

# Active and passive isolation techniques

*TNO offers an innovative technology to meet current and future noise level requirements for the working environment and comfort on board transport and luxury vessels. The new technology, hybrid vibration isolation, integrates traditional passive vibration isolation techniques and innovative active vibration isolation methods.*



*TNO has developed a robust high-performance actuator design.*

A hybrid vibration isolation system consists of passive mounts, actuators, sensors and a controller. The passive mounts reduce the transmission of vibrations in much the same way as in traditional systems. Sensors measure the residual vibration levels on the ship structure. The controller uses the sensor information to calculate an actuator signal that produces anti-vibrations in order to minimise the residual vibrations.

The result is a vibration isolation system with outstanding isolation performance, especially for low frequency noise, which is the main cause of passenger and crew discomfort. This innovative technology is already in the development phase of commercial products. There are still some options for licenses and/or co-operative contracts with industrial partners in the fields of hybrid vibration isolation in ships.

## **High performance actuators**

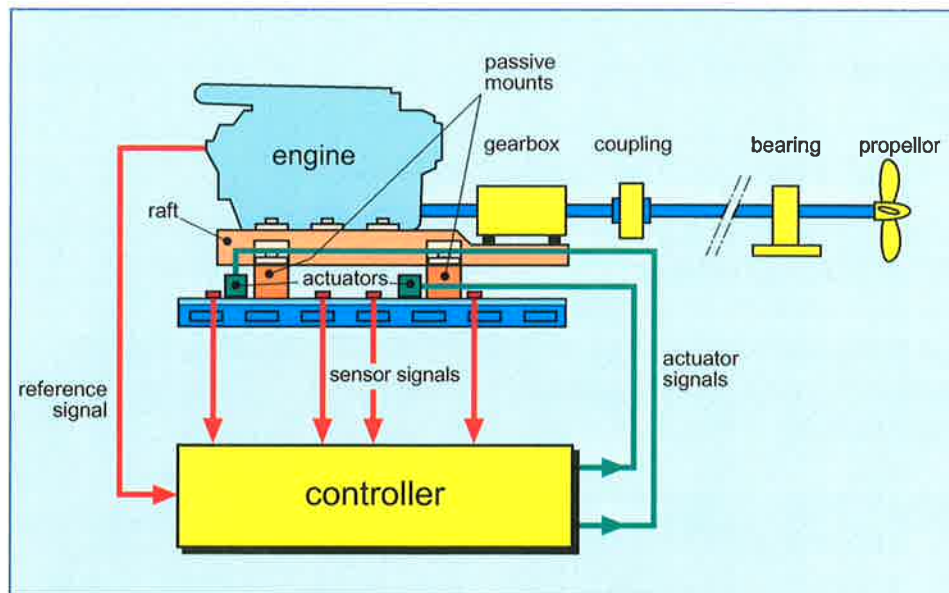
To be able to deliver high forces for a hybrid isolation solution, rugged high-performance actuators optimised for continuous operation are required. Such an actuator has been developed at TNO and is based on a scalable design, of which a 650-N version is available.

## **Specifications**

The compact design features high efficiency, excellent thermal characteristics, no sliding components and minimum fatigue of the mechanical suspension.

This TNO designed actuator is based on the integration of electromagnetic, mechanical and thermal characteristics, the aim of which is to produce robustness and continuous operation. The electromagnetic design and the design of the mechanical suspension were developed following a series of Finite Element simulations.

The designs have been optimised for minimum temperatures even at sustained operation; no active cooling is required.



Schematic overview of hybrid isolation set-up.

Acoustics

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