

Lifting equipment

Don't treat carrying heavy loads as a light matter!

The ease with which a crane lifts even the heaviest loads can easily disguise the dangers hidden in this process. The role of the load attachment is particularly often underestimated. However, only if the load is correctly attached can it be prevented from falling down, tipping up or swinging uncontrollably as it is lifted! And what is more: if carefully thought-out load attachments are used properly throughout the job, not only are risks reduced, but time and nerves are saved. For that reason we present you here with a few notes on the correct use of rigging hardware. **Take a little time to read it!** We are confident that it will in practice help you to avoid troublesome and above all dangerous situations.

Our experts will bring you up to speed.

If you have any questions, or would like more information, you can call our experts at any time. Or attend our training on the topic of "Rigging hardware". There we will give you personal, practical preparation for your daily work.

Regulations that carry weight.

The accident protection regulations for load carrying equipment and lifting gear published by the Textiles and Clothing Trade Association (Berufsgenossenschaft für Textilien und Bekleidung) (VBG 9a) and the safety training papers from the Study Group for Metal Industry Trade Associations (Sicherheitslehrbrief für Anschläger der Arbeitsgemeinschaft für Metall Berufsgenossenschaften) (BGI 556) apply to the use of rigging hardware. You can obtain both of these documents by request from the appropriate trade associations. We would be pleased to give you the addresses!

Always outstanding: Rigging hardware that accord with DIN

A variety of standards apply to rigging hardware (such as lifting straps, round sling, chain suspensions), and every manufacturer must observe these. So this is our first

tip:

Never use rigging hardware that doesn't have a label and whose manufacturer is unknown!

You would then never have any certainty that the rigging hardware satisfied the appropriate standard!

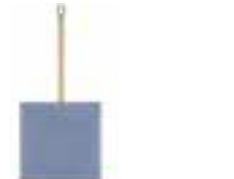
Load-bearing or unbearable? How to find the right rigging hardware.

Rigging hardware must always be marked with a rated load capacity (e.g. 1000 kg). This rated capacity, however, does not mean that it can actually lift 1000 kg!

The reason for this is the various forces that act on the rigging hardware, depending on how the attachment is implemented. This can be illustrated by a simple example: if you carry a case in the usual way, close your body at the side, it is quite easy.

However, if you carry it with your arms raised at a right angle, you need a great deal more strength. The load support material, in this case your arm, is more heavily stressed in this case. To be sure that the rigging hardware can indeed carry the load, you must therefore determine the true working load limit (WLL) in each individual case. For each rigging method a particular load support factor is specified for this purpose.

Direct load support



Here the load support material "only" carries the weight of the load. Load support factor = 1, true working load limit = rated carrying capacity

Direct load support with inclination



Here the load support materials also pull against one another. This means that they must withstand more than the actual load. The greater the angle of inclination, the greater is this opposed force.

0° to 45°
Load support factor = 1.4
45° to 60°
Load support factor = 1.0
Never use an angle greater than 60°!

Strap without inclination



In this case the bending stress at the tying corner reduces the carrying capacity to 80%.
Load support factor = 0.8 per rope

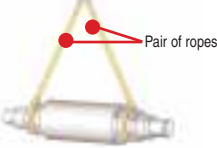


Easy to lift

Rather more difficult to lift

The greater the angle, the more force you need to perform the lift. The actual stress is greater than the weight of the load.

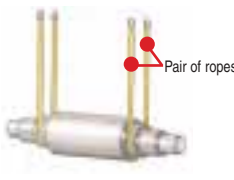
Strap with inclination



This type of rigging is found only with multi-strand load support materials. Here again, the bending stress at the tying corner reduces the load capacity to 80%. It is also necessary to take the angle of inclination into account. The greater the angle of inclination, the lower the carrying capacity of the load support material.

$\beta = 0^\circ$ to 45°
Load support factor = 1.12
 $\beta = 45^\circ$ to 60°
Load support factor = 0.8

Folded load support without inclination:



In this case the load support material is stressed over two ropes. If these ropes are vertical (angle of inclination 7°), then the rule is:
For each pair of ropes
Load support factor = 2.0

Folded load support with inclination



If the ropes are inclined, then the rule again here is:
For each pair of ropes
 $\beta = 0^\circ$ to 45°
Load support factor = 1.4
 $\beta = 45^\circ$ to 60°
Load support factor = 1.0

Load supports with 3 or 4 strand suspension



A 4-strand suspension is treated in principle like a 3-strand suspension. This is because it is, in practice, never possible to adjust the four strands so evenly that they are all equally stressed.

So the rule for 4-leg suspensions, like that for 3-leg suspensions, is:

$\beta = 0^\circ$ to 45°
Load support factor = 2.1
 $\beta = 45^\circ$ to 60°
Load support factor = 1.5
Load supports with three and four leg suspensions as straps with inclination

$\beta = 0^\circ$ to 45°
Load support factor = 1.68
 $\beta = 45^\circ$ to 60°
Load support factor = 1.2

The true working load limit results from the load support factor and the rated carrying capacity:
WLL = load support factor x rated carrying capacity

You can do this even more easily with our loading tables. They show you what is necessary for every type of load support and every load support method.

We would be happy to supply you with a full set of tables! (You will find more tables on our product pages 24-27)

Important: These figures only apply when all the ropes are evenly (symmetrically) loaded!



Lifting equipment

Correct load attachment, step-by-step.

1. What does the load weigh?

It is clear that the weight of the load plays an important role.

→ Find the weight!

2. Where is the centre of gravity?

If you lift an object that is significantly heavier on the left than on the right by picking it up at the centre, it will tilt to the left. To avoid this, the lifting point must always be directly above the centre of gravity.

→ Place the crane hook above the centre of gravity!



Warning! If the centre of gravity is not in the centre, this also means that the weight is unevenly distributed. It must then be assumed that only two of three or four ropes are actually carrying the load. If the suspension is only using two ropes, it must be assumed that only one is carrying the load.

3. Are attachment points available?

This question is relevant in the choice of attachment type. Important: Only hang rigging hardware correctly on suitable attachment points!

→ Only use proper attachment points!



4. What type of attachment is appropriate?

The technique used depends on practical considerations. On the shape of the load, on whether support points exist, and whether, for instance, a traverse is being used. The crucial point is that the rigging hardware is subject to different stresses depending on the way the support is provided!

→ First determine the type of support, then the necessary carrying capacity!

Information:

Uncertain? We would be happy to help you to find a solution for your lifting and transport problems. Together with our partner, an experienced engineering consultancy, who might also, for instance, help you with complicated calculations. Talk to us!

5. How large is the angle of inclination?

If you choose a type of support that acts at an angle, you must measure the angle of inclination. It must never be more than 60°! You can ask us at any time for a suitable device for measuring the angle.

→ Measure the angle of inclination (never more than 60°)!

6. How great is the true working load?

Find the true working load using this formula: **Rated carrying capacity x load support factor = true working load capacity.** Or look it up in our tables (you will find the tables on pages 24-27). You can ask us at any time for a full set.

7. What kind of surface does the load have? (e.g. delicate, rough, sharp-edged)

This is also important in order to select the proper rigging hardware. Chains, for instance, can damage delicate surfaces. Lifting straps, on the other hand, must themselves be protected from damage from rough surfaces using protective PVC sleeve. Whatever the rigging hardware, edge protection must be used at sharp corners! A corner can be considered sharp if the radius of the corner is the same size or smaller than the thickness of the supporting material.

We offer appropriate edge protection materials for every type of rigging hardware (see page 28).

→ Make sure that the supporting material is not damaged!



8. Will the supporting material come into contact with chemicals? Or will it be subject to high temperatures?

Contact with chemicals and high temperatures can attack or damage rigging hardware. Polyamide lifting straps, for instance, lose carrying capacity when they become wet. Bear this in mind when making the selection, and consult us if in doubt. We will be happy to tell you whether the rigging hardware is suitable for a particular application!

→ Consider the surrounding conditions!

9. What kind of crane hook is being used (size, thickness)?

Particularly when you are using lifting straps with end loops, you must check the connection to the crane hook very carefully! The full width of straps must lie on the crane hook, and must never be positioned on the point of the hook. Only in this way it is even loading ensured, and damage to be avoided. At the same time, the loop must not be too short for the hook. Otherwise it will be pulled apart too much, and the seams could tear out. So do not be miserly with the length of the loop! The loop must be at least 3.5 times as long as the thickness of the crane hook. When the loop is hanging from the hook, the opening angle must not be greater than 20°! Rigging hardware with shackles spare you this consideration.



tip:

Supporting material with traverses: Traverses can make supporting and lifting easier. Provided you observe the following points:

- The crane must also lift the traverse. This means that the load that the crane can lift is reduced by the weight of the traverse.

- Traverses must never be loaded on one side only, otherwise the load can slip out.

- For the same reason, loads must never be supported with reversed angles of inclination.

If you want to use traverses, talk to us! With the assistance of an experienced engineering consultancy we will be happy to support you in the necessary calculations and purchase.

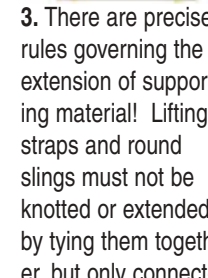
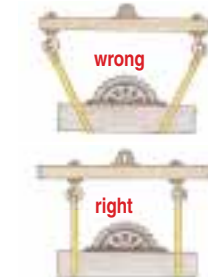


Never forget the golden rules.

1. Never use lashing equipment as rigging hardware.

Rigging hardware has to satisfy different requirements, and is specially manufactured.

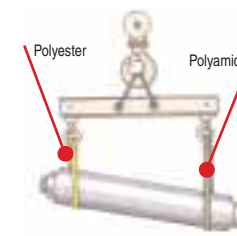
2. Supporting with reversed angle of inclination is forbidden. The supporting equipment can slip away from under the item being lifted.



3. There are precise rules governing the extension of supporting material! Lifting straps and round slings must not be knotted or extended by tying them together, but only connected by the use of appropriate shackles. Just as with other rigging hardware, special connecting elements must be used!



4. Only ever use rigging hardware of the same type. Consider the material being used! Chains, polyester lifting straps and polyamide lifting straps stretch differently when under load, with the result that the load can slip out.



There are large differences in extension, particularly when wet!

5. When threading through, always observe the "natural" threading angle of 120°.

6. Never attempt to retighten materials that have been threaded through! The frictional heat generated can damage the rigging hardware.

7. Always observe the special instructions for the use of any supporting material.

8. Ensure that the supporting material cannot be damaged during lifting. Take particular care to see that edge protection is sufficient!

9. Never allow lifting straps or round slings to run loosely over the crane hook. Otherwise the load can tilt!

