with lower performance for shock absorption. This is reflected in the efficiency (η) of the unit, which for Polaris can be in excess of 90 %, while a multipurpose unit typically would get 40-60 % and then only for a particular payload speed, while Polaris gives the same performance for a wide range of payload speeds.

The efficiency improvement directly means that a reduced stroke length can be used compared to a multipurpose unit, which makes Polaris lighter, shorter and cheaper.

Recent news about a large shock absorber used for falling piling hammers has been released publicly and here we do a quick comparison between a Polaris unit with the same energy absorption capability as the “yellow shock absorber”.

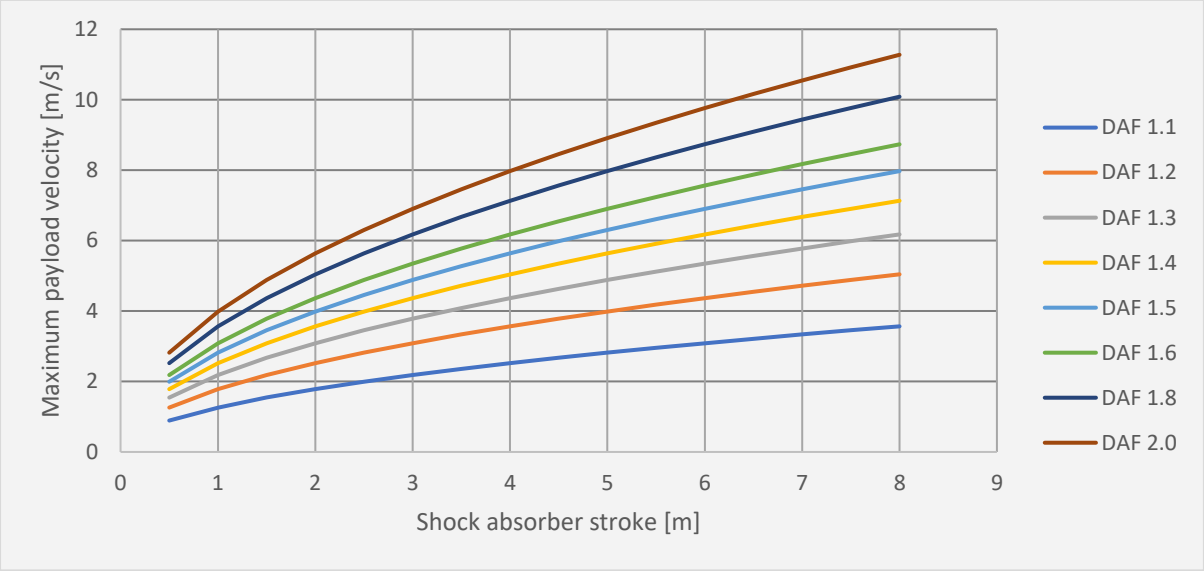
	Polaris	Yellow shock absorber
Max force	3500t	3500t
Cylinder stroke	3750 mm	5500 mm
Efficiency	90+ %	50-60 %
Weight (excluding shackles)[1]	**65t**	**220t**
LxWxH[2]	6x3.5x3.5m	8x5x5m
Electronic control	No[3]	Yes
Cost[4]	**<2 MUSD**	**9.5 MUSD**

[1] Reported by manufacturer
[2] Estimated values
[3] Optional extra
[4] Reported value in news

Technical details

Performance

The chart below can be used to estimate maximum allowed payload velocity based on allowed dynamic amplification factor (DAF) and shock absorber stroke.



As an example, we have a shock absorber with 2 m stroke and an allowed DAF of 1.3, we can then read that the maximum payload velocity can then be around 3.1 m/s.

More accurate estimates can be done either in the provided Excel simulation sheet or in OrcaFlex. Contact us for further information or assistance.

Classification

Classification and design according to DNV ST-0378 and DNV RP-N202 by DNV.

Upon special request, and with extra cost, we can also offer classification by BV, ABS and other classification societies.

Water depth rating

All versions are certified to a depth rating of 200 m.

Upon a special request we can increase the depth rating, but it will increase costs.

Shackles

Shock absorber SWL	Shackles
10t	2x Van Beest P-6033 12.5t
30t	2x Van Beest P-6033 30t
75t	2x Van Beest P-6033 75t
150t	2x Van Beest P-6033 150t
250t	2x Van Beest P-6033 250t
400t	2x Van Beest P-6033 400t
600t	2x Van Beest P-6033 600t
800t	2x Van Beest P-6033 800t
1250t	2x Van Beest P-6033 1250t
1550t	2x Van Beest P-6033 1550t
2000t	2x GN Rope H14 2000t
2500t	2x GN Rope H14 2500t
3000t	2x GN Rope H14 3000t
3500t	2x GN Rope H14 3500t
4000t	2x GN Rope H14 4000t

Hydraulic fluid & gas

All versions use mineral oil as standard hydraulic fluid due to reduced needs for maintenance and increased reliability, it is widely available, and the risk of leakage is minimal. We also offer bio friendly fluids upon special request, such as water-glycol, at extra cost. Nitrogen is used as standard gas.

Testing

- Overload tested according to DNV ST-0378 rules.
- Pressure tested according to EN 14359 and EN 13445 requirements.
- 100% UT and visual inspection of welds.
- Leakage test of complete assembly.
- Optional drop test to verify shock absorber performance.

Weight

		Stroke [m]							
		1.0m	2.0m	3.0m	4.0m	5.0m	6.0m	7.0m	8.0m
SWL [t]	10t	0.1t	0.1t	0.2t	0.2t	0.2t	0.2t	0.2t	0.3t
	30t	0.3t	0.4t	0.5t	0.5t	0.6t	0.7t	0.7t	0.8t
	75t	1t	1t	2t	2t	2t	2t	2t	2t
	150t	2t	2t	3t	3t	3t	4t	4t	4t
	250t	3t	4t	4t	5t	5t	6t	7t	7t
	400t	5t	6t	7t	8t	9t	9t	10t	11t
	600t	7t	8t	10t	11t	12t	13t	15t	16t
	800t	9t	11t	13t	14t	16t	18t	20t	22t
	1000t	11t	13t	16t	18t	20t	22t	25t	27t
	1250t	14t	17t	20t	22t	25t	28t	31t	34t
	1550t	17t	21t	24t	28t	31t	35t	38t	42t
	2000t	22t	27t	31t	36t	40t	45t	49t	54t
	2500t	30t	35t	40t	45t	50t	55t	60t	65t
	3000t	35t	40t	45t	50t	65t	70t	75t	80t
	3500t	40t	50t	55t	65t	70t	80t	85t	90t
	4000t	45t	50t	60t	70t	80t	90t	100t	110t

Contact information

For more information about the Polaris shock absorber or for orders please contact us at post@nodynamics.com or +47 9664 7886.

See also our website www.nodynamics.com