

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!

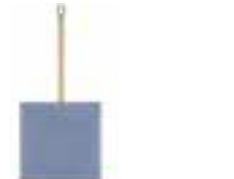
Load-bearing or unbearable? How to find the right rigging hardware.

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

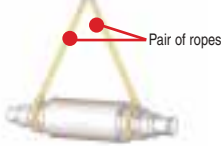


Easy to lift

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.

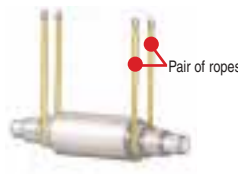
Strap with inclination



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.

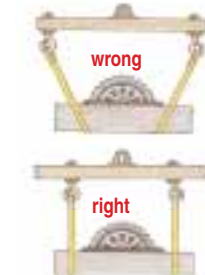


Never forget the golden rules.

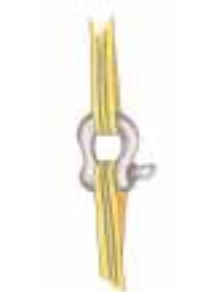
1. Never use lashing equipment as rigging hardware.

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

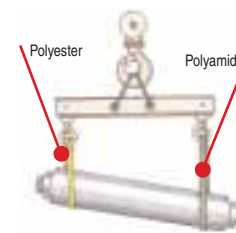
2. Supporting with reversed angle of inclination is forbidden. The supporting equipment can slip away from under the item being lifted.



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.



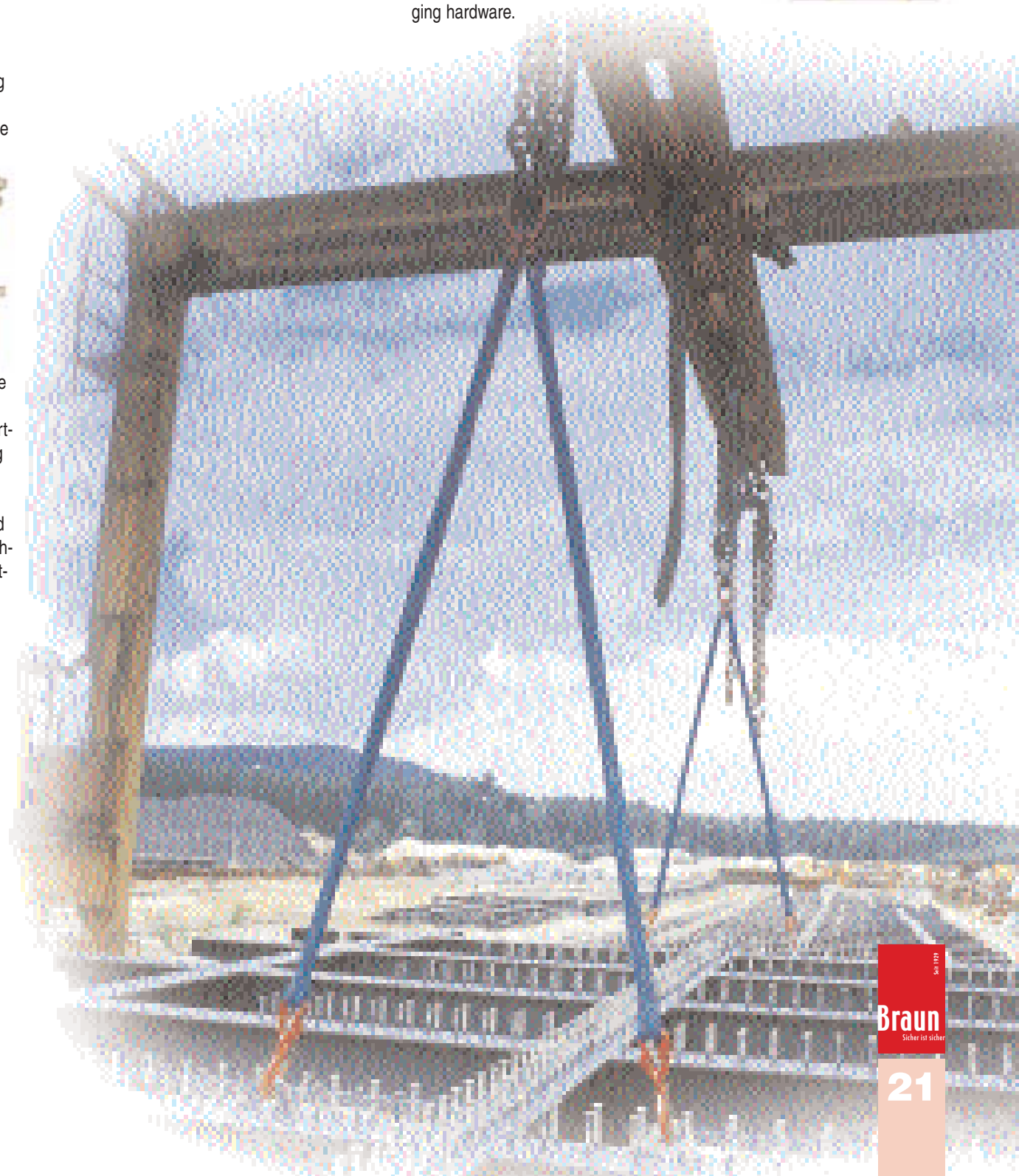
There are large differences in extension, particularly when wet!

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!



Lifting systems

Sling chains

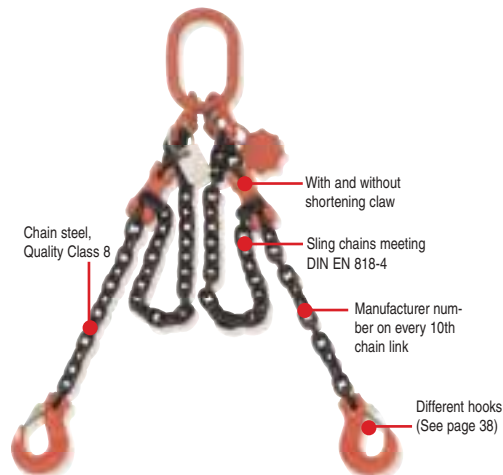
We supply single and multi-chain suspensions in a number of different versions and with a wide range of accessories. We are very pleased to offer you skilled advice, and ship urgent orders that reach us by 10.00 am on the same day. We also have the knowledge and the technical equipment necessary to inspect chain suspensions. In particular we will carry out the specified 3-yearly crack checks (magnetic particle testing) for you, and, if possible, will perform any necessary repairs.



Non-interchangeable construction

Big in choice, big in quality

So that you are well-equipped for every job, you can obtain chain suspensions from us having different versions, but all with the same high quality: All-through non-interchangeable construction. From the ring to the connecting piece and from the chain to the fork-head hook. Always fully assembled when supplied. Ring, connecting piece and hook red, chain painted black. ackiert.



Extra for extreme conditions

For applications in which the chains are exposed to aggressive materials you can obtain all our chain suspensions, if desired, with long-term corrosion protection. Tests show that chains do not show any corrosion damage even after 10,000 hours in saltwater spray – provided there is no abrasion.

From universal to special

The range we offer is as many-sided as the jobs you have to do. So you can obtain chain suspensions from us with all usual carrying capacities. But we also offer solutions for particularly demanding problems. Our new Goliath chain suspension, made from high-strength chain steel with Quality Class 10, offers a higher carrying capacity for a given chain size than do the usual chain suspensions with Quality Class 8.

Standard chain - Quality Class 8	
Nom.Thickness	Load carrying capacity direct 1-chain
6 mm	1120 kg
8 mm	2000 kg
10 mm	3150 kg
13 mm	5300 kg

GOLIATH - Quality Class 10	
Nom.Thickness	Load carrying capacity direct 1-chain
6 mm	1400 kg
8 mm	2500 kg
10 mm	4000 kg
13 mm	6700 kg

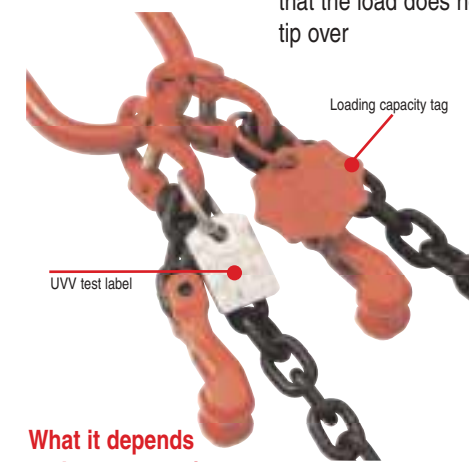
You will find the complete loading table on page 39

Accessories and more

We can offer you all the necessary accessories such as ring nuts, ring screws or quick release chain fasteners for all chain suspensions (See page 41).

The labelling

The loading capacity tag supplies you with important information on use, and is used for identification and tracing. For your own safety, never use no-name chain suspensions without manufacturer's codes, loading capacity tag or test label!



What it depends on: Important points on use

You must observe special instructions on the use of chain suspensions, and we will introduce them to you here briefly. You will make life easier for yourself if you attend our training course, where you will be informed in an easily understandable way of everything that you need to know for your daily work.

- Do not use chains on smooth or slippery surfaces
- Only make use of chains of Quality Classes 8 and 10

Operating temperature:	Temperature	Load carrying capacity
	- 40 C - + 200 C	100 %
+ 200 C - + 300 C	90 %	
+ 300 C - + 400 C	75 %	

within the permitted temperature range (-40°C to +400°C), and bear in mind that high temperatures reduce the loading capacity.

- Make sure that the support point is located above the centre of gravity of the load, so that the load does not tip over

the suspension piece can move freely in the load hook

- Bear the angle of inclination in mind (see loading capacity table on pages 38/39)

Things last longer if looked after: Care and storage

- Check chain suspensions before and after every use for visible faults

- Avoid contact with aggressive chemicals and acids

- Have an expert carry out a special check for freedom from cracks every three years (magnetic particle testing), and a visual check once a year

- Only have repairs carried out at a specialist firm

- Store chain suspensions hanging up under dry conditions, protected from the weather and from contact with aggressive materials

Important: The end of useful life

Discard chain suspensions as soon as

- You note mechanical damage caused by crushing, notching or the formation of cracks
- Deformations occur

as a result of bending, twisting or crushing

- You notice the beginning of cracks, or of corrosion pittings that would affect loading capacity

- A chain link is broken, or the external dimension has extended by more than 3 %

- The mean nominal thickness of the links has fallen by more than 10% at some location around the link

- The bolt wear has reached or exceeded 10%

Exchange the hook when

- The hook mouth has opened by more than 10%

- The point of the hook is bent

- The catch no longer closes, or no longer exists

- The base of the hook has worn by more than 5 %

Sling chains

EN 818-4



Standard chain

Chain suspensions, Quality Class 8
Our standard, all-purpose chain

Chain suspension, 1-chain

Artikel-Nr.	Nominal thickness	carrying capacity in kg direct $L_A=1$
106...	6 mm	1120
107...	7 mm	1500
108...	8 mm	2000
110...	10 mm	3150
113...	13 mm	5300
116...	16 mm	8000
118...	18 mm	10000
119...	19 mm	11200
120...	20 mm	12500
122...	22 mm	15000
126...	26 mm	21200
132...	32 mm	31500

Chain suspension, 2-chain

Item no.	Nominal thickness	carrying capacity in kg at an angle of	
		β 0° - 45° $L_A=1,4$	β 45° - 60° $L_A=1$
206...	6 mm	1600	1120
207...	7 mm	2120	1500
208...	8 mm	2800	2000
210...	10 mm	4250	3150
213...	13 mm	7500	5300
216...	16 mm	11200	8000
218...	18 mm	14000	10000
219...	19 mm	16000	11200
220...	20 mm	17000	12500
222...	22 mm	21200	15000
226...	26 mm	30000	21200
232...	32 mm	45000	31500

The following hooks are available for all sizes:



- Hook no. 1**
Safety load hook type OKN
Forged safety catch.
- Hook no. 2**
Wide-mouthed hook type CWH
The container hook for special applications in foundries.
- Hook no. 4**
Sika swivel hook type WHS
Swivelling hook with washer (cannot be rotated under load). Also available with ball-bearings (can be rotated under load). drehbar).
- Hook no. 5**
Standard load hook type WAG
Forged safety catch.
- Hook no. 6**
Sika hook type GHS
Forged safety catch, wide mouth.
- Hook no. 7**
Safety load hook
Self-closing: closes automatically as the load is lifted.

Chain suspension, 3 and 4-chain

Item no. 3-chain	Item no. 4-chain	Nominal thickness	carrying capacity in kg at an angle of	
			β 0° - 45° $L_A=2,1$	β 0° - 60° $L_A=1,5$
306...	406...	6 mm	2360	1700
307...	407...	7 mm	3150	2240
308...	408...	8 mm	4250	3000
310...	410...	10 mm	6700	4750
313...	413...	13 mm	11200	8000
316...	416...	16 mm	17000	11800
318...	418...	18 mm	21200	15000
319...	419...	19 mm	23600	17000
320...	420...	20 mm	26500	19000
322...	422...	22 mm	31500	22400
326...	426...	26 mm	45000	31500
332...	432...	32 mm	67000	47500

Ordering example

2 08 5 04

↓ ↓ ↓ ↓

Chains Chain size 8 mm Hook no. 6 Length in metres

Important:
You only need to complete the ordering numbers where printed red.

Solution:
2-chain suspension, type Goliath (the G stands for Goliath), chain size 13 mm, with SIKA hook, 4 metres long
With shortening claw:
Add "VK" at the end of the ordering number.



Chain edge protection

The polyurethane edge protection for high-strength chains. Protects chain and edge from crushing or breaking. Available for all chain sizes, simply quote the nominal thickness.en.

Shortening claw VK

For hanging back a length of chain. Available for all chain sizes.



GOLIATH

Chain suspension, Quality Class 10, type Goliath. Our high-strength chain. Represents the highest load carrying capacity with the maximum security through non-interchangeable construction.

Chain suspension, 1-chain GOLIATH

Item no.	Nominal thickness	carrying capacity in kg direct $L_A=1$
G106...	6 mm	1400
G108...	8 mm	2500
G110...	10 mm	4000
G113...	13 mm	6700
G116...	16 mm	10000
G118...	18 mm	12500
G122...	22 mm	19000

Chain suspension, 2-chain GOLIATH

Item no.	Nominal thickness	carrying capacity in kg at an angle of	
		β 0° - 45° $L_A=1,4$	β 0° - 60° $L_A=1$
G206...	6 mm	2000	1400
G208...	8 mm	3550	2500
G210...	10 mm	5600	4000
G213...	13 mm	9500	6700
G216...	16 mm	14000	10000
G218...	18 mm	18000	12500
G222...	22 mm	26500	19000

Chain suspension, 3 and 4-chain GOLIATH

Item no. 3-chain	Item no. 4-chain	Nominal thickness	carrying capacity in kg at an angle of	
			β 0° - 45° $L_A=2,1$	β 0° - 60° $L_A=1,5$
G306...	G406...	6 mm	3000	2120
G308...	G408...	8 mm	5300	3750
G310...	G410...	10 mm	8000	6000
G313...	G413...	13 mm	14000	10000
G316...	G416...	16 mm	21200	15000
G318...	G418...	18 mm	26500	19000
G322...	G422...	22 mm	40000	28000

Ordering example

G4 08 6 06

↓ ↓ ↓ ↓

Chains Chain size 8 mm Hook no. 6 Length in metres

Important:
You only need to complete the ordering numbers where printed red.

Solution:
4-chain suspension, type Goliath (the G stands for Goliath), chain size 13 mm, with SIKA hook, 6 metres long
With shortening claw:
Add "VK" at the end of the ordering number.

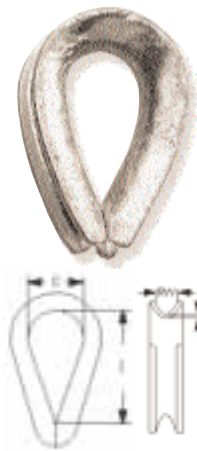


Sling chains Accessories



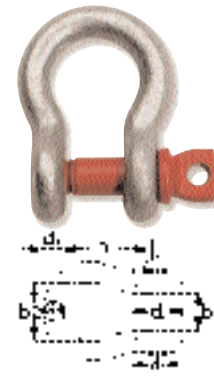
Wire cable clamps, galvanised, DIN 1142

Item no.:	for rope diameters in inches	for rope diameters in mm	Required number of cable clamps	Weight per piece in kg
70742	3/16	5	3	0.021
70731	1/4	6,5	3	0.040
70732	5/16	8	4	0.082
70733	3/8	10	4	0.092
70734	1/2	13	4	0.275
70735	5/8	16	4	0.430
70736	3/4	19	4	0.490
70737	7/8	22	5	0.680
70738	1	26	5	1.170



Heart-shaped thimble, galvanised, DIN 3090

Item no.:	Nominal size in mm	Groove width in mm	c mm	l mm	s mm	Weight of 100 pieces in kg
72184	4	5	10	20	2,1	1.4
72185	6	7	15	30	2,6	3.0
72186	8	9	20	40	4	7.8
72187	10	11	25	50	5	15.8
72188	12	13	30	60	6	23.7
72189	14	16	35	70	7	33.5
72190	16	18	40	80	8	48.0
72191	18	20	45	90	9	65.0
72192	20	22	50	100	10	95.0
72193	22	24	55	110	10	108.0
72194	24	26	60	120	11	132.0



Shackle, high strength, curved, with stud, load carrying capacity stamped on

Item no.:	Nominal size inches	Load carrying capacity in kg	Shackle diameter d ₁ mm	Bolt-diameter d ₂ mm	d ₃ mm	b ₁ mm	b ₂ mm	h ₂ mm	Weight per piece in kg
71034	1/4	500	6,5	8	5/16	12	20	28	0.05
71036	3/8	1000	10	11	7/16	16	26	36	0.14
71037	7/16	1500	11	13	1/2	18	29	42	0.22
71038	1/2	2000	13	16	5/8	21	33	48	0.33
71039	5/8	3250	16	19	3/4	27	43	60	0.65
71040	3/4	4750	19	22	7/8	32	51	71	0.97
71041	7/8	6500	22	25	1	36	58	84	1.52
71042	1	8500	25	29	1 1/8	43	68	95	2.39
71043	1 1/8	9500	29	32	1 1/4	46	74	108	3.15
71044	1 1/4	12000	32	35	1 3/8	52	82	119	4.32
71045	1 3/8	13500	35	38	1 1/2	57	92	133	5.67
71046	1 1/2	17000	38	41	1 5/8	60	98	146	7.79
71047	1 3/4	25000	44	51	2	73	127	178	12.51
71048	2	35000	51	57	2 1/4	83	146	197	18.5
71050	2 1/2	55000	63	70	2 3/4	105	184	267	37.58



Fire service snap hooks, galvanised

Item no.:	Nominal size	b mm	d mm	l mm	m mm	w mm	Weight per 100 pieces in kg
70781	40 x 4	6	4	40	6	4	1.0
70782	50 x 5	8	5	50	7	4	1.3
70151	60 x 6	9	6	60	8	5	2.7
70152	70 x 7	10	7	70	8	8	4.3
70153	80 x 8	10	8	80	9	8	6.4
70154	90 x 9	12	9	90	10	9	8.8
70155	100 x 10	15	10	100	11	10	12.6
70156	120 x 11	18	11	120	16	11	19.0
70157	140 x 12	20	12	140	19	13	26.0
70160	160 x 13	22	13	160	25	15	35.0



Shackle, forged, galvanised, with eyebolt (not suitable for lifting loads!)

Item no.:	Nominal-size inches	Load carrying-capacity in kg	d ₂ inches	b ₁ mm	b ₂ mm	h ₁ mm	Weight per piece in kg
82250	3/16	80	5	10	16	20	0.02
82251	1/4	100	6	14	20	25	0.03
82252	5/16	200	8	16	24	32	0.07
82253	3/8	320	10	24	32	40	0.13
82254	7/16	400	11	22	34	46	0.17
82255	1/2	500	12	24	38	51	0.24
82256	9/16	600	14	29	44	59	0.35
82257	5/8	800	16	32	56	69	0.50
82258	3/4	1100	19	38	66	83	0.80
82259	7/8	1500	22	44	72	93	1.30
82260	1	2000	25	45	69	93	2.00



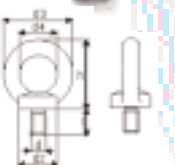
Ring nuts, galvanised, DIN 582, SF 4:1

Item no.:	Thread d	d ₂ mm	d ₃ mm	d ₄ mm	h mm	Weight per piece in kg	Load Carrying capacity in kg	
							for 1 nut	for 2 nuts
73027	M 8	20	36	20	36	0,05	140	95
73016	M 10	25	45	25	45	0,09	230	170
73017	M 12	30	54	30	53	0,16	340	240
73019	M 16	35	63	35	62	0,24	700	500
73021	M 20	40	72	40	71	0,36	1200	830
73022	M 24	50	90	50	90	0,72	1800	1270



Ring screws, galvanised, DIN 580, SF 4:1

Item no.:	Thread d	l mm	d ₂ mm	d ₃ mm	d ₄ mm	h mm	Weight per piece in kg	Load Carrying capacity in kg	
								for 1 screw	for 2 screws
73031	M 8	13	20	36	20	36	0,06	140	95
73032	M 10	17	25	45	25	45	0,11	230	170
73033	M 12	20,5	30	54	30	53	0,18	340	240
73035	M 16	27	35	63	35	62	0,28	700	500
73037	M 20	30	40	72	40	71	0,45	1200	830
73038	M 24	36	50	90	50	90	0,74	1800	1270



Quick-release chain fastener, connectable with screws, galvanised

Item no.:	Material-diameter d mm	Internal length mm	Mouth width mm	Load carrying capacity kg	Weight per piece in kg
70380	4	31,50	5,50	180	0.021
70381	5	38,00	6,50	340	0.022
70382	6	45,00	7,50	500	0.036
70383	7	52,00	8,00	600	0.050
70384	8	60,00	10,00	1000	0.078
70386	10	69,00	12,00	1500	0.138

Bravo type ratchet pull

Item no.:	Useful load in kg	Number of load bearing strands	Normal-lift in m	Weight with chain approx kg
72520	250	1	1,5	2
72521	500	1	1,5	5
72522	750	1	1,5	7
72523	1500	1	1,5	11
72524	3000	1	1,5	20
72525	6000	2	1,5	30



Ratchet tensioner
See lashing systems table on page 15

