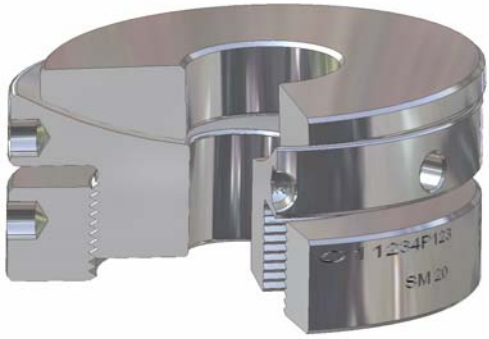
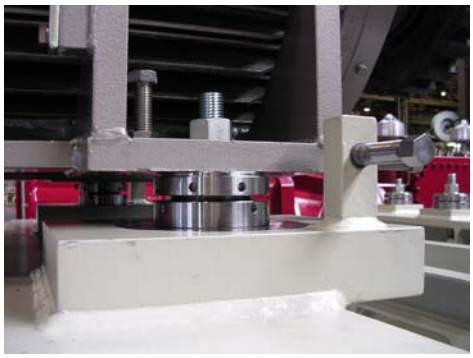
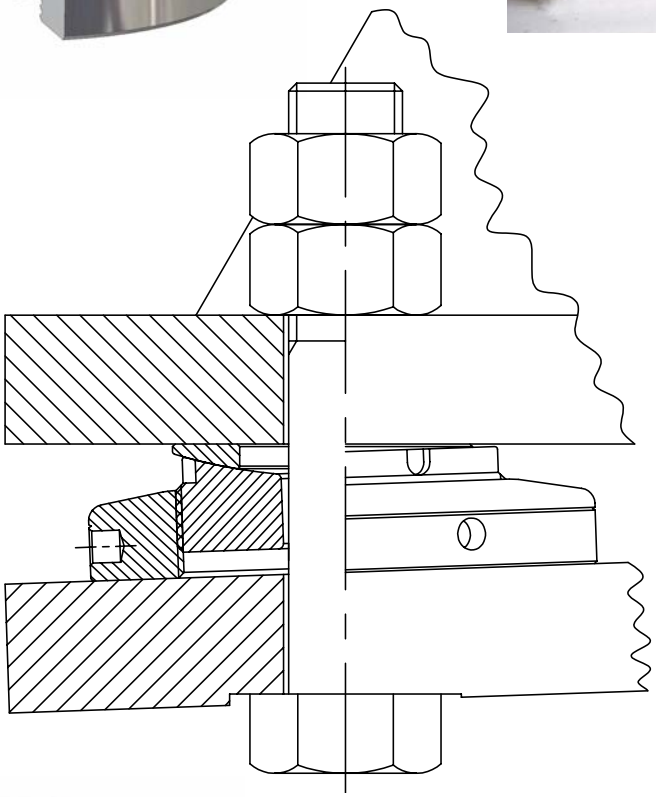
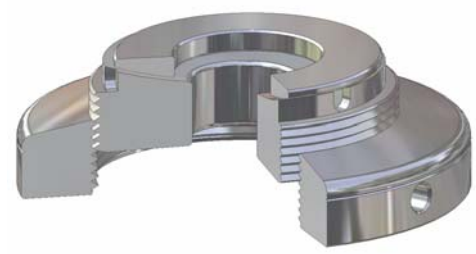
MACHINE SUPPORT
Laser Alignment, Mounting Services and Products

Vibracon®
Frequently Asked Questions









5 Vibracon® Frequently Asked Questions

5.1 General questions

5.1.1 What is a Vibracon® chock?

The Vibracon® chock is an universal adjustable steel chock. Universal refers to the fact that a Vibracon® chock can be used instead of rigid steel chocks, shims or epoxy resin chocks. Adjustable refers to the possibility of aligning and re-adjusting the chock at every re-alignment event. The name of the chock ”Vibracon” suggests that the elements can absorb vibrations like a vibration damper. We want to point out that the Vibracon® chock is absolutely **not** a vibration damper (resilient mount).

5.1.2 How long have Vibracon® chocks been in use?

The design of the elements is based on products which are used to mount tool machines. In 1988 Machine Support designed the Original Vibracon® chocks. In 2003 Machine Support designed the low profile Vibracon® configuration. Both chocks have patents pending.

Figure 5.1.2.1 Vibracon® Original

Figure 5.1.2.2 Vibracon® Low Profile

The Vibracon® Original and Vibracon® Low Profile chocks are approved by all major shipbuilding classification societies and a large number of original equipment manufacturers.

5.1.3 Who is Machine Support?

Machine Support is a dedicated engineering service organization, which has been in operation for over 20 years. At present, the group consists of three companies with a wide network of affiliated dealers and services. During many successful years of operation, the company has developed a reputation of excellence in laser alignment services and mounting solutions for an increasingly global market.

The comprehensive capabilities of the company include the highest proficiency in the installation support of diesel engines, turbines and the alignment to generators, pumps, compressors and shaft lines. Machine Support also specialises in geometric alignments, such as measuring the line bore of diesel engines and measuring the straightness of stern tubes onboard marine vessels.

The majority of our business is in the marine segment, however we also perform work in the industrial segment, from which mainly pulp and paper.
Machine Support's marine engineering services include the research and development into mounting products and advancement of machinery installation techniques. Furthermore, Machine Support is experienced in the support of owners, builders and engineering activities in obtaining classification society approvals or military qualification of the design for satisfactory machinery mountings. "Support" in the company's name represents more than just mounting of machinery.

Machine Support is ISO9001 and VCA certified.

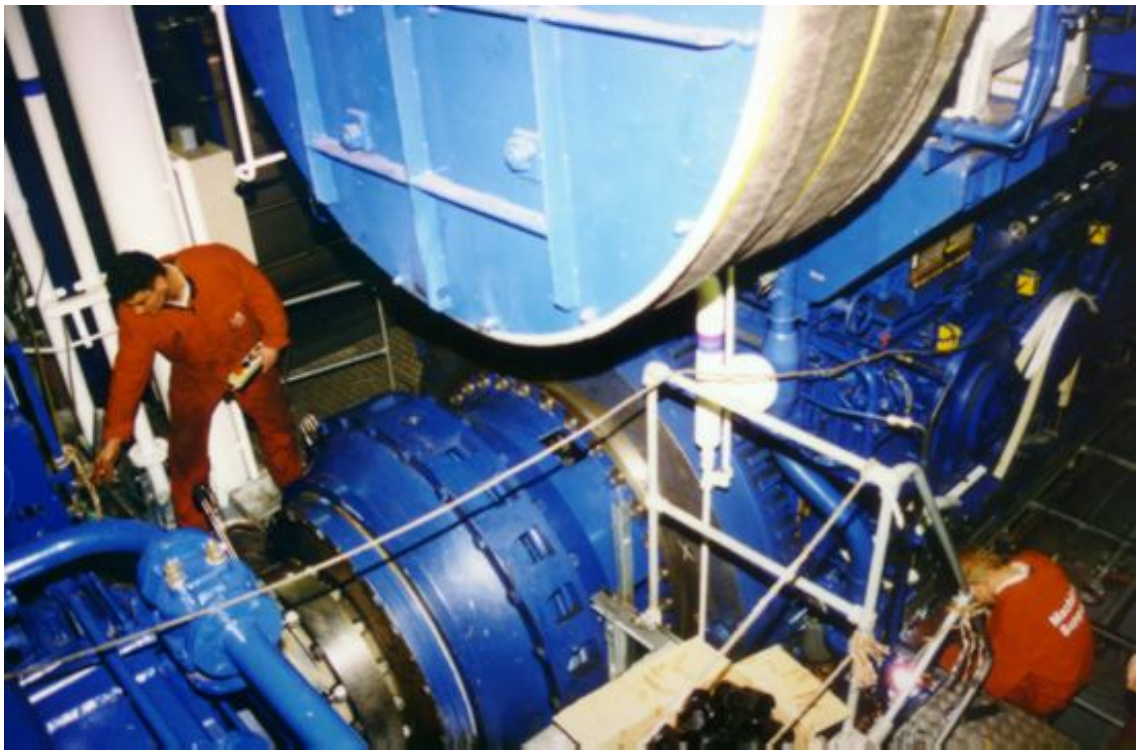


Figure 5.1.3.1 Alignment and chocking of components are typical Machine Support activities.

5.1.4 What are the benefits of Vibracon® chocks?

In packaged units (like generator, compressor, turbine and pump sets) the benefits are:

- No parallel or angular soft foot problems, even when the skid is twisted;
- No machining of the base frame;
- No on site problems to arrange or install shims;
- Re-adjustable;
- In combination with laser alignment equipment, alignment time can be reduced by 50%;
- Existing chocking systems, steel chocks or epoxy resin with a height of only 20 mm, can be replaced by the Vibracon® Low Profile configuration (depending on Vibracon® size).

On board ships for chocking propulsion units and auxiliary equipment:

- No curing time like epoxy resin chocks;
- No time consuming fitting of rigid steel chocks;
- Chocking can be carried out when the ship is still in the dry dock, the alignment check and (if required) realignment has to be carried out after the ship has been launched;
- No parallel or angular soft foot problems, even if the foundation is not machined;
- No machining of foundation, only locally (where the elements will be fitted) machining if required.

5.1.5 What is more cost effective: Vibracon® chocks, steel chocks, epoxy resin chocks or shims?

In most of the applications the Vibracon® chocks will be cheaper because of:

- Reduced chocking time
- Always a perfect fitting chock
- No soft foot problems
- Installation of the Vibracon® chocks doesn't require special skills or tools
- Usually no machining of foundations or base frames is required

5.1.6 Where can we use the chocks?

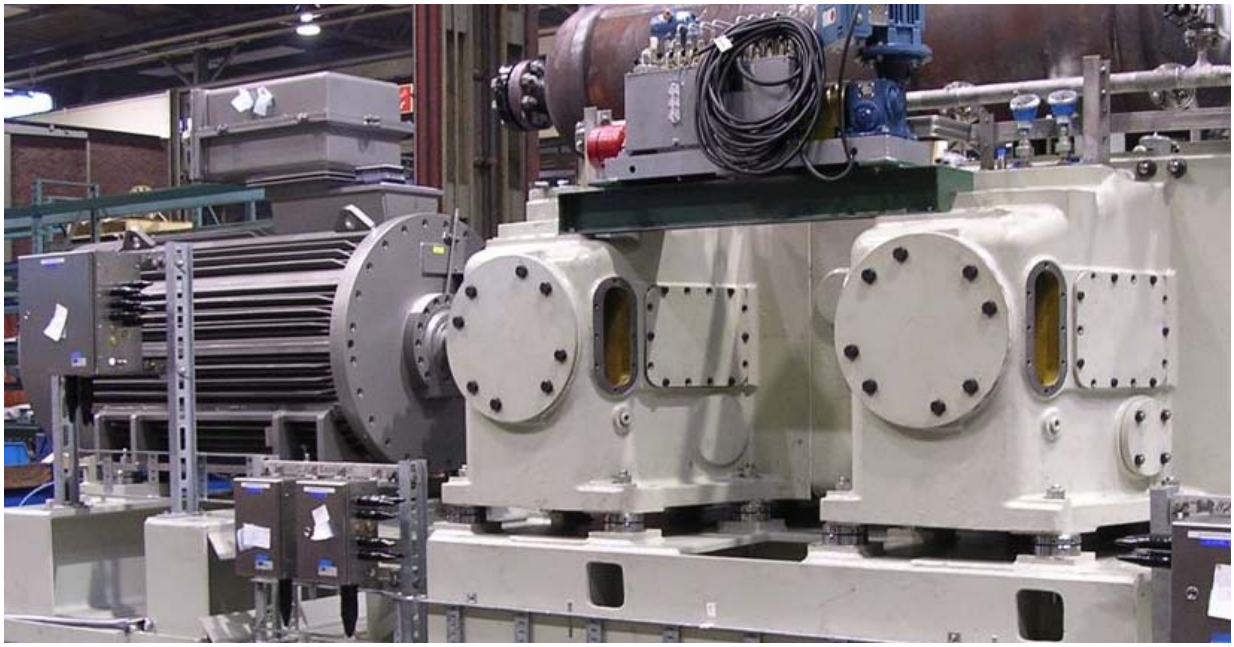


Figure 5.1.6.1 Several components mounted on Vibracon® chocks.

Figure 5.1.6.2 Generator of genset mounted on Vibracon® chocks.

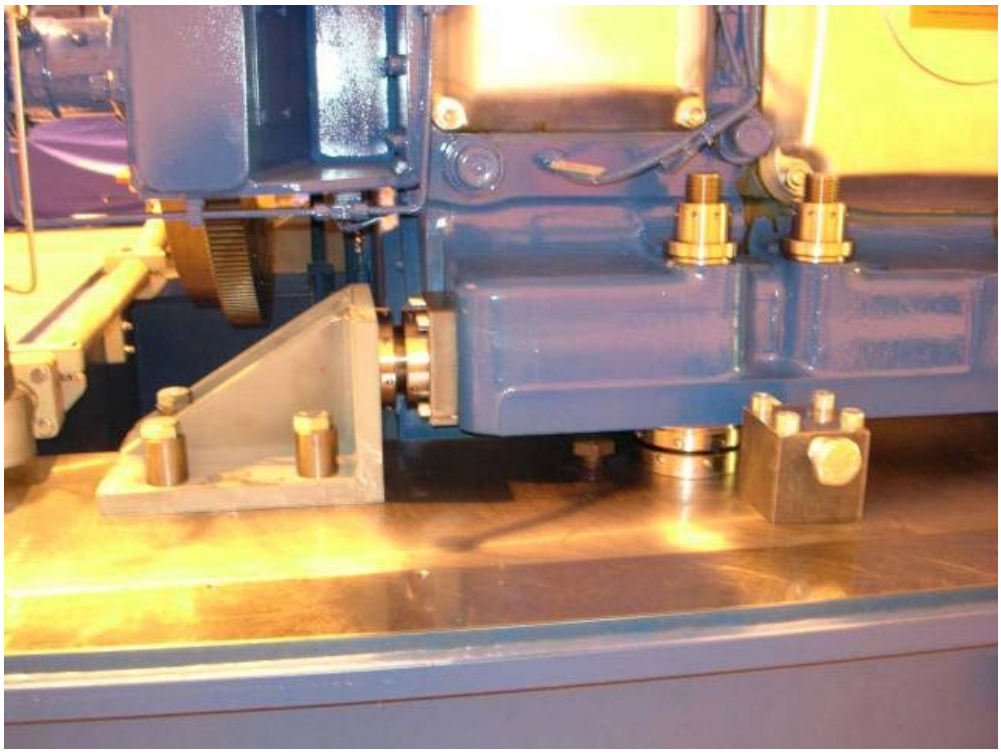


Figure 5.1.6.3 Detail of bracket with Vibracon® to create a fixed point (alternative for fitted bolts).

Figure 5.1.6.4 Overview of engine mounted on Vibracon® chocks on a concrete foundation.

In **production plants** the elements can be used under all kinds of rotating equipment, and also in production lines which need accurate alignment.

When Vibracon® chocks will be mounted on a concrete foundation, the maximum allowable surface pressure of the existing concrete has to be checked. In case the surface pressure will be too high then it is possible to reduce the surface pressure, with the use of an additional steel plate of sufficient surface and thickness, to an acceptable level.

5.1.7 Do we need special skills or tools to use the chocks?

Special skills or tools are not required to use Vibracon® chocks. Machine Support always advises you to contact your local dealer or Machine Support for support during the first time installation of the elements. Also, check the installation procedure (chapter 4).
The use of laser alignment equipment is recommended but not necessary.

5.1.8 How do we order Vibracon® chocks?

Vibracon® chocks are always on stock at Machine Support in the Netherlands. However it is recommended to check the delivery time before ordering. Our local dealers of the elements also have some elements on stock. A list of all the distributors is available on the website from Machine Support: www.machinesupport.com.

5.2 Technical questions

5.2.1 Is it possible to chock a heavy machine on a Vibracon® chock?

Yes, the primary forces for this Vibracon® sizing consideration are:

F_{weight}	due to gravity
F_{torque}	due to the fact that the machine wants to rotate
F_{bolt}	due to the tightening torque of the foundation bolt

F_{bolt} is approximately 6 till 10 times F_{weight} and even 10 till 15 times F_{torque}.

This means that F_{bolt} is the critical force on the normal element
If we consider for example the Vibracon® SM 30 chock, we can see that we are tightening a M30 bolt against a M95 thread (internal thread size of a Vibracon® SM30). It is easy to understand that the Vibracon® chock can't be damaged by the machine forces unless the element sizes are wrongly calculated or the foundation bolts are insufficiently tightened.

5.2.2 Can we align a machine with a Vibracon chock?

No, the chocks are only meant for chocking! For aligning the machine, hydraulic tools or jack bolts are recommended. When the weight of the machine is compressing the element it will lock itself automatically due to friction in the thread.

5.2.3 How do we prevent the chock from rotating?

The Vibracon® chock will lock itself (due to friction in the thread) after the foundation bolts are tightened. It is not necessary to lock the chock in any other way.

5.2.4 Are there any limits to the chock height?

Yes, there are limits to the standard chocks. Please check in the table on the Vibracon brochure the minimum and maximum height of each type of chock. When designing a chocking arrangement, please have a look on the nominal height of the chock.

5.2.5 What to do if we want to have elements with extended height?

In this case, it is possible to use an additional bottom ring with an extended height (contact Machine Support or your local dealer). The maximum height of the chock should not exceed the diameter of the chock.

5.2.6 What to do if we want to have chocks which are lower than the minimum height?

It is allowed to reduce the Vibracon® Original to a minimum reduced height which is mentioned in chapter 6 figure 6.4.2 Reducing the height can be done on a lathe by machining the centre and bottom part of the chock. Keep in mind that the adjustment capabilities also will be reduced. At the minimum reduced height, you will only have 1 mm adjustment capability left!

5.2.7 Is it possible to enlarge the bolt holes of the Vibracon® chock?

To do so you always need approval from Machine Support and the classification society. It is allowed to enlarge the bolt hole of the elements in accordance with the following table:

Original Type	Low Profile Type	Bolt	Enlarged bolt hole (mm)
SM12		M16	17
SM16	SM16LP	M20	21
SM20	SM20LP	M24	25
SM24	SM24LP	M30	31
SM30	SM30LP	M36	37
SM36	SM36LP	M42	43
SM42	SM42LP	M48	49
SM48		M56	57
SM56		M64	65
SM64		M72	73

Figure 5.2.7 Table for enlarged bolt holes

Please contact your local dealer or Machine Support to calculate the bolt torque and recommended clamped length.

5.2.8 If we want to use fitting bolts, how should we do this?

In general, it is not necessary to ream through the Vibracon® chock. Reaming only the foot of the machine and the foundation usually will do. In some situations (for example in cases where no side and collision stoppers are installed) we also advise to ream the Vibracon® chocks. Please contact your local dealer or Machine Support for additional information on this matter.

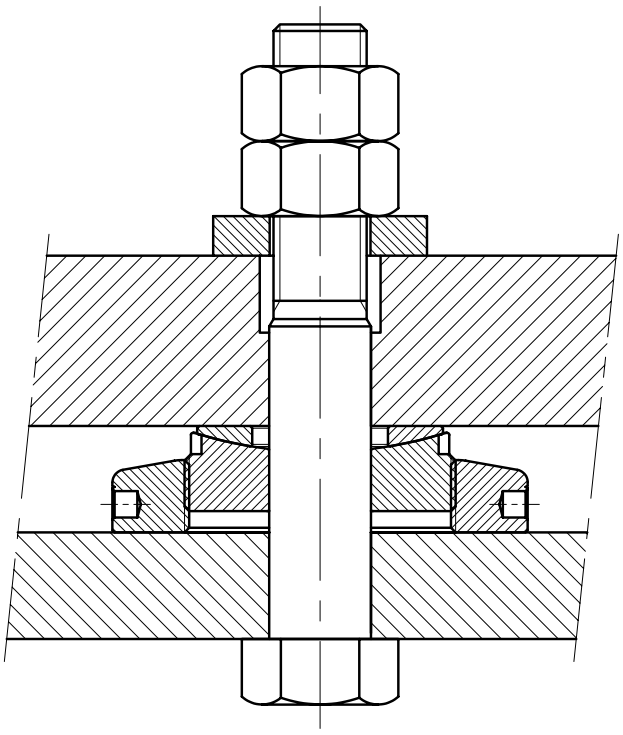


Figure 5.2.8 General arrangement for a fitted bolt

5.2.9 If we want to use dowel pins, how should we do this?

After the alignment and the securing of the foundation bolts, weld down a block of steel (which is just 1 mm lower than the chocks) near at least one of Vibracon® chocks or between two chocks. Drill a hole through the foot of the machine into this block. Now the dowel pin can be installed.

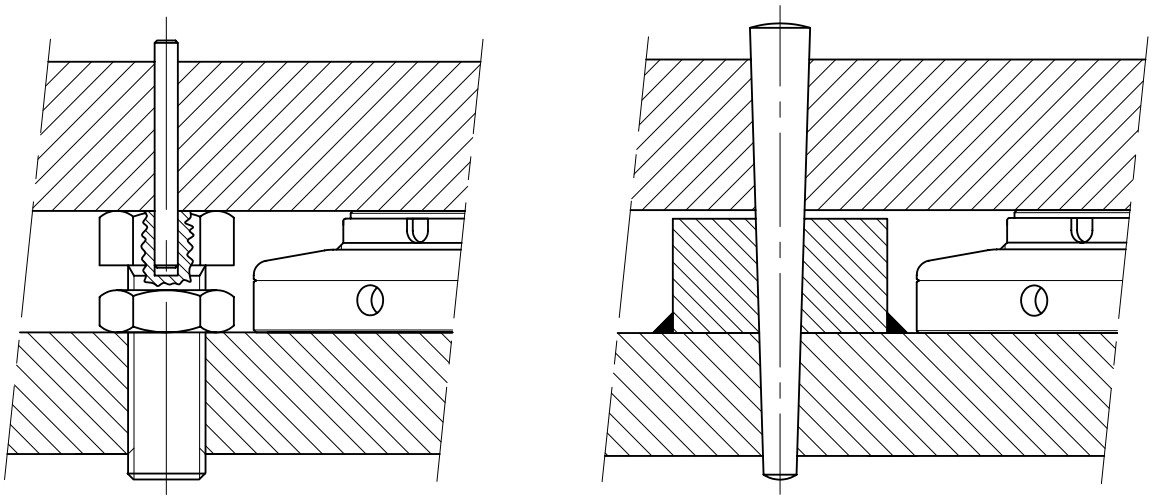


Figure 5.2.9 Alternatives for a dowel pin application

5.3 Marine application questions

5.3.1 Is the Vibracon® chock approved by classification societies?

Yes, the chock is approved by all major shipbuilding classification societies. However, it is always necessary to submit a calculation and a sketch of the chocking arrangement for approval for each application. This is mainly necessary for propulsion units and for some societies, also for auxiliary equipment. Contact your local dealer or Machine Support for assistance.

5.3.2 What information does Machine Support need to make a calculation and a sketch of the chocking arrangement?

For the production of a, free of charge, Vibracon® chocking proposal it is necessary to fill in a datasheet, which you can download from our website: www.machinesupport.com.

The following data is requested:

General
- Yard or owner name
- Ship name or new building number
- Classification society
- Type of object
- Make / type

Machine
- Mass
- Power
- Revolutions
- Foundation width between bolts
- Number of elements
- Diameter of the existing bolt holes

Additional information when it concerns a gearbox:
- Reduction rate
- Average distance between bolt holes
- Difference in height between output shaft and foundation
- Propulsion efficiency

Drawing
- Foundation plan
- Chock height
- Thickness of machine foot
- Thickness of foundation
- Plan for fitted bolts
- Plan for steel end chocks

5.3.3 Example of a Vibracon® chocking proposal

Based on the completed datasheets, Machine Support B.V. can prepare a chocking proposal for your project. At the following pages, you will find an example of such a proposal.

Machine Support B.V., The Netherlands
Phone : +31 (0)180 483828
Fax : +31 (0)180 483829
Website : www.machinesupport.com
E-mail : info@machinesupport.com

Shipyard / Customer	:	Wärtsilä Nederland B.V.
Shipname / Project	:	M.V. " Baldomero Lopez "
Classification society	:	American Bureau of Shipping
Object	:	Piston engine
Make / type	:	Wärtsilä 18TM410

Selection of Vibracon SM element

Machine

Mass (if engine with water +oil)	:	145000	(kg)
Power	:	9700	(kW)
Revolutions	:	550	(rpm)
Foundation width (bolt distance)	:	20990	(mm)
Number of elements	:	24	(-)
Bolthole diameter	:	48	(mm)
Correction / Safety factor	:	2	(-)
Minimum required Vibracon SM element	:	42	(-)
Advised Vibracon SM element	:	**42**	(-)
Element load (maximum)	:	59,88	(kN)
Element load (minimum)	:	58,54	(kN)
Machine load	:	119,75	(kN)

Calculation of holding down bolts' torque

Foundation stud bolt

Foundation bolts	:	22 * M42 (L = 555 mm)	(-)
Material	:	42 CrMo 4	(-)
E-modul	:	207000	(N/mm²)
Yield strength	:	750	(N/mm²)
Elongation foundation bolt	:	0,92	(mm)
Tension per bolt	:	488,1	(kN)
Tensile stress	:	479,5	(N/mm²)
Disposable yield strength	:	64	(%)
Equivalent stress	:	625,0	(N/mm²)
Disposable yield strength < 90 %	:	83	(%)
Tightening torque	**:**	**4100**	**(Nm)**

Fitted stud bolt

Fitted bolts	:	2 * M42 (L = 555 mm)	(-)
Material	:	42 CrMo 4	(-)
E-modul	:	207000	(N/mm²)
Yield strength	:	750	(N/mm²)
Elongation of fitted bolt	:	0,76	(mm)
Tension per bolt	:	488,1	(kN)
Tensile stress	:	479,5	(N/mm²)
Disposable yield strength	:	64	(%)
Equivalent stress	:	625,0	(N/mm²)
Disposable yield strength < 90%	:	83	(%)
Tightening torque	**:**	**4100**	**(Nm)**

MS REF. NUMBER : E-02-1313-01a-RV

MS-F-331 BLAD 1/1 REV.00 D.D. 01.08.2001

Figure 5.3.3.1 Example of Vibracon® calculation report

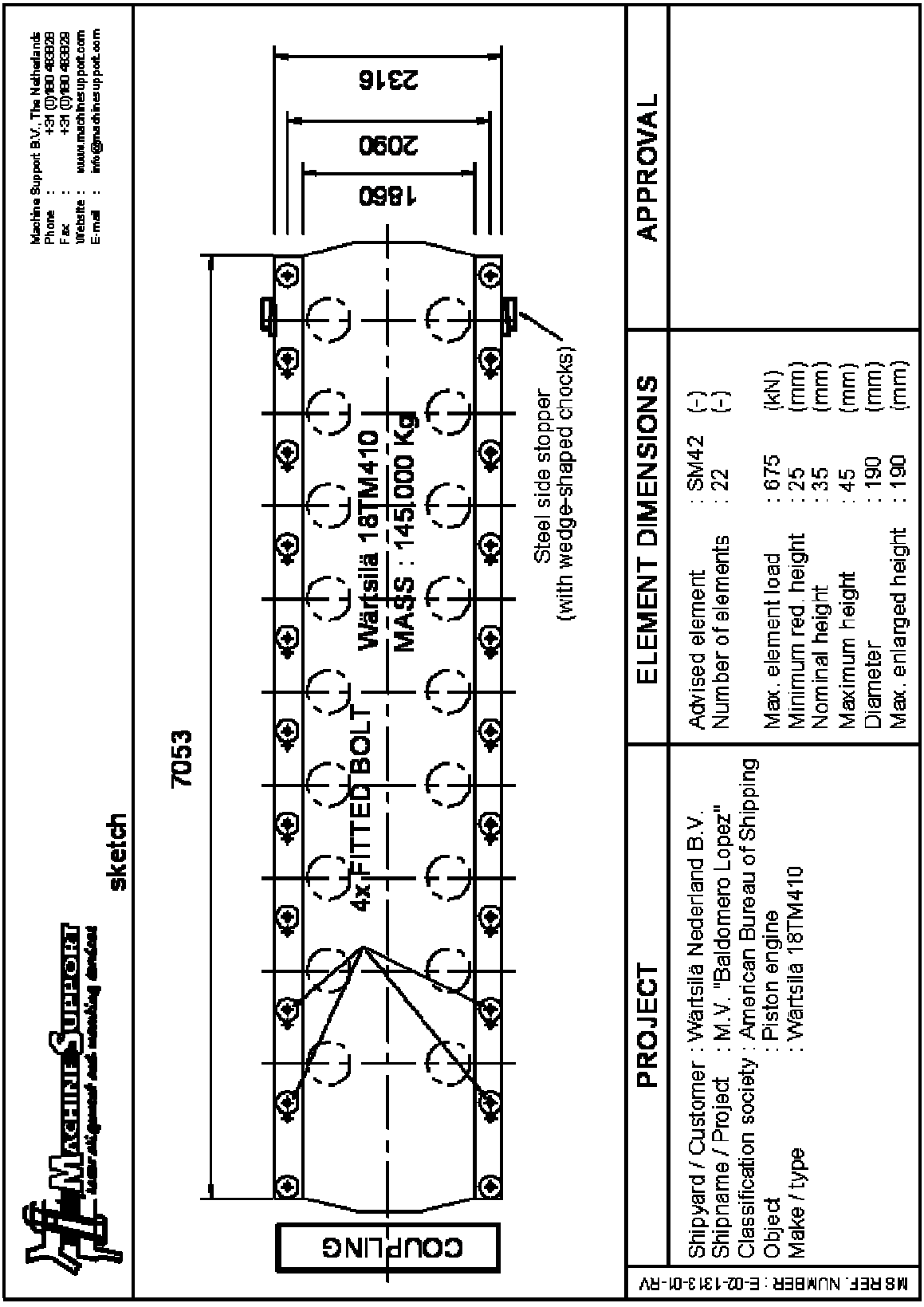
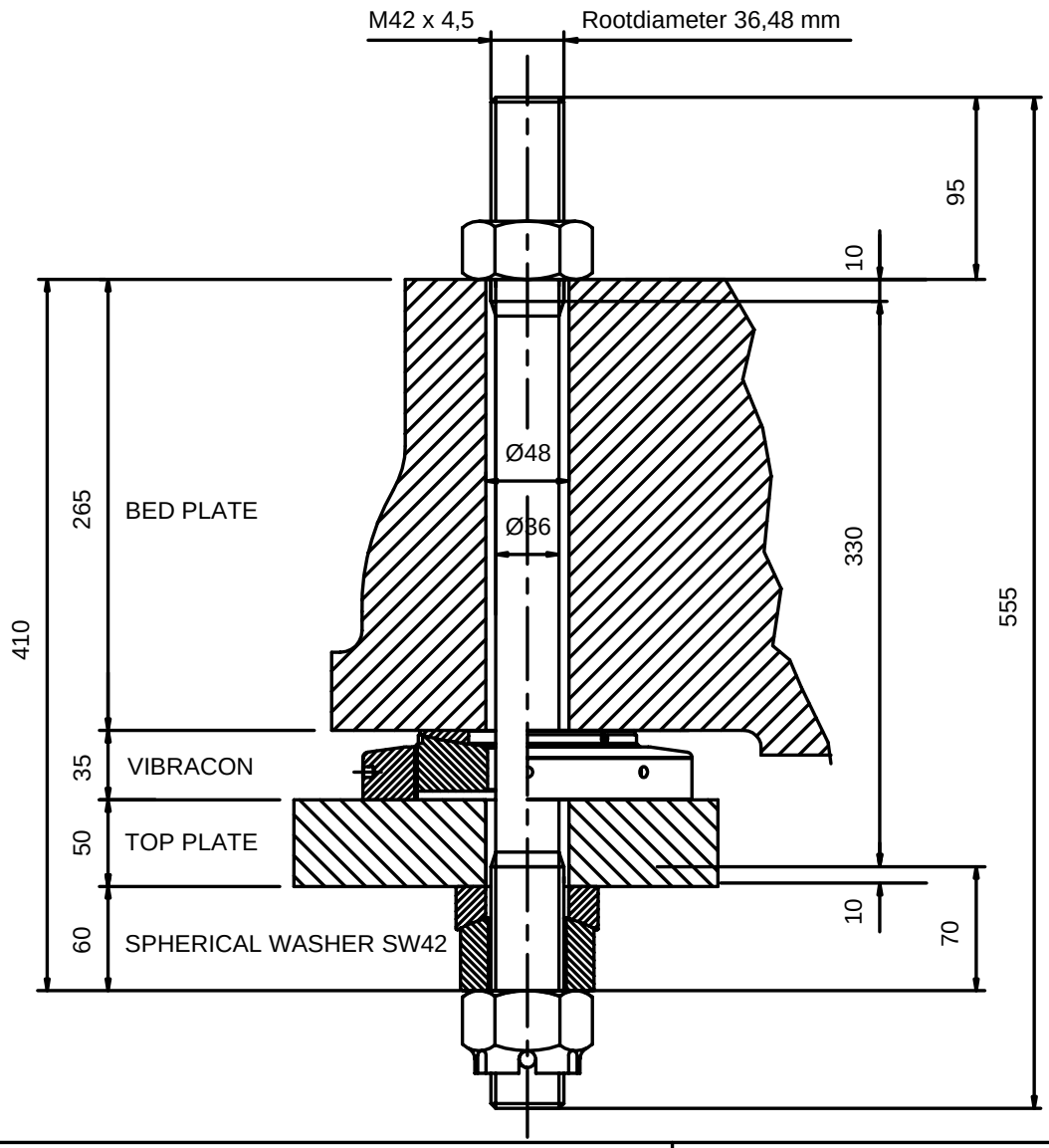


Figure 5.3.3.2 Example of Vibracon® calculation top view

Machine Support B.V., The Netherlands
Phone : +31 (0)180 483828
Fax : +31 (0)180 483829
Website : www.machinesupport.com
E-mail : info@machinesupport.com

sketch



MS REF. NUMBER : E-02-1313-01-RV

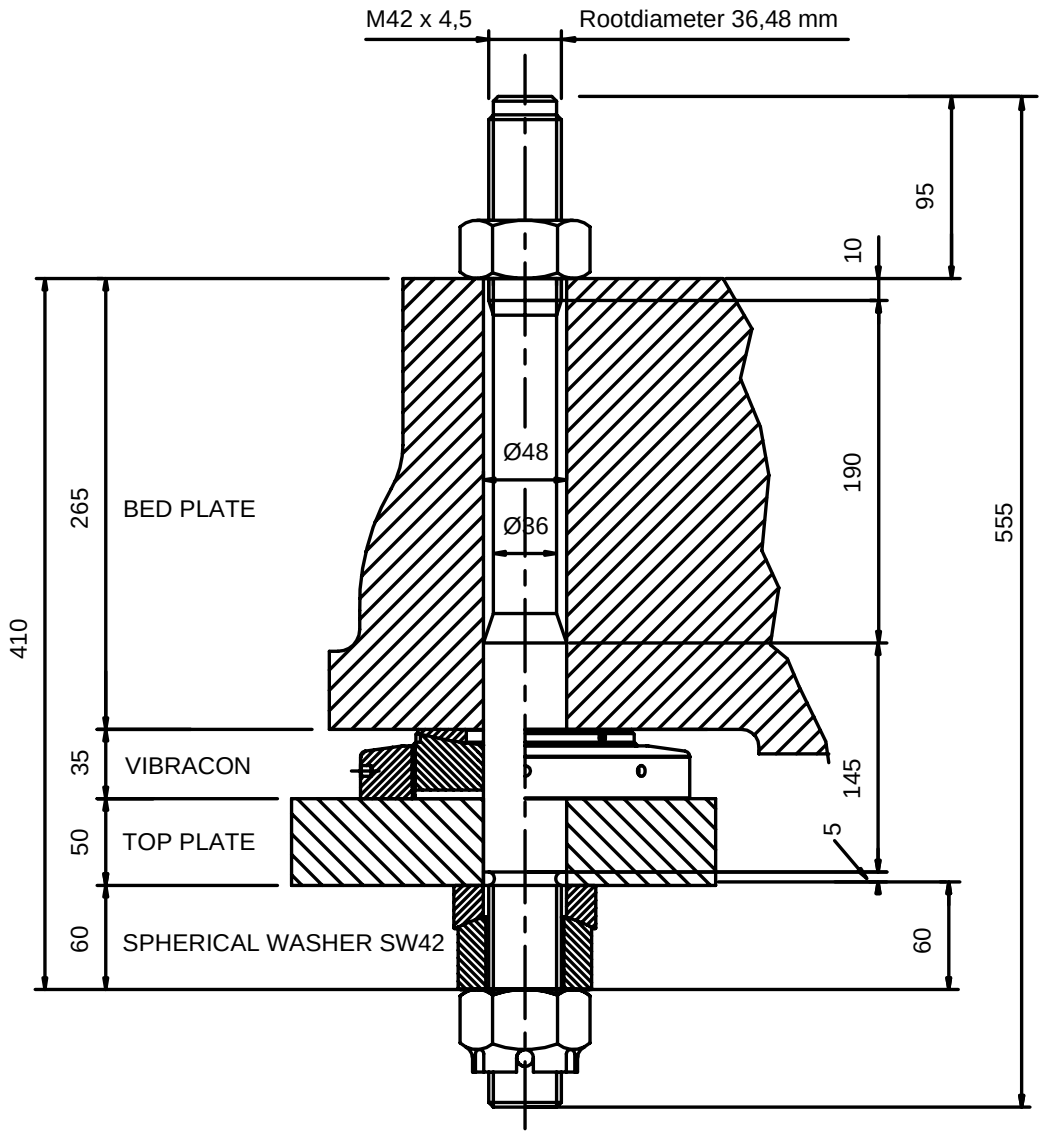
FOUNDATION STUD BOLT			APPROVAL
Bolt material	:	42CrMo4	
Yield strength	:	750 (N/mm^2)	
Size of foundatiion bolt	:	18 * M42 L = 555 (mm)	
Stretch	:	0.92 (mm)	
Tightening torque	:	4100 (Nm)	
Shipyard / Customer	:	Wärtsilä Nederland B.V.	
Shipname / Project	:	M.V. "Baldomero Lopez"	
Classification society	:	American Bureau of Shipping	
Object	:	Piston engine	
Make / type	:	Wärtsilä 18TM410	

Calculations are valid for bolts with usual thread, material grade 8.8., yield strength > 630 N/mm^2, oil lubricated thread courses and nut mating surfaces without slide additives

Figure 5.3.3.3 Example of Vibracon® calculation cross section of foundation bolt

Machine Support B.V., The Netherlands
Phone : +31 (0)180 483828
Fax : +31 (0)180 483829
Website : www.machinesupport.com
E-mail : info@machinesupport.com

sketch



MS REF. NUMBER : E-02-1313-01-RV

FITTED BOLT

Bolt material	:	42CrMo4
Yield strength	:	750 (N/mm^2)
Size of fitted bolt	:	4 * M42 L = 555 (mm)
Stretch	:	0.76 (mm)
Tightening torque	:	4100 (Nm)

Shipyard / Customer	: Wärtsilä Nederland B.V.
Shipname / Project	: M.V. "Baldomero Lopez"
Classification society	: American Bureau of Shipping
Object	: Piston engine
Make / type	: Wärtsilä 18TM410

APPROVAL

Calculations are valid for bolts with usual thread, material grade 8.8., yield strength > 630 N/mm^2, oil lubricated thread courses and nut mating surfaces without slide additives

Figure 5.3.3.4 Example of Vibracon® calculation cross section of fitted bolt

5.3.4 What bolt torque should we apply?

Machine Support has developed bolt torque calculation software in close cooperation with original equipment manufacturers and classification societies. The philosophy of the calculating software is to reach a minimum bolt elongation (stretch) of 0.20 mm in the bolted connection. The bolts are to be tightened within the elastic range of the bolt material, in general Machine Support advices a maximum bolt tension related to 75% of the yield strength of the bolt material.

The values stated in our Vibracon® brochure are based on the above mentioned calculations rules. The mentioned values are valid for bolts with course thread, material grade 8.8, yield strength > 630 N/mm², oil lubricated thread courses and nut mating surfaces without slide additives.
As a service to our customers, Machine Support offers you a chocking proposal, with the advised tightening torque included, for your application **free of charge**!