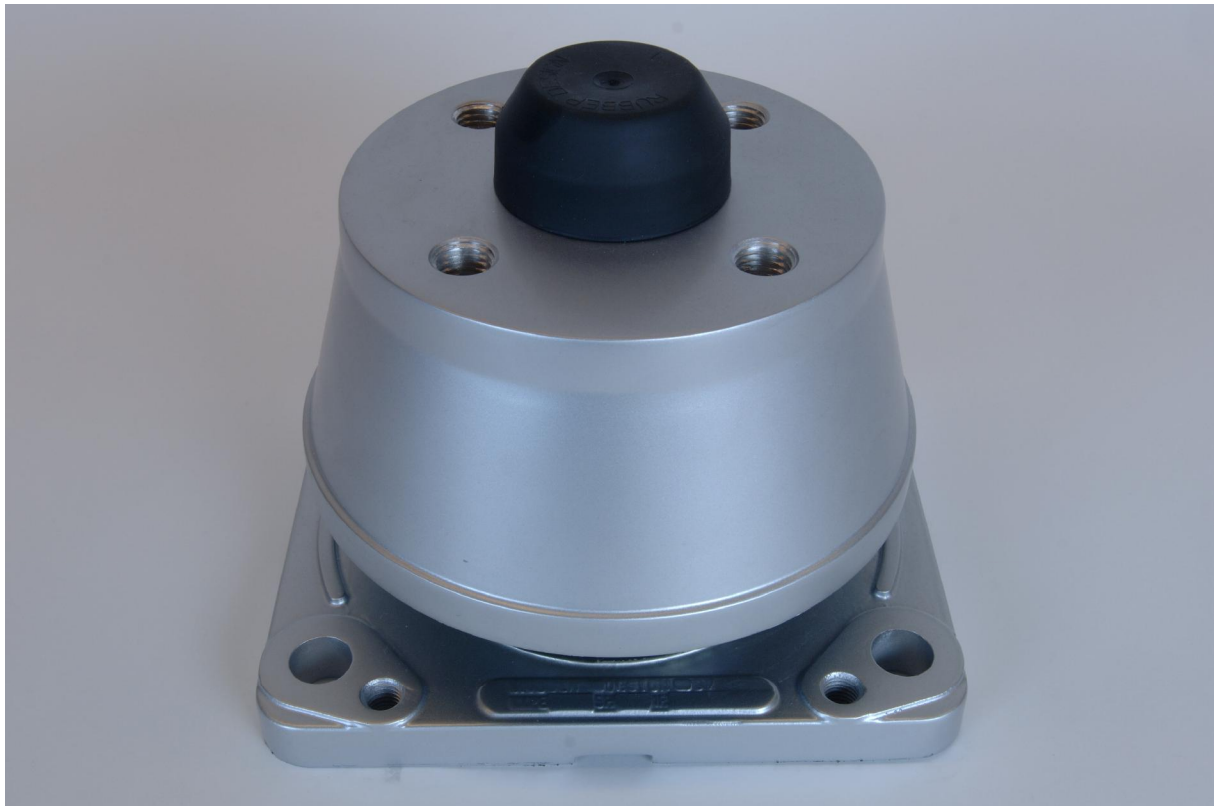


Conical mountings Installation Instruction





Conical mountings – General information

General

The range of conical marine mountings were designed specially with medium speed engines in mind. The conical design provides high deflection and load capacity combined with long service life.

Although originally designed for main engine, auxiliary engine and generator installations, the mountings are particularly versatile and can be equally used for exhaust gasboilers and silencers. For applications like the suspension of deckhouses, accommodation rooms and control cabins, this mounting is an excellent isolator against structure borne vibration and noise, passive isolation.

The acoustic properties of this type of mounting are excellent. The result of the measured structure - borne vibration and noise transmission are available. In both vertical and horizontal directions the transfer functions show in the low frequency range a decrease of 12 dB/octave, an 'ideal mass-less spring characteristics'.

Specification

The characteristics of the mounting are provided by a conical rubber element designed to carry the vertical load in a combination of compression and shear. The rubber elements for the mountings are produced in several types. Type RD 113, 114, 214 and 314 are produced with extra interleaf rings and type RD 115, 215 and 315 without extra interleaf ring. The types RD 244 and 344 are produced with extra interleaf ring and opposite recesses to enable different stiffnesses in three directions.

The rubber elements are manufactured in six 'standard' rubber mixes: 45NR11, 50NR11, 55NR11, 60NR11, 65NR11, 70NR11 and consequently cover a wide range of load / deflection requirements. Applicable up to 70°C continuous and 90°C peak temperatures. Next to that, for the high temperatures applications, there are the NR39 (90°C continuous and 110°C peak temperature) and the CR56 (110°C continuous and 130°C peak temperature) compounds, available in the above mentioned Shore hardnesses.

All mounting inserts are both individual tested and selected on stiffness by Rubber Design. The mounting castings are manufactured in a seawater resisting aluminium-silicon alloy and / or nodular cast iron. They are designed to protect the rubber element against oil and physical damage. An adjustable central buffer (spindle), manufactured in high tensile steel, controls the mounted equipment displacements due to e.g. shipmovements, both vertically and horizontally within defined limits and so eliminates the need for separate buffers. The cut out in the bottom casting allows the buffer adjustment to be checked.

Shock

The standard execution of the RD 113 in nodular cast iron can withstand shock loads upto 360 kN in all directions. The standard execution of the RD 114 - 115 in nodular cast iron can withstand shock loads upto 300 kN in all directions. The standard aluminium execution of the RD 214 - 215 - 244 mountings can withstand shock-loads upto 150 kN in all directions. On application we can supply a special non-magnetic type manufactured in inoxida, adjustable in axial and radial direction and suitable for shockloads upto 300 kN. The aluminium execution of the RD 314 - 315 - 344 can withstand shockloads upto 70 kN in all directions.

Approval

The mountings and our calculation method have been approved on many applications by the following classification societies:

- American Bureau of Shipping
- Bureau Veritas
- Class NK
- Det Norske Veritas
- Germanischer Lloyd
- Korean Register of Shipping
- Lloyd's Register of Shipping
- Registro Italiano Navale
- USSR Register of Shipping



Instructions for fitting conical mountings

General

It is advisable to read the instructions completely, before starting to design and / or fit the resiliently mounted system. There are several possible ways to fit the conical mounting to the suspended equipment and / or foundation, the final choice being with the end user.

Preparation

It is critical that the correct vibration isolator is installed in the proper location. Clean the bracket and the conical bearing, especially on the contact surfaces. Clean the upper surface of the ships foundation from dust, rust, oil, dirt and particles at the intended positions of the mountings. Anti corrosion oil should be applied on the steel parts. Attach each mounting to the engine / installation brackets handtight; simultaneously block the central buffer by applying a spanner to the top hexagon. Lower the installation load onto the mountings. Loosen the nut.

Fitting

Check that all central buffers can be turned easily by applying a spanner to the top hexagon. If this is not possible it will be necessary to partly remove the installation load, until the buffers can be turned freely. The central buffer should now be turned anti-clockwise (upwards) and the installation relowered onto the mountings. Check that all central buffers can be turned freely with full installation load on the mountings. If this is not the case then the above mentioned procedure should be repeated.

Where practical, the mountings should be allowed to settle for a minimum of 48 hours before any attempt is made to line up drives, pipe-work, etc. The suspended installation may now be levelled if necessary by means of jacking bolts which can be placed into the tapped holes of the base casting of each mounting.

Care must be taken, during levelling of the installation, to ensure that individual mountings are not overloaded. The variation in laden height should not exceed 2 mm and should ideally be less. The laden height can be measured between top- and basecasting at X (or H3 / H4) on two sides. The difference between the two sides of a mounting should not be more than the value mentioned in the table.

Vertical buffer adjustment

The central buffer working clearance for each mounting can be set as follows:

Turn the central buffer clockwise (downwards) to the maximum lower position until it contacts the filler plate or foundation. Turn the central buffer anti-clockwise (upwards) into its operating position and to set the working clearance (see table on the next page). The central buffer clearance can be checked by using a feeler gauge through the cut in the base casting of the mountings. A feeler gauge has to pass easily under the internal buffer.

Final assembly

The buffer can be fixed by means of a nut, while simultaneously blocking the buffer by applying a spanner to the top hexagon. The nut should be tightened with the maximum recommended torque. Further locking is not necessary. We recommend, as prevention against corrosion, to apply an amount of water-resistant grease in the supplied (nut) cap.

Individual filler plate thickness can now be measured. Notice that the filling plate must at least have the dimensions of the mounting foot.

Maintenance

The central buffer clearance should be examined and reset if necessary after the first week, after three months and thereafter to fit in with normal maintenance programmes. The central buffer clearance can be checked by using a feeler gauge through the cut in the base casting of the mountings. A feeler gauge has to pass easily under the internal buffer.



Instructions for fitting conical mountings (continued)

Pouring

Chocking of the foundation plate by means of synthetic cast resin is to be done by the manufacturer or its authorised agency. The type of the cast resin has to be approved by the resp. classification society. The supplier of the cast resin or its authorised personnel has to confirm the mechanical strength of the cast resin considering the tightening torque of the foundation bolts, engine weight and engine torque.

In order to avoid an additional thermal shock of the rubber elements of the conical mountings, an additional heat treatment for speeding up the curing process of the cast resin is not permissible!

After curing (curing time is stated by the manufacturer of the synthetic casting resin), the jacking bolts are to be removed. The foundation bolts have to be tightened in accordance with the required tightening torque.

Additional instructions for fitting conical mountings with divided stud

Turn the central buffer clockwise (downwards) to the maximum lower position until it contacts the filler plate or foundation. The stud can be tightened onto the buffer (recommended torque : see table). Turn the central buffer anti-clockwise (upwards) into its operating position and to set the working clearance. If the stud loosens from the buffer while turning it anti-clockwise, the stud should be tightened again onto the buffer. The basecasting of the conical mounting can be lifted by using four hexagon bolts to get the buffer clear off the foundation and the stud and buffer can move freely.

When it is not possible to lift the basecasting of the conical mounting by using four hexagon bolts, due to the limited space to apply a spanner, you will need an external hydraulic jack to lift the engine slightly and remove some of the installation load before turning the central buffer anti-clockwise (upwards) into its operating position and to set the working clearance.

By turning the stud anti-clockwise it is possible to loosen the stud and remove it easily from the central buffer. After removing the stud it is easy to remove the conical mounting sideways after slightly lifting the installation.

For specific instructions for fitting of conical mountings with divided stud, please contact Rubber Design. A copy of the instructions including a drawing will be send on request.

Mounting type	Allowable difference per mounting	No. of turns to set working clearance	Working clearance	Torque divided stud
RD 113	0,9 mm	1,5 (anti-clockwise)	6,0 mm	
RD 114 / RD 115	0,9 mm	2,0 (anti-clockwise)	6,0 mm	120 Nm
RD 214 / RD 215 / RD 244	0,6 mm	2,0 (anti-clockwise)	4,0 mm	80 Nm
RD 314 / RD 315 / RD 344	0,5 mm	2,0 (anti-clockwise)	4,0 mm	40 Nm



Key widths central buffers and nuts standard conical mountings

Mounting type	Execution	Material	Thread	Key widths		
				Central buffer	Nut	Adjusting nut
RD 113	Non height adjustable	Cast iron	M 56 x 4	36	85	-
RD 114	Non height adjustable	Cast iron	M 48 x 3	30	75	-
RD 114	Height adjustable	Cast iron	M 48 x 3	30	75	100
RD 115	Non height adjustable	Cast iron	M 48 x 3	30	75	-
RD 115	Height adjustable	Cast iron	M 48 x 3	30	75	100
RD 214	Non height adjustable	Aluminium	M 42 x 2	22	-	-
RD 214	Height adjustable	Aluminium	M 27 x 2 M 42 x 2	19 30	41 65	90 90
RD 215	Non height adjustable	Aluminium	M 42 x 2	22	-	-
RD 215	Height adjustable	Aluminium	M 27 x 2 M 42 x 2	19 30	41 65	90 90
RD 244	Non height adjustable	Aluminium	M 42 x 2	22	-	-
RD 244	Height adjustable	Aluminium	M 27 x 2 M 42 x 2	19 30	41 65	90 90
RD 314	Non height adjustable	Aluminium	M 27 x 2	19	41	-
RD 314	Height adjustable	Aluminium	M 27 x 2	19	41	65
RD 315	Non height adjustable	Aluminium	M 27 x 2	19	41	-
RD 315	Height adjustable	Aluminium	M 27 x 2	19	41	65
RD 344	Non height adjustable	Aluminium	M 27 x 2	19	41	-
RD 344	Height adjustable	Aluminium	M 27 x 2	19	41	65



Tightening torques bolts and nuts standard conical mountings

Mounting type	Execution	Material	Nut	Tightening torque	Bolts (4x)	Tightening torque
RD 113	Non height adjustable	Cast iron	M 56 x 4	7600 Nm	M 30 – 8.8 (base)	1425 Nm
RD 114	Non height adjustable	Cast iron	M 48 x 3	4900 Nm	M 27 – 8.8 (base)	1030 Nm
RD 114	Height adjustable	Cast iron	M 48 x 3	4900 Nm	M 27 – 8.8 (base)	1030 Nm
RD 115	Non height adjustable	Cast iron	M 48 x 3	4900 Nm	M 27 – 8.8 (base)	1030 Nm
RD 115	Height adjustable	Cast iron	M 48 x 3	4900 Nm	M 27 – 8.8 (base)	1030 Nm
RD 214	Non height adjustable	Aluminium	M 42 x 2	-	M 20 – 8.8 (base) M 20 – 8.8 (top)	400 Nm 250 Nm
RD 214	Height adjustable	Aluminium	M 27 x 2 M 42 x 2	1000 Nm 1650 Nm	M 20 – 8.8 (base) M 20 – 8.8 (base)	400 Nm 400 Nm
RD 215	Non height adjustable	Aluminium	M 42 x 2	-	M 20 – 8.8 (base) M 20 – 8.8 (top)	400 Nm 250 Nm
RD 215	Height adjustable	Aluminium	M 27 x 2 M 42 x 2	1000 Nm 1650 Nm	M 20 – 8.8 (base) M 20 – 8.8 (base)	400 Nm 400 Nm
RD 244	Non height adjustable	Aluminium	M 42 x 2	-	M 20 – 8.8 (base) M 20 – 8.8 (top)	400 Nm 250 Nm
RD 244	Height adjustable	Aluminium	M 27 x 2 M 42 x 2	1000 Nm 1650 Nm	M 20 – 8.8 (base) M 20 – 8.8 (base)	400 Nm 400 Nm
RD 314	Non height adjustable	Aluminium	M 27 x 2	300 Nm	M 16 – 8.8 (base)	205 Nm
RD 314	Height adjustable	Aluminium	M 27 x 2	1000 Nm	M 16 – 8.8 (base)	205 Nm
RD 315	Non height adjustable	Aluminium	M 27 x 2	300 Nm	M 16 – 8.8 (base)	205 Nm
RD 315	Height adjustable	Aluminium	M 27 x 2	1000 Nm	M 16 – 8.8 (base)	205 Nm
RD 344	Non height adjustable	Aluminium	M 27 x 2	300 Nm	M 16 – 8.8 (base)	205 Nm
RD 344	Height adjustable	Aluminium	M 27 x 2	1000 Nm	M 16 – 8.8 (base)	205 Nm



Key widths central buffers and nuts special conical mountings (long spindles)

Mounting type	Execution	Material	Thread	Key widths		
				Central buffer	Nut	Adjusting nut
RD 113	Non height adjustable	Cast iron	M 48 x 3	30	75	-
RD 214	Non height adjustable	Aluminium	M 24 x 2	19	36	-
		Aluminium	M 27 x 2	19	41	-
		Aluminium	M 42 x 2	30	65	-
		Cast iron	M 42 x 2	30	65	-
		Cast iron	1 1/2"-12UNF	1 1/8" (28,6)	2 1/4" (57,2)	-
RD 214	Height adjustable	Aluminium	M 24 x 2	19	36	90
		Cast iron	M 27 x 2	19	41	90
		Cast iron	M 42 x 2	30	65	90
RD 215	Non height adjustable	Aluminium	M 24 x 2	19	36	-
		Aluminium	M 42 x 2	30	65	-
RD 215	Height adjustable	Cast iron	M 27 x 2	19	41	90
		Cast iron	M 42 x 2	30	65	90
RD 244	Height adjustable	Cast iron	M 27 x 2	19	41	90
		Cast iron	M 42 x 2	30	65	90
RD 314	Non height adjustable	Aluminium	M 20 x 1,5	13	30	-
		Aluminium	M 24 x 2	19	36	-
		Cast iron	M 27 x 2	19	41	-
		Cast iron	1"- 12 UNF	3/4" (19,05)	1 1/2" (38,1)	-
RD 314	Height adjustable	Aluminium	M 20 x 1,5	13	30	65
		Cast iron	M 20 x 1,5	13	30	65
		Aluminium	M 24 x 2	19	36	65
		Cast iron	M 24 x 2	19	36	65
		Cast iron	M 27 x 2	19	41	65
RD 315	Non height adjustable	Aluminium	M 16 x 1,5	10	24	-
		Aluminium	M 24 x 2	17	36	-
		Cast iron	M 27 x 2	19	41	-
RD 315	Height adjustable	Aluminium	M 20 x 1,5	13	30	65
		Cast iron	M 20 x 1,5	13	30	65
		Aluminium	M 24 x 2	19	36	65
		Cast iron	M 24 x 2	19	36	65
		Cast iron	M 27 x 2	19	41	65
RD 735	Height adjustable	Cast iron	M 27 x 2	19	41	65



Tightening torques bolts and nuts special conical mountings (long spindles)

Mounting type	Execution	Material	Nut	Tightening torque	Bolts (4x)	Tightening torque
RD 113	Non height adjustable	Cast iron	M 48 x 3	4900 Nm	M 27 – 8.8 (base)	1030 Nm
RD 214	Non height adjustable	Aluminium	M 24 x 2	250 Nm	M 20 – 8.8 (base)	400 Nm
		Aluminium	M 27 x 2	300 Nm	M 20 – 8.8 (base)	400 Nm
		Aluminium	M 42 x 2	800 Nm	M 20 – 8.8 (base)	400 Nm
		Cast iron	M 42 x 2	1400 Nm	M 20 – 8.8 (base)	400 Nm
		Cast iron	1 1/2"-12UNF	1400 Nm	7/8" UNC (base)	400 Nm
RD 214	Height adjustable	Aluminium	M 24 x 2	400 Nm	M 20 – 8.8 (base)	400 Nm
		Cast iron	M 27 x 2	600 Nm	M 20 – 8.8 (base)	400 Nm
		Cast iron	M 42 x 2	1400 Nm	M 20 – 8.8 (base)	400 Nm
RD 215	Non height adjustable	Aluminium	M 24 x 2	250 Nm	M 20 – 8.8 (base)	400 Nm
		Aluminium	M 42 x 2	800 Nm	M 20 – 8.8 (base)	400 Nm
RD 215	Height adjustable	Cast iron	M 27 x 2	600 Nm	M 20 – 8.8 (base)	400 Nm
		Cast iron	M 42 x 2	1400 Nm	M 20 – 8.8 (base)	400 Nm
RD 244	Height adjustable	Cast iron	M 27 x 2	600 Nm	M 20 – 8.8 (base)	400 Nm
		Cast iron	M 42 x 2	1400 Nm	M 20 – 8.8 (base)	400 Nm
RD 314	Non height adjustable	Aluminium	M 20 x 1,5	200 Nm	M 16 – 8.8 (base)	205 Nm
		Aluminium	M 24 x 2	400 Nm	M 16 – 8.8 (base)	205 Nm
		Cast iron	M 27 x 2	600 Nm	M 16 – 8.8 (base)	205 Nm
		Cast iron	1"- 12 UNF	600 Nm	5/8" UNC (base)	205 Nm
RD 314	Height adjustable	Aluminium	M 20 x 1,5	200 Nm	M 16 – 8.8 (base)	205 Nm
		Cast iron	M 20 x 1,5	280 Nm	M 16 – 8.8 (base)	205 Nm
		Aluminium	M 24 x 2	400 Nm	M 16 – 8.8 (base)	205 Nm
		Cast iron	M 24 x 2	500 Nm	M 16 – 8.8 (base)	205 Nm
		Cast iron	M 27 x 2	600 Nm	M 16 – 8.8 (base)	205 Nm
RD 315	Non height adjustable	Aluminium	M 16 x 1,5	150 Nm	M 16 – 8.8 (base)	205 Nm
		Aluminium	M 24 x 2	400 Nm	M 16 – 8.8 (base)	205 Nm
		Cast iron	M 27 x 2	600 Nm	M 16 – 8.8 (base)	205 Nm
RD 315	Height adjustable	Aluminium	M 20 x 1,5	200 Nm	M 16 – 8.8 (base)	205 Nm
		Cast iron	M 20 x 1,5	280 Nm	M 16 – 8.8 (base)	205 Nm
		Aluminium	M 24 x 2	400 Nm	M 16 – 8.8 (base)	205 Nm
		Cast iron	M 24 x 2	500 Nm	M 16 – 8.8 (base)	205 Nm
		Cast iron	M 27 x 2	600 Nm	M 16 – 8.8 (base)	205 Nm
RD 735	Height adjustable	Cast iron	M 27 x 2	600 Nm	M 16 – 8.8 (base)	205 Nm



Key widths central buffers and nuts conical mountings with divided stud

Mounting type	Execution	Material	Thread	Connection thread	Key widths		Adjusting nut
					Central buffer	Nut	
RD 114	Non height adjustable	Cast iron	M 48 x 3	M 36 x 2	30	75	-
RD 114	Height adjustable	Cast iron	M 48 x 3	M 36 x 2	30	75	100
RD 115	Non height adjustable	Cast iron	M 48 x 3	M 36 x 2	30	75	-
RD 214	Non height adjustable	Aluminium	M 27 x 2	M 24 x 2	19	41	-
		Cast iron	M 42 x 2	M 27 x 2	30	65	-
RD 214	Height adjustable	Aluminium	M 27 x 2	M 24 x 2	19	41	90
		Cast iron	M 27 x 2	M 24 x 2	19	41	90
RD 215	Non height adjustable	Cast iron	M 42 x 2	M 27 x 2	30	65	-
RD 215	Height adjustable	Aluminium	M 27 x 2	M 24 x 2	19	41	90
RD 244	Height adjustable	Cast iron	M 27 x 2	M 24 x 2	19	41	90
RD 314	Non height adjustable	Aluminium	M 20 x 1,5	M 18 x 1,5	13	30	-
		Aluminium	M 27 x 2	M 18 x 1,5	19	41	-
		Cast iron	M 27 x 2	M 18 x 1,5	19	41	-
RD 314	Height adjustable	Aluminium	M 27 x 2	M 18 x 1,5	19	41	65
		Cast iron	M 27 x 2	M 18 x 1,5	19	41	65
RD 315	Non height adjustable	Aluminium	M 27 x 2	M 18 x 1,5	19	41	-
RD 315	Height adjustable	Aluminium	M 24 x 2	M 18 x 1,5	19	36	65
		Aluminium	M 27 x 2	M 18 x 1,5	19	41	65
RD 344	Non height adjustable	Cast iron	M 27 x 2	M 18 x 1,5	19	41	-



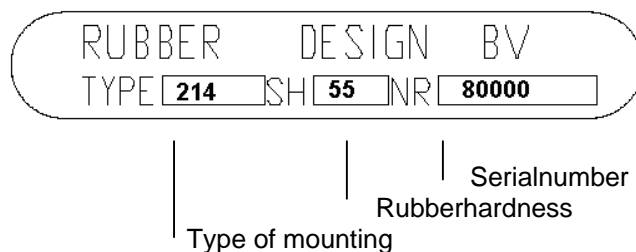
Tightening torques bolts and nuts conical mountings with divided stud

Mounting type	Execution	Material	Nut	Tightening torque	Bolts (4x)	Tightening torque
RD 114	Non height adjustable	Cast iron	M 48 x 3	2800 Nm	M 27 – 8.8 (base)	1030 Nm
RD 114	Height adjustable	Cast iron	M 48 x 3	2800 Nm	M 27 – 8.8 (base)	1030 Nm
RD 115	Non height adjustable	Cast iron	M 48 x 3	2800 Nm	M 27 – 8.8 (base)	1030 Nm
RD 214	Non height adjustable	Aluminium Cast iron	M 27 x 2 M 42 x 2	700 Nm 700 Nm	M 20 – 8.8 (base) M 20 – 8.8 (base)	400 Nm 400 Nm
RD 214	Height adjustable	Aluminium Cast iron	M 27 x 2 M 27 x 2	700 Nm 700 Nm	M 20 – 8.8 (base) M 20 – 8.8 (base)	400 Nm 400 Nm
RD 215	Non height adjustable	Cast iron	M 42 x 2	700 Nm	M 20 – 8.8 (base)	400 Nm
RD 215	Height adjustable	Aluminium	M 27 x 2	700 Nm	M 20 – 8.8 (base)	400 Nm
RD 244	Height adjustable	Cast iron	M 27 x 2	700 Nm	M 20 – 8.8 (base)	400 Nm
RD 314	Non height adjustable	Aluminium Aluminium Cast iron	M 20 x 1,5 M 27 x 2 M 27 x 2	200 Nm 300 Nm 300 Nm	M 16 – 8.8 (base) M 16 – 8.8 (base) M 16 – 8.8 (base)	205 Nm 205 Nm 205 Nm
RD 314	Height adjustable	Aluminium Cast iron	M 27 x 2 M 27 x 2	300 Nm 300 Nm	M 16 – 8.8 (base) M 16 – 8.8 (base)	205 Nm 205 Nm
RD 315	Non height adjustable	Aluminium	M 27 x 2	300 Nm	M 16 – 8.8 (base)	205 Nm
RD 315	Height adjustable	Aluminium Aluminium	M 24 x 2 M 27 x 2	250 Nm 300 Nm	M 16 – 8.8 (base) M 16 – 8.8 (base)	205 Nm 205 Nm
RD 344	Non height adjustable	Cast iron	M 27 x 2	300 Nm	M 16 – 8.8 (base)	205 Nm



Maintenance of the conical mountings

- The life expectancy of the rubber elements will be approx. 20 years in ideal circumstances. Unfortunately ideal circumstances are not feasible, therefore the (working) life expectancy will be approx. 10 years. The life expectancy of the rubber elements is dependent on the environmental circumstances (weather influences, contaminants, etc).
- A visual inspection of the conical mountings should be carried out six months after installation and should be repeated every year. For better recognition of damages one can use a blunt pin. The use of a screwdriver is not advisable, because of the damage it can cause to the conical mountings.
- The use of a natural rubber (NR) compound for the rubber elements means that they are not oil resistant. The occasional occurrence of oil-leaks does not effect the working of the conical mountings, because the oil will only damage the surface of the rubber elements. In case of oil contamination the rubber elements will show some signs of swelling.
- To prevent damage caused by oil contamination, the rubber elements can be treated with an oil resistant coating.
- When cleaning the engine or the engineroom with a solvent cleansing agent, it is advisable to cover up the conical mountings. If the cleansing agent still contaminates the rubber elements, they should be cleaned as follows.
- Storage, cleaning and maintenance of the rubber elements should be done in accordance with DIN 7716. The cleaning of the conical mountings should be done with a normal (household) cleansing agent. It is also advisable to use a glycerine-alcohol mixture (1:10). Do not use a solvent cleansing agent.
- In cases where it is necessary to replace the rubber insert, we advise to return the complete conical mounting to Rubber Design BV.
- If required, the conical mountings can be painted by the customer. Be aware that only the top- and basecasting of the conical mounting can be painted. Do not use paint on the rubber element as the rubber element might be contaminated and therefore be damaged.
- The central buffer clearance should be examined and reset if necessary after the first week, after three months, and thereafter to fit in with normal maintenance programmes.
- Each conical mounting has a serial number for identification which will be used for replacement to deliver a complete new identical product or to replace the insert of the mountings in question with genuine inserts and / or parts.



- All deliveries are stored for over 20 years in a database including all relevant data and characteristics.



Weight of the standard conical mountings

Mounting type	Execution	Material	Approximate weight
RD 113	Non height adjustable	Cast iron	64,5 kg
RD 114	Non height adjustable	Cast iron	59,5 kg
RD 114	Height adjustable	Cast iron	62,0 kg
RD 115	Non height adjustable	Cast iron	58,0 kg
RD 115	Height adjustable	Cast iron	60,5 kg
RD 214	Non height adjustable	Cast iron Aluminium	25,5 kg 13,5 kg
RD 214	Height adjustable	Cast iron Aluminium	27,0 kg 14,0 kg
RD 215	Non height adjustable	Cast iron Aluminium	25,0 kg 13,0 kg
RD 215	Height adjustable	Cast iron Aluminium	26,5 kg 13,5 kg
RD 244	Non height adjustable	Cast iron Aluminium	25,5 kg 13,5 kg
RD 244	Height adjustable	Cast iron Aluminium	27,0 kg 14,0 kg
RD 314	Non height adjustable	Cast iron Aluminium	16,0 kg 8,0 kg
RD 314	Height adjustable	Cast iron Aluminium	16,3 kg 8,3 kg
RD 315	Non height adjustable	Cast iron Aluminium	15,2 kg 7,2 kg
RD 315	Height adjustable	Cast iron Aluminium	15,5 kg 7,5 kg
RD 344	Non height adjustable	Cast iron Aluminium	15,6 kg 7,6 kg
RD 344	Height adjustable	Cast iron Aluminium	15,9 kg 7,9 kg



Thermoshock, thermal expansion and creep effect of the conical mountings

The typical creep rate of the conical mountings will vary with compound, rubber hardness, dynamic loads and strain. A typical figure for a natural rubber compound in ° Shore A for loads in between the maximum static load marine application and half that load will be 2% of the static deflection increase per decade. 48 hours after loading, more than half of the total creep figure over 20 years will be achieved.

Every temperature exceeding the latest achieved peak temperature will cause a permanent set of the conical mounting of approximately 0,01 mm /°C in the range from 20° to 70° C. For instance the first thermal load from surrounding temperature to normal working temperature will cause an extra set of the deflected height next to the normal creep. Everytime the mounting temperature is raised to the normal working temperature, no extra set will occur. Once the normal working temperature is exceeded, an extra set will occur again. The permanent set is directly related to the temperature of the rubber element.

The typical thermal expansion rate of the conical mounting will be approx. 0,03 mm / °C increase in height depending on compound, rubber hardness and strain. The expansion rate is directly related to the temperature of the rubber element.

On the next page you will find a sketch with the explanation of the deflections, thermoshock, thermal expansion and extra deflections caused by creep. The numbers correspond with the numbers in the sketch. The values as mentioned are all assumptions.

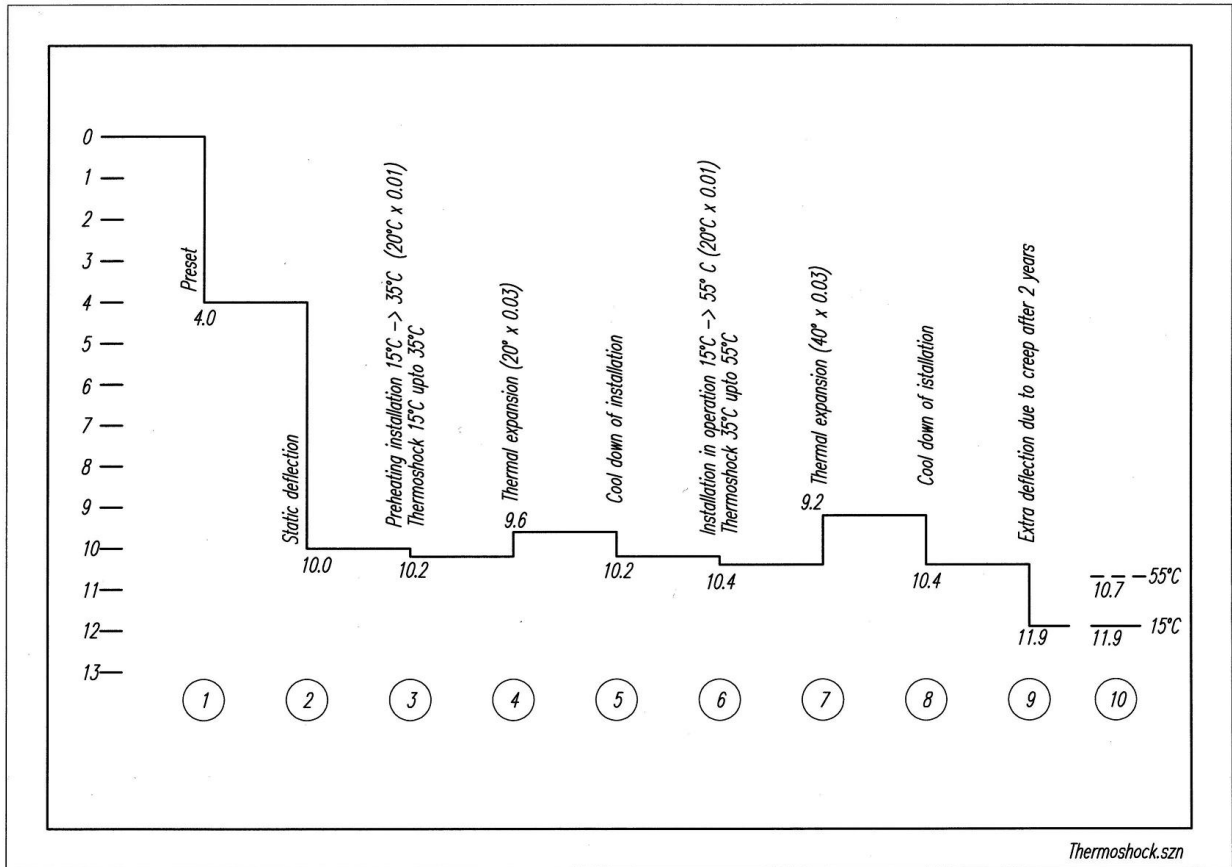
- 1) After assembly of the mountings, we will preset the mountings for 4 mm to simplify the installation of the mountings underneath the diesel engine.
- 2) After the engine is installed on the mountings, the weight of the diesel engine will be distributed over the mountings and a deflection of 10 mm is reached.
- 3) Due to the pre-heating of the diesel engine from 15° C to 35° C and supposed that the mountings will follow after a period of time to the same level of temperature, the mountings will have a thermoshock over the difference of 20° C. Based on our experience this will be $20 \times 0,01 \text{ mm} = 0,2 \text{ mm}$. This will result in a permanent extra deflection.
- 4) In the meantime the conical mounting will grow due to the thermal expansion over the same range of 20° C. Based on our experience this will be $20 \times 0,03 \text{ mm} = 0,6 \text{ mm}$.
- 5) After cool down of the installation, the mountings will follow and the conical mountings become the same height before the pre-heating of the diesel engine. Only the 0,2 mm of the thermoshock remains.
- 6) Due to the full operation of the engine, the mountings will reach a temperature of let's say 55° C. The thermoshock effect will cause an extra deflection; however, only from 35° C to 55° C !! Based on our experience this will be $20 \times 0,01 \text{ mm} = 0,2 \text{ mm}$. This will again result in a permanent extra deflection.
- 7) In the meantime the conical mounting will grow due to the thermal expansion over the same range of 40° C. Based on our experience this will be $40 \times 0,03 \text{ mm} = 1,2 \text{ mm}$.
- 8) After cool down of the installation, the mountings will follow and the conical mountings become the same height before the pre-heating of the diesel engine. Only the 0,2 mm of the thermoshock remains.
- 9) In the meantime we have an extra deflection caused by creep; this starts already at point 1 and will be after a period of approx. 2 years 1,49 mm. The extra deflection per decade will be 2 % and can be calculated as follows.

6 sec		10,00 mm deflection
60 sec	$10,00 \times 1,02$	10,20 mm deflection
600 sec	$10,20 \times 1,02$	10,40 mm deflection

1,9 year	$10,00 \times 1,02^7$	11,49 mm deflection
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- 10) So, when the engine is not running and supposed that the environment temperature is 15° C, the deflection will be 11,90 mm. During running the conical mountings can reach a temperature of 55° C and the deflection will be 10,70 mm due to thermal expansion.

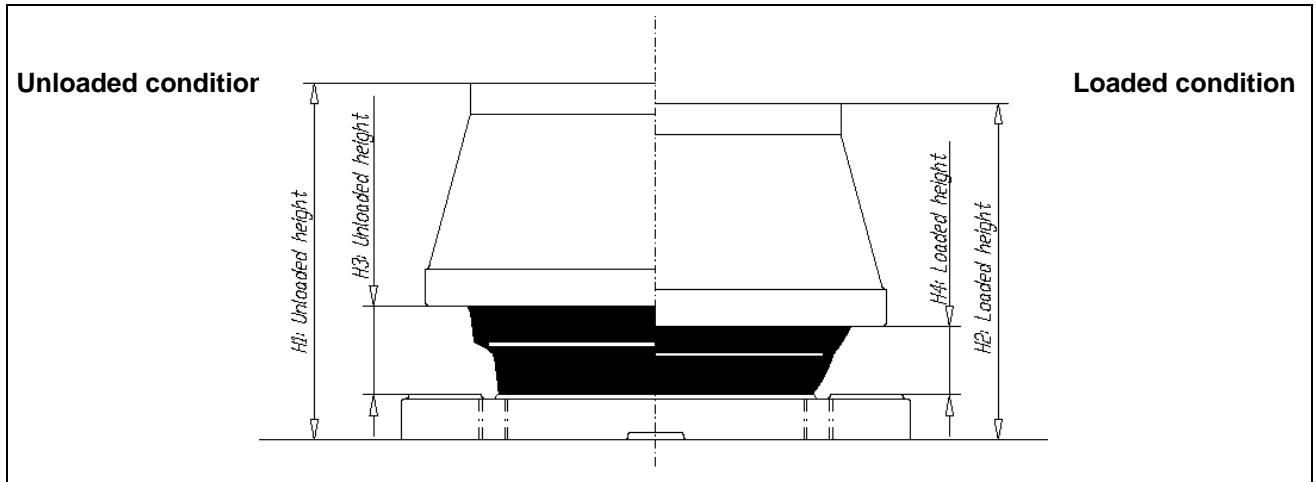


Thermoshock, thermal expansion and creep effect of the conical mountings





Data sheet for loaded height



Before measuring the loaded height;
please make sure that the internal buffer (spindle) can be turned freely.

As a minimum; please measure or $H1 + H2$ or $H3 + H4$

Pos	Serialnumber	H1	H2	H3	H4
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					



Minimum dimensions to reject a flexible mounted system

Marine application	Mounting type	Shore A.	Mounting Height H1 (Unloaded)	Tolerance	X-dimension H3 (Unloaded)	Max. Deflection	X-dimension H4 (Loaded)	Mounting height H2 (Loaded)
	RD 114	45	181,0	+1,0 / -1,5	44,0	16,0	28,0	165,0 *
	RD 114	50	181,0	+1,0 / -1,5	44,0	15,0	29,0	166,0 *
	RD 114	55	181,0	+1,0 / -1,5	44,0	15,0	29,0	166,0 *
	RD 114	60	181,0	+1,0 / -1,5	44,0	14,0	30,0	167,0 *
	RD 114	65	181,0	+1,0 / -1,5	44,0	13,0	31,0	168,0 *
	RD 115	45	181,0	+1,0 / -1,5	44,0	18,0	26,0	163,0 *
	RD 115	50	181,0	+1,0 / -1,5	44,0	18,0	26,0	163,0 *
	RD 115	55	181,0	+1,0 / -1,5	44,0	18,0	26,0	163,0 *
	RD 115	60	181,0	+1,0 / -1,5	44,0	18,0	26,0	163,0 *
	RD 115	65	181,0	+1,0 / -1,5	44,0	17,0	27,0	164,0 *

Stationairy application	Mounting type	Shore A.	Mounting Height H1 (Unloaded)	Tolerance	X-dimension H3 (Unloaded)	Max. Deflection	X-dimension H4 (Loaded)	Mounting height H2 (Loaded)
	RD 114	45	181,0	+1,0 / -1,5	44,0	18,0	26,0	163,0 *
	RD 114	50	181,0	+1,0 / -1,5	44,0	17,0	27,0	164,0 *
	RD 114	55	181,0	+1,0 / -1,5	44,0	16,0	28,0	165,0 *
	RD 114	60	181,0	+1,0 / -1,5	44,0	16,0	28,0	165,0 *
	RD 114	65	181,0	+1,0 / -1,5	44,0	14,0	30,0	167,0 *
	RD 115	45	181,0	+1,0 / -1,5	44,0	20,0	24,0	161,0 *
	RD 115	50	181,0	+1,0 / -1,5	44,0	20,0	24,0	161,0 *
	RD 115	55	181,0	+1,0 / -1,5	44,0	20,0	24,0	161,0 *
	RD 115	60	181,0	+1,0 / -1,5	44,0	19,0	25,0	162,0 *
	RD 115	65	181,0	+1,0 / -1,5	44,0	18,0	26,0	163,0 *

* : The mounting height H2 (Loaded) is related to the mounting height H1 (Unloaded) without observing the tolerance.



Minimum dimensions to reject a flexible mounted system

Marine application	Mounting type	Shore A.	Mounting Height H1 (Unloaded)	Tolerance	X-dimension H3 (Unloaded)	Max. Deflection	X-dimension H4 (Loaded)	Mounting height H2 (Loaded)
	RD 214	45	175,0	+1,0 / -1,5	44,5	16,0	28,5	159,0 *
	RD 214	50	175,0	+1,0 / -1,5	44,5	16,0	28,5	159,0 *
	RD 214	55	175,0	+1,0 / -1,5	44,5	15,0	29,5	160,0 *
	RD 214	60	175,0	+1,0 / -1,5	44,5	15,0	29,5	160,0 *
	RD 214	65	175,0	+1,0 / -1,5	44,5	14,0	30,5	161,0 *
	RD 214	70	175,0	+1,0 / -1,5	44,5	13,0	31,5	162,0 *
	RD 214	MDX	175,0	+1,0 / -1,5	44,5	15,0	29,5	160,0 *
	RD 215	45	175,0	+1,0 / -1,5	44,5	18,0	26,5	157,0 *
	RD 215	50	175,0	+1,0 / -1,5	44,5	18,0	26,5	157,0 *
	RD 215	55	175,0	+1,0 / -1,5	44,5	18,0	26,5	157,0 *
	RD 215	60	175,0	+1,0 / -1,5	44,5	18,0	26,5	157,0 *
	RD 215	65	175,0	+1,0 / -1,5	44,5	17,0	27,	158,0 *
	RD 244	45	175,0	+1,0 / -1,5	44,5	16,0	28,5	159,0 *
	RD 244	50	175,0	+1,0 / -1,5	44,5	16,0	28,5	159,0 *
	RD 244	55	175,0	+1,0 / -1,5	44,5	15,0	29,5	160,0 *
	RD 244	60	175,0	+1,0 / -1,5	44,5	15,0	29,5	160,0 *
	RD 244	65	175,0	+1,0 / -1,5	44,5	14,0	30,5	161,0 *
Stationary application	Mounting type	Shore A.	Mounting Height H1 (Unloaded)	Tolerance	X-dimension H3 (Unloaded)	Max. Deflection	X-dimension H4 (Loaded)	Mounting height H2 (Loaded)
	RD 214	45	175,0	+1,0 / -1,5	44,5	18,0	26,5	157,0 *
	RD 214	50	175,0	+1,0 / -1,5	44,5	17,0	27,5	158,0 *
	RD 214	55	175,0	+1,0 / -1,5	44,5	17,0	27,5	158,0 *
	RD 214	60	175,0	+1,0 / -1,5	44,5	16,0	28,5	159,0 *
	RD 214	65	175,0	+1,0 / -1,5	44,5	15,0	29,5	160,0 *
	RD 214	70	175,0	+1,0 / -1,5	44,5	14,0	30,5	161,0 *
	RD 214	MDX	175,0	+1,0 / -1,5	44,5	16,0	28,5	159,0 *
	RD 215	45	175,0	+1,0 / -1,5	44,5	20,0	24,5	155,0 *
	RD 215	50	175,0	+1,0 / -1,5	44,5	20,0	24,5	155,0 *
	RD 215	55	175,0	+1,0 / -1,5	44,5	19,0	25,5	156,0 *
	RD 215	60	175,0	+1,0 / -1,5	44,5	19,0	25,5	156,0 *
	RD 215	65	175,0	+1,0 / -1,5	44,5	18,0	26,5	157,0 *
	RD 244	45	175,0	+1,0 / -1,5	44,5	17,0	27,5	158,0 *
	RD 244	50	175,0	+1,0 / -1,5	44,5	17,0	27,5	158,0 *
	RD 244	55	175,0	+1,0 / -1,5	44,5	17,0	27,5	158,0 *
	RD 244	60	175,0	+1,0 / -1,5	44,5	16,0	28,5	159,0 *
	RD 244	65	175,0	+1,0 / -1,5	44,5	15,0	29,5	160,0 *

* : The mounting height H2 (Loaded) is related to the mounting height H1 (Unloaded) without observing the tolerance.



Minimum dimensions to reject a flexible mounted system

Marine application	Mounting type	Shore A.	Mounting Height H1 (Unloaded)	Tolerance	X-dimension H3 (Unloaded)	Max. Deflection	X-dimension H4 (Loaded)	Mounting height H2 (Loaded)
	RD 314	45	132,5	+1,0 / -1,5	32,5	15,0	17,5	117,5 *
	RD 314	50	132,5	+1,0 / -1,5	32,5	14,0	18,5	118,5 *
	RD 314	55	132,5	+1,0 / -1,5	32,5	14,0	18,5	118,5 *
	RD 314	60	132,5	+1,0 / -1,5	32,5	13,0	19,5	119,5 *
	RD 314	65	132,5	+1,0 / -1,5	32,5	13,0	19,5	119,5 *
	RD 314	MDX	132,5	+1,0 / -1,5	32,5	14,0	18,5	118,5 *
	RD 315	45	132,5	+1,0 / -1,5	32,5	17,0	15,5	115,5 *
	RD 315	50	132,5	+1,0 / -1,5	32,5	17,0	15,5	115,5 *
	RD 315	55	132,5	+1,0 / -1,5	32,5	16,0	16,5	116,5 *
	RD 315	60	132,5	+1,0 / -1,5	32,5	16,0	16,5	116,5 *
	RD 315	65	132,5	+1,0 / -1,5	32,5	16,0	16,5	116,5 *
	RD 344	45	132,5	+1,0 / -1,5	32,5	15,0	17,5	117,5 *
	RD 344	50	132,5	+1,0 / -1,5	32,5	14,0	18,5	118,5 *
	RD 344	55	132,5	+1,0 / -1,5	32,5	14,0	18,5	118,5 *
	RD 344	60	132,5	+1,0 / -1,5	32,5	14,0	18,5	118,5 *
	RD 344	65	132,5	+1,0 / -1,5	32,5	13,0	19,5	119,5 *
	RD 735	60	132,5	+1,0 / -1,5	32,5	16,0	16,5	116,5 *
	RD 735	65	132,5	+1,0 / -1,5	32,5	16,0	16,5	116,5 *
Stationary application	Mounting type	Shore A.	Mounting Height H1 (Unloaded)	Tolerance	X-dimension H3 (Unloaded)	Max. Deflection	X-dimension H4 (Loaded)	Mounting height H2 (Loaded)
	RD 314	45	132,5	+1,0 / -1,5	32,5	16,0	16,5	116,5 *
	RD 314	50	132,5	+1,0 / -1,5	32,5	16,0	16,5	116,5 *
	RD 314	55	132,5	+1,0 / -1,5	32,5	15,0	17,5	117,5 *
	RD 314	60	132,5	+1,0 / -1,5	32,5	15,0	17,5	117,5 *
	RD 314	65	132,5	+1,0 / -1,5	32,5	14,0	18,5	118,5 *
	RD 314	MDX	132,5	+1,0 / -1,5	32,5	15,0	17,5	117,5 *
	RD 315	45	132,5	+1,0 / -1,5	32,5	19,0	13,5	113,5 *
	RD 315	50	132,5	+1,0 / -1,5	32,5	18,0	14,5	114,5 *
	RD 315	55	132,5	+1,0 / -1,5	32,5	18,0	14,5	114,5 *
	RD 315	60	132,5	+1,0 / -1,5	32,5	18,0	14,5	114,5 *
	RD 315	65	132,5	+1,0 / -1,5	32,5	17,0	15,5	115,5 *
	RD 344	45	132,5	+1,0 / -1,5	32,5	16,0	16,5	116,5 *
	RD 344	50	132,5	+1,0 / -1,5	32,5	16,0	16,5	116,5 *
	RD 344	55	132,5	+1,0 / -1,5	32,5	15,0	17,5	117,5 *
	RD 344	60	132,5	+1,0 / -1,5	32,5	15,0	17,5	117,5 *
	RD 344	65	132,5	+1,0 / -1,5	32,5	14,0	18,5	118,5 *
	RD 735	60	132,5	+1,0 / -1,5	32,5	18,0	14,5	114,5 *
	RD 735	65	132,5	+1,0 / -1,5	32,5	17,0	15,5	115,5 *

* : The mounting height H2 (Loaded) is related to the mounting height H1 (Unloaded) without observing the tolerance



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