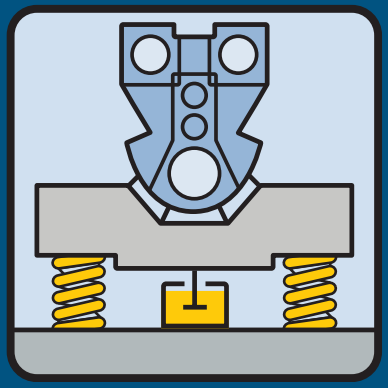
GERB
Vibration Control Systems

Elastic Support of Gas and Diesel Generators



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Elastic Support of Gas and Diesel Generators

Spring Unit with Integrated Viscodamper®
(Center of Viscodamper® shown)

Large gas and diesel engines are used for many purposes – in trains and ships as well as for local power generation. In all cases, the foundations for these engines must be both economical and effective. Elastic support of this equipment not only meets these requirements, but is currently the state of the art.

Around the world GERB spring-damper-systems protect people, buildings and equipment from vibrations and structure borne noise. These systems allow diesel generators to be installed almost anywhere – no matter if in the third subbasement of a hotel in Seoul, on the thirtieth floor of a high-rise building in Melbourne, in a power station on a remote Caribbean island or in a nuclear power plant in Germany.

The applicable local regulations must be considered for each and every machine foundation. What problems can arise?

During operation, some of the oscillating forces and moments generated by the engine are balanced internally; remaining forces and moments are transmitted into the foundation.

The frequency of these “residual” forces and moments is usually the same as or higher than the speed of the engine; however, it may also be half that speed.

The engine and generator are normally arranged on a common foundation. With small equipment this usually consists of a steel frame. In the case of larger generators, a concrete or steel foundation is often provided to balance the dynamics of the engine with a corresponding mass and to channel dynamic and static forces safely into the subsoil. A heavy foundation alone provides this mass, but dynamic forces are still transmitted into the soil or substructure, the building and its surroundings.

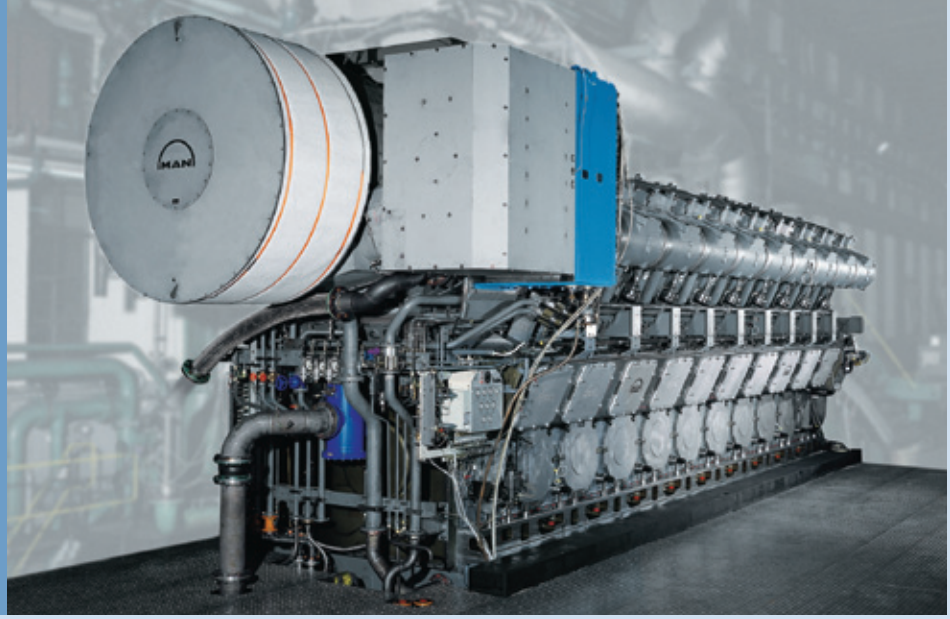
Problems at this point can no longer be overlooked. The walls, support columns and roof of the diesel generator building can be excited by vibrations. A nearby machine in stand-by position can be damaged. Ground settlement can reach critical dimensions. Neighbouring residential areas can experience disturbances.

While settlement problems can be solved with an expensive pile foundation, the transmission of disturbing dynamic forces can rarely be limited by utilising conventional foundation methods.

Solving foundation problems after-the-fact is expensive. This usually necessitates considerable cost and, perhaps worst of all, a very long downtime for the machine.

The substructure is a critical part of the foundation design. In most cases this is the subsoil, in other cases it may be a floor or other type of construction. The static properties are not always known, the dynamic properties often even less. While these properties can be estimated or assessed by an expert, risk remains and costs increase.

A rigid massive foundation does not meet standards for vibration protection of the immediate vicinity nor of neighbouring buildings. Therefore, GERB recommends dynamically uncoupling the machine foundation from the substructure by means of spring elements and Viscodampers®.



Spring Supported Diesel Engine
(MAN Diesel & Turbo)

The GERB elastic support system provides the following advantages:

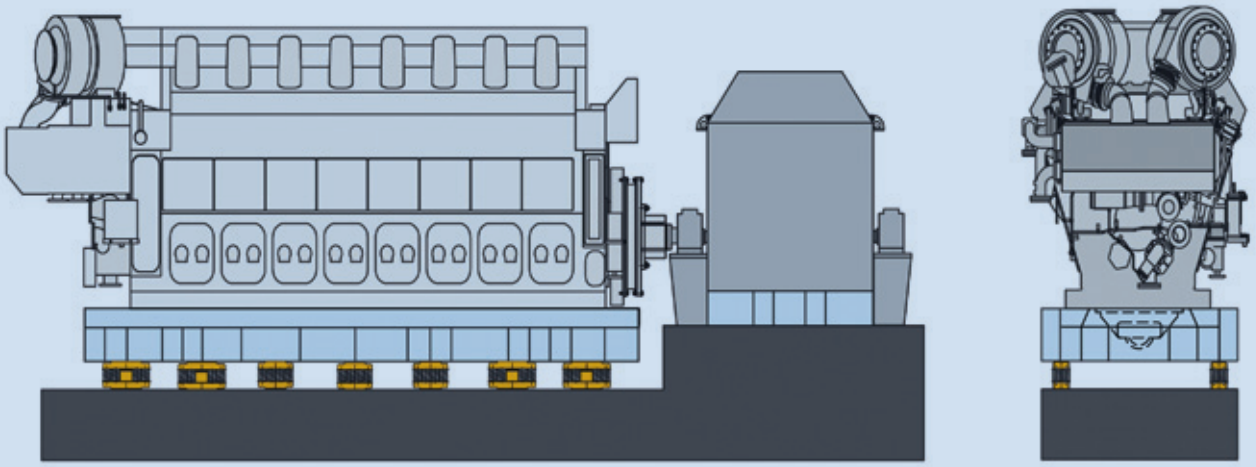
- The machine foundation is dynamically uncoupled from the surroundings with high isolation efficiency (up to 98%).
- Transmission of structure borne noise is virtually eliminated.
- Optimal foundation design and analysis is possible, and accurate dynamic characteristics can be determined. Vibration isolated machine foundations can indeed be offered as economical, safe and time-saving solutions.
- The calculations allow the foundation mass, and therefore its cost, to be designed as small as possible.
- With a foundation that does not require a deep pit, problems with ground water can be avoided.
- Where settlement of the substructure occurs, realignment with spring elements is easy.
- The size of the diesel generator building can be designed to match the size of the optimized machine foundation.
- In seismic zones, a properly designed elastic support system protects machinery against earthquake damage.

GERB offers the complete solution for your vibration isolation problems:

- Consultation,
- Design, surveys,
- Engineering,
- Supply of spring units and Viscodampers®,
- Installation or supervision of installation.

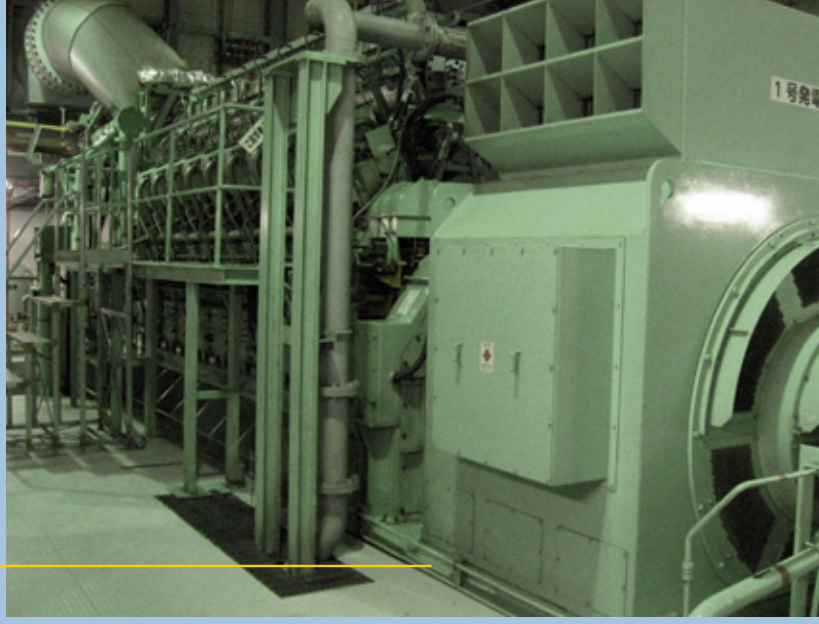
For design, engineering and consultation, please contact the engineers at GERB.

Offices located worldwide are shown on the back of this brochure.



Spring Supported Diesel Engine with Steel Frame

Spring Unit with Viscodamper®



Spring Supported Gen Set (MHI)

These advantages and more can be achieved by the use of a GERB elastic support system, which consists of highly elastic, low tuned helical spring elements complemented by Viscodampers®. The natural frequency of the system should be less than 70 % of the normal machine speed to provide good isolation efficiency. 35 % or less is ideal and often achieved.

For the most common medium speed diesel generators, only a helical spring system can economically meet these requirements.

Velocity-proportional Viscodampers® stabilize the foundation block and limit the amplitudes of the machine when passing through resonance at startup and shutdown.

GERB vibration isolation systems fulfill all requirements and have done so for decades.

Spring Supported Emergency Gen Set (MTU)

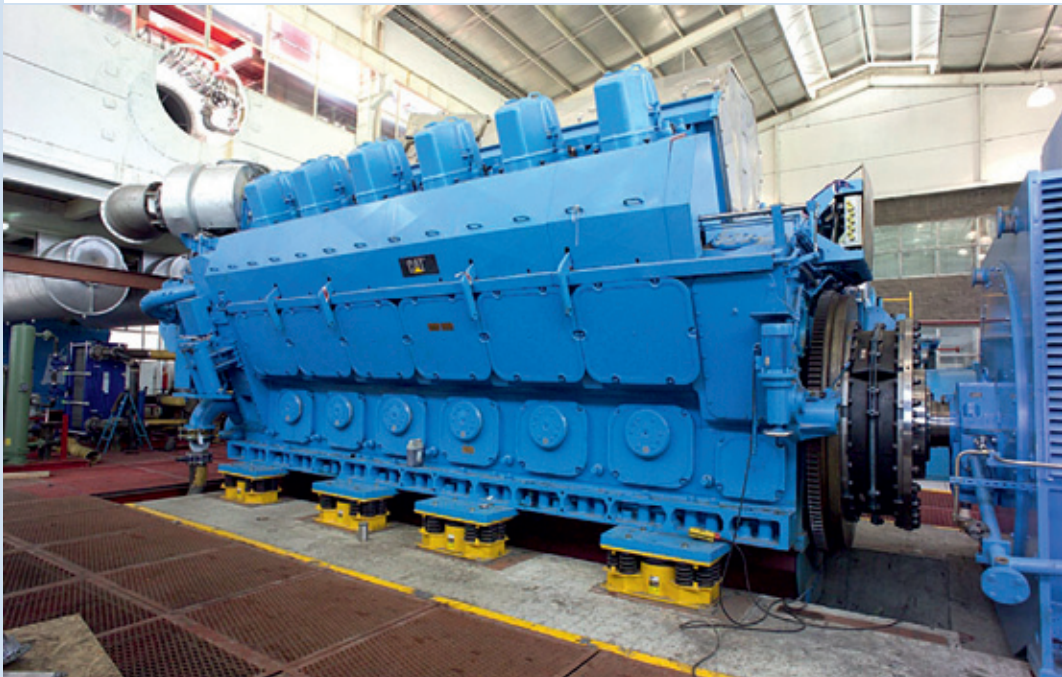
Diesel Engine for Ships with Spring Support (KHD)

GERB Vibration Control Systems

Elastic Support of Gas and Diesel Generators
Reference List (Selection)

Country	Plant	Manufacturer	Engine type	Capacity (kW)
Argentina	Atucha 2	KHD	4 x 18 PA 6V 280	4 x 5956
Australia	Grosvenor	MAN Diesel & Turbo	6 x 16V 20/27	6 x 1567
Austria	Rottenmann	MAN Diesel & Turbo	6L40/45	3140
Belgium	ACEC Harelbeke	MAN Diesel & Turbo	18V 52/55a	1332
Brazil	Mineracao Rio do Norte Fortaleca	MAN Diesel & Turbo MAN Diesel & Turbo	2 x 9L48/60 8 x 18V 48/60	2 x 10395 8 x 18900
China	Hongwan Kuicheng-Shinchun Lianyungang Sintai	SWD MAN Diesel & Turbo SEMT Caterpillar	9 x 9TM 620 18V 28/32 H 12CM32C	9 x 12000 4 x 5000 6000
Denmark	Jelling + Toftlund	Frichs/Niigata	2 x 18V 33 CX-G	2 x 5181
Egypt	El Arish	Diesel Ricerche	2 x BL 500	2 x 5800
France	NPP Civaux 1 + 2 ND de Gravenchon Mayotte, Komoren	 Sulzer Diesel Caterpillar		
Germany	Deutsche Bundesbank MHKW Stendal MHKW Ludwigsfelde Lanor Energy Systems	MAN Diesel & Turbo Blohm & Voss Masch. Halberstadt SEMT Pielstick	6L32/40 DG 18 PC 2-5 V 400 DFC 12 VD 48/42 3 x 9 PC 2-3L DF	2400 7938 4800
Honduras	Elcatex Choloma	Caterpillar MAN Diesel & Turbo	16CM32C 14 x 18V 48/60	8000 14 x 18900
India	Aggarwal Metal Works Bhushan Industries Larsen & Toubro Ltd. Lumax Industries P & ED Mizoram	SEMT Pielstick MAN Diesel & Turbo Powerica/Cummins Cummins Kirloskar Oil Engines	SEMT 3800 12V 48/60 QSK60G4 KTA50G3 4 x 9PA6CL	3040 12000 1600 1000 4 x 2500
Indonesia	Tjiwi Kimia	Krupp MaK	6 x 6 M 601	6 x 6000
Italy	La Vallette Bardonecchia	Ansaldo Caterpillar	3 x A 420.16 G16CM34	3 x 7500 6100
Japan	Sumitomo Matsushita	MHI Yanmar	18KU30GA AT2700	5500 1750
Korea	Lotte Jamsil	Niigata	6 x 14 PC 2-5 VDF	6 x 5900
New Zealand	Wellington Hospital	Mirrlees Blackstone	4 x KP8	4 x 2500
Netherlands	Hoogovens	Blohm & Voss	18 PC 2-5 V DFC	7938
Philippines	Concord I	MAN Diesel & Turbo	12 V 28/32 H	2640
Portugal	Pico Santos y Monteiro	Krupp MaK MAN Diesel & Turbo	3 x 6 M 453 8L32/40	3 x 2000 3460
Russia	Seafresh	Caterpillar	G16CM34C	6100
Saudi Arabia	Al Ruquaii	Krupp MaK	4 x 16 M 453	4 x 4215
Spain	Mellila Ceuta	MAN Diesel & Turbo MAN Diesel & Turbo	12V 48/60 2 x 12V 48/60	12600 2 x 12600
Sri Lanka	Embilipitya	Caterpillar	14 x 16CM32C	8000
Switzerland	City of Geneva	Caterpillar	G16CM34	6100
Taiwan	NPP Lungmen Talco	AvK / Siemens MAN Diesel & Turbo	2 x 1701/6W 8 x 18V 52/55	2 x 3800 8 x 11912
Turkey	Habas	MAN Diesel & Turbo	3 x 18V 48/60	3 x 18900
Yemen	Shehr	Krupp MaK	3 x 8 M 453	3 x 4215

Spring Supported Gen Set (Caterpillar)



GERB
worldwide

For design, engineering and consultation, please provide us with the following data:

- Manufacturer, type and dimensions of the DG Set,
- Layout drawing,
- Total weight and centre of gravity,
- Normal speed,
- Requirement for earthquake protection (if necessary).

GERB Schwingungsisolierungen GmbH & Co. KG

Roedernallee 174-176
13407 Berlin/Germany
Tel. +49 (0)30 4191-0
Fax +49 (0)30 4191-199

Ruhrallee 311
45136 Essen/Germany
Tel. +49 (0)201 26604-0
Fax +49 (0)201 26604-40

info@gerb.com
www.gerb.com

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