VOITH

Controlling Forces.
Vibration Damper Hydrodamp

Vibration Damping Means Economy.

Modern engines with high torques and optimized fuel consumption are making significantly higher demands on today's drive lines. Consequently: wear on components increases significantly. However, in the commercial vehicle industry, the reliability of the entire drive line has high priority for manufacturers and customers when it comes to economy. The Hydrodamp protects the drive line against overloads and increases the service life of individual components. Today, the Hydrodamp is proving itself in tractors, construction machinery, buses and rail vehicles. Leading manufacturers therefore rely on Hydrodamp for their drive concepts.

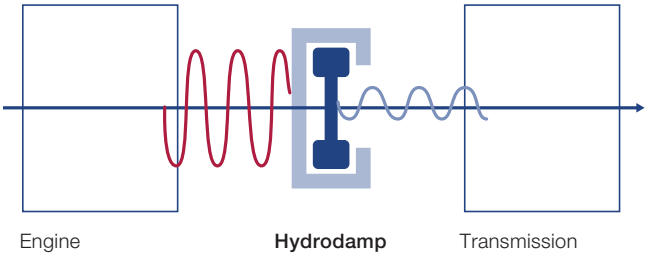
How and where does the Hydrodamp work?

The Hydrodamp is a modern torsional vibration damper which "thinks" with you and "responds" multi-functionally to complex vibration scenarios. It recognizes automatically the difference between the need for vibration damping and the need for vibration isolation during driving. To do this the Hydrodamp utilizes the hydraulic operating principle. With its hydraulic system, the Hydrodamp has been designed as a maintenance-free unit for commercial vehicles. It is arranged between engine and transmission or cardan shaft.

The key benefits of hydraulic damping

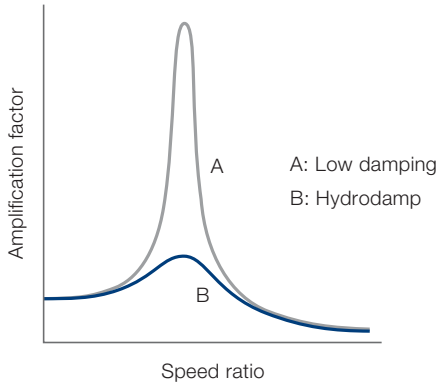
- No stick-slip phases with tear-away, which means there is no excitation of vibrations as experienced with conventional friction damping
- The damping effect can be adjusted to different operating ranges via the torsional angle, gap geometries and the viscosity of the medium
- Damping is proportional to driving speed, which means that high frequencies or amplitudes result in a high damping effect
- Damping occurs wear-free

Isolation behavior of the Hydrodamp



Hydrodamp HTSD 300

Damping behavior of the Hydrodamp



Its Operating Principle Reacts Flexibly to the Existing Drive Line.

The Hydrodamp is a highly elastic vibration damper with a spring-mass system and a separately arranged hydraulic damping system. The low stiffness of the springs combined with favorable mass arrangements shift critical resonances into areas below the operating speed range. Independent of this, the hydraulic operating principle is designed in line with the operating speed ranges, in order to provide vibration damping and isolation.

Economy and comfort by damping and isolating in one single system

The hydraulic operating principle divides the Hydrodamp into a damping and an isolating system. The Hydrodamp contains a floating and decoupled damping ring, which is arranged between the primary and the secondary mass of the damper with a defined amount of backlash.

Within normal operating range: vibration isolation

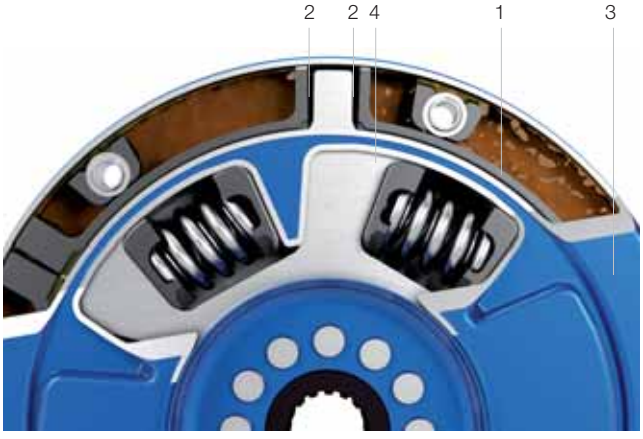
In order to avoid vibrations or undesirable noise development during driving, vibration amplitudes, however small, must be prevented from getting into the transmission. During this operating condition, optimum isolation is required. This is where the isolation system (Fig. 1) of the Hydrodamp becomes active: within the defined backlash range of the damping ring, vibrations are absorbed and isolated. As a resulted, optimum vibration isolation is ensured even in the lower operating speed range.

If load amplitudes are increased: vibration damping

Increased vibration amplitudes that occur at passing through a resonance stage (e. g. starting or stopping the engine) or during shock loads are effectively dampened by the hydraulic damping system (Fig. 2) of the Voith Hydrodamp.

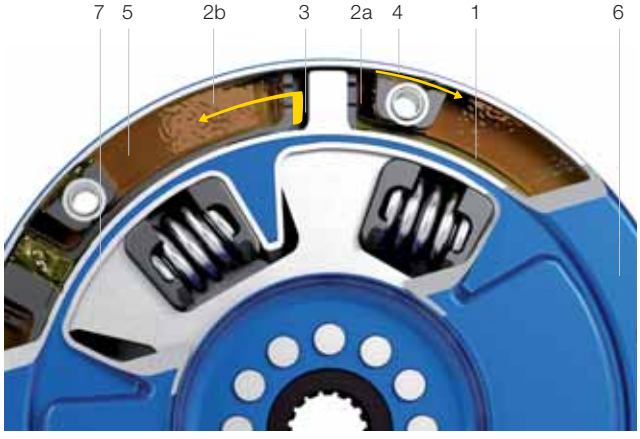
Through the application of temperature-resistant damping oils or damping grease, excess vibration energy is effectively removed from the system, even at higher temperatures.

Function vibration isolation (Fig. 1)



1 Floating damping ring with segments
2 Free movement (backlash between damping ring and secondary mass)
3 Primary mass
4 Secondary mass

Function vibration damping (Fig. 2)



1 Floating damping ring with segments
2a Pressure side of the damping chambers
2b Suction side of the damping chambers
3 Free movement (backlash between damping ring and secondary mass)
4 Damping gap
5 Damping medium
6 Primary mass
7 Secondary mass

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Type Ranges and Applications.

The Hydrodamp is based on a modular principle. The individual modules cover engine torques of up to 3 700 Nm. Installation to the individual customer-specific drive line occurs via primary or secondary-side solutions, such as SAE centering flanges, hubs or shaft connections. Within the individual type ranges, the Hydrodamp can be precisely adapted by alignment of the curve and damping characteristics to the specific drive line requirements.

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1 Medium to heavy tractor series with HTSD 300.

2 Citybus with DIWA transmission and HTSD 365.

3 For heavy rail vehicles with Hydrodamp HTSD 400.

Hydrodamp HTSD 300 / HTSD 300 LS

- Applications in medium to heavy tractors and construction machinery with load-shift transmissions and stepless drives
- Engine torques up to 1 650 Nm
- Hydraulic damping system with damping grease
- Weight-optimized sheet metal forming technology

Hydrodamp HTSD 365

- For automatic transmissions in city-buses and rail vehicles, as well as in heavy tractors and construction machinery with load-shift transmissions and stepless drives
- Engine torques up to 2 600 Nm
- Hydraulic damping system with damping oil or damping grease
- Idling stage, several operating stages and terminal operating stage
- Designed as flange or cardan shaft version

Hydrodamp HTSD 400

- For heavy rail vehicle transmissions and high-performance tractors
- Engine torques up to 3 700 Nm
- Hydraulic damping system with damping oil or damping grease

Hydrodamp HTSD 300

Hydrodamp HTSD 365

Hydrodamp HTSD 400

Automotive processes during series assembly ensure customer satisfaction with ongoing series runs.

Utilize Our Experience and Our Design Competency.

The Hydrodamp was developed during decades of competency and years of experience in the field of hydrodynamics. Long-term international partnerships in projects with customers and universities, as well as the high qualifications of our employees, enable us to set standards now and in the future, when it comes to developing innovative and benefit-oriented products for our customers.

Simulation-based design saves time and cuts costs

Simulations reduce iteration loops during test drives, thus cutting costs and shortening development times. Both the spring characteristics, degrees of stiffness and mass ratios of the spring-mass system and the hydraulic damping and isolating system are all adapted to each other to meet customer-specific drive line requirements.

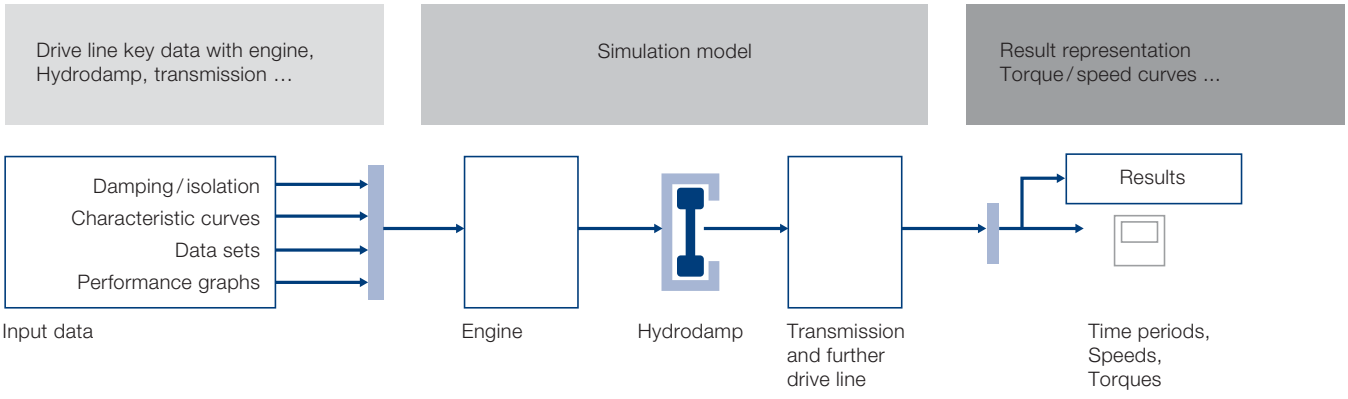
Operating resistance equals higher systems reliability

Load-specific, reliable and long-lasting strength configurations of construction elements determined by FEM and life-cycle calculations, as well as test-stand trials, increase and ensure customer benefits.

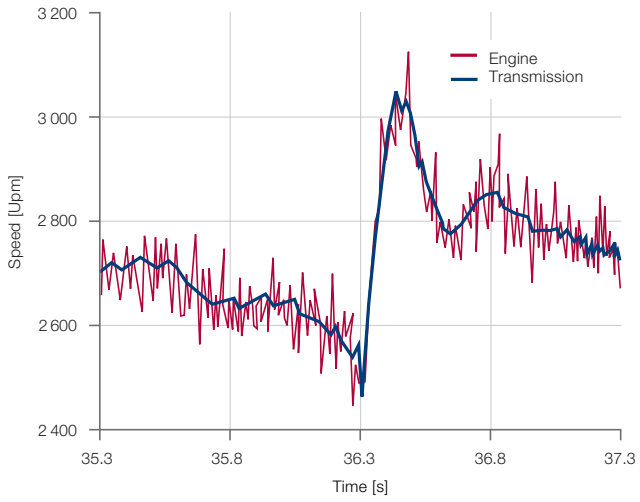
Vehicle measurements throughout the development phase

Vibration measurements during relevant driving conditions right from the start of the development allow functionally secure adaptation of the Hydrodamp into customer drive lines.

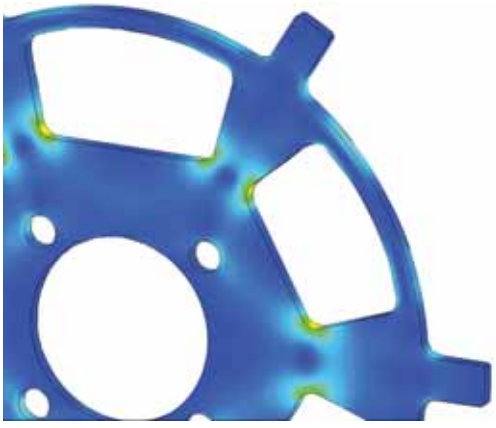
Simulation model



Measurement: upward gear-shifting under full-load

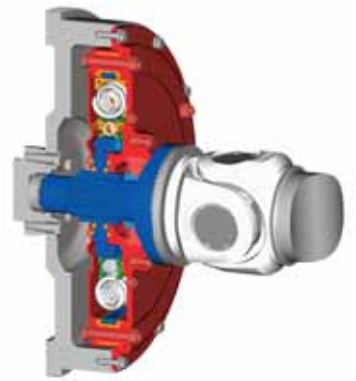


FEM calculation of a middle disc



HTSD 300 direct installation

HTSD 365 cardan shaft connection



HTSD 400 direct installation

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Engineered Reliability