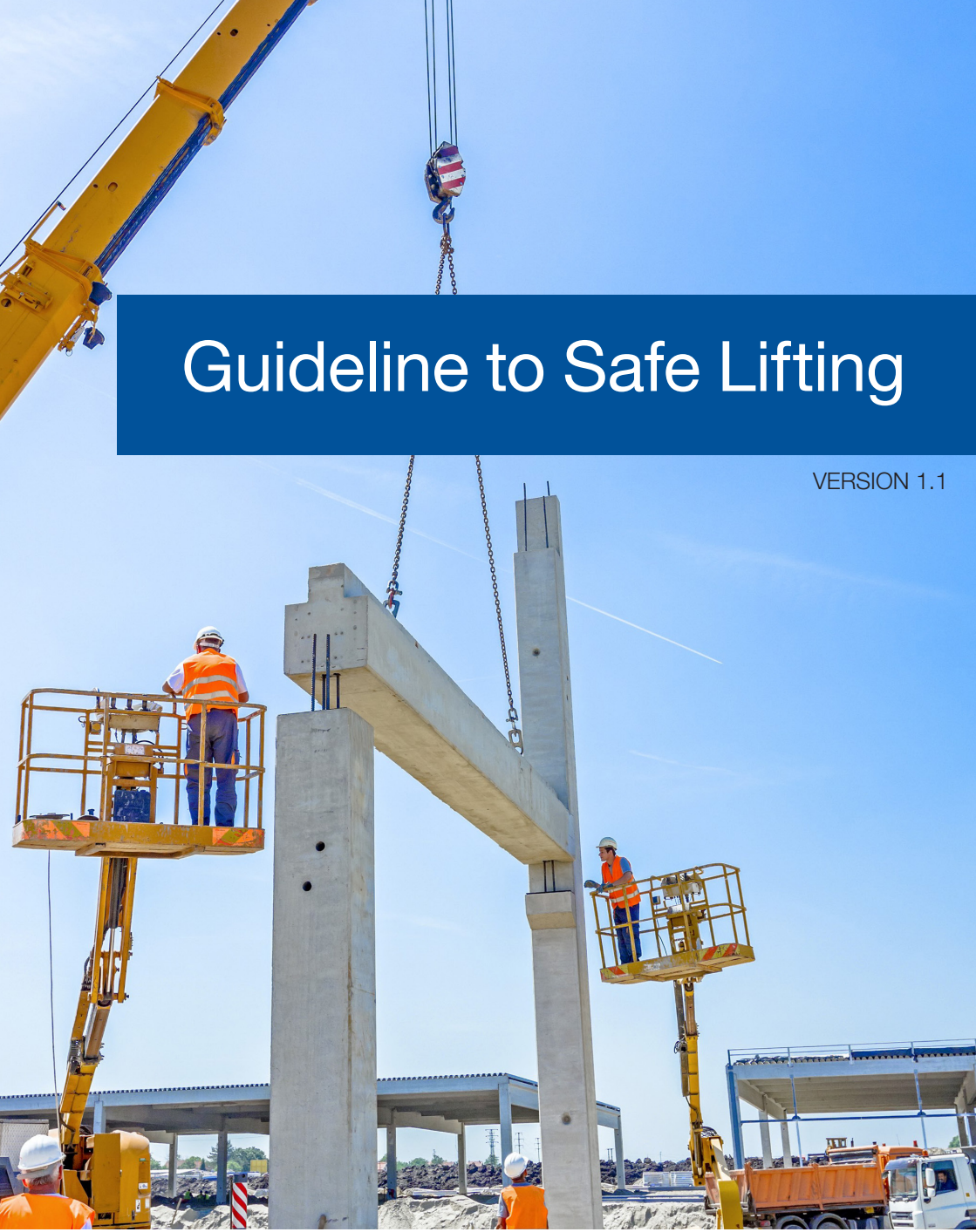
# Guideline to Safe Lifting

VERSION 1.1



Forankra
Secures everything in transit™

**Forankra is a leading European supplier of cargo securing, cargo optimization and lifting equipment. With our expertise, quality assured products and customized solutions, we help our customers secure all goods in transit.**

## Guideline to safe lifting

Safe lifting requires approved and certified products, as well as correct handling and inspection of the lifting equipment before use. In our "Guideline to safe lifting", we have gathered information that is important to consider before using lifting equipment and to ensure safe lifting situations.

## You probably already know that:

Forankra offers a selected range of lifting products covering most everyday needs in the areas of construction and industry. Our lifting equipment complies with the European Machinery Directive and is supplied with the required documentation, which is stored in our systems for traceability and possible recovery.
For more information about our lifting range, we recommend that you visit our website www.forankra.se.

## Contact us

If you have any questions or want to discuss which products and solutions that best meet your lifting needs, please contact our experts.

You can easily reach us on +46 (0)322-66 78 00, info@forankra.se or via our website www.forankra.se.

# Safe lifting

Many types of lifting operations are carried out every day in different industries. Lifting is always associated with a certain risk, and this set high demands on both the user and the lifting products. Even if the products are approved and certified, improper handling and incorrect application of the products can create dangerous situations.

**The correct equipment**

Safe lifting always starts with choosing the correct lifting equipment.
Lifting products are heavily regulated by the European Machinery Directive 2006/42/EC (AFS 2008:3), which sets strict demands on suppliers of lifting products regarding:

- Product performance
- Product marking
- Technical product documentation
- CE marking
- Traceability of products throughout the value chain

**Laws and requirements**

To prevent accidents and injuries in connection with lifting operations, the Swedish Work Environment Authority (Arbetsmiljöverket) has developed the “Use of lifting devices and lifting accessories” regulations (AFS 2006:6). These regulations govern an employer’s as well as an employee’s responsibility for the use and control of lifting equipment, see following extracts:

**§30** Lifting devices and lifting equipment MUST be maintained and undergo continuous inspection and daily checks when in use.

**§32** Maintenance, repair and conversion MUST be carried out in such a way that the function, strength and stability of the equipment are not compromised.

**§33** A journal MUST be kept for maintenance and continuous inspection according to §30

More information about the requirements for work equipment and lifting equipment can be found on the Swedish Work Environment Authority’s website www.av.se:

- Use of work equipment (AFS 2006:4)
- Use of lifting devices and lifting accessories (AFS 2006:6)

# General information on lifting equipment

**Risk assessment**
Always carry out a risk assessment and take suitable action if necessary before starting to lift. What does the lifting area look like?
Who or what is within the risk zone?

**The correct lifting equipment**
Ensure that the right equipment is selected for the operation and that it meets the relevant directives and requirements. The requirements also apply to documentation of the equipment.

**Knowledge**
Employers must ensure that employees who use lifting equipment have adequate theoretical and practical knowledge to use the equipment safely. This knowledge must be documented. Employees have a responsibility to follow regulations and instructions.

**Maintenance and inspection**
- Lifting equipment MUST be regularly maintained and inspected before use.
- This continuous inspection MUST be recorded in a journal.
- New lifting equipment MUST be registered and checked before being commissioned.

This information can be found in AFS 2006:6 and in the equipment instructions for use.

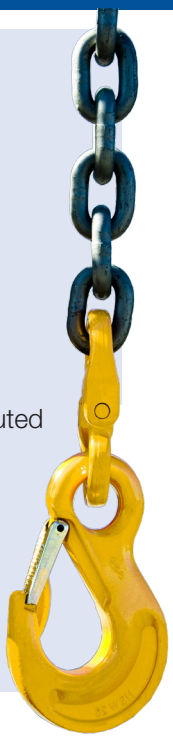
**Systematic health and safety at work**
Under the rules of the Swedish Work Environment Authority (Arbetsmiljöverket) employers have the primary responsibility and must develop routines to ensure a good working environment in collaboration with employees and safety representatives.

The employer must implement all necessary measures to prevent employees from suffering accidents.

The employer must have systematic health and safety at work procedures and is therefore required to investigate, implement and follow up activities in order to prevent accidents and illness.

# Checklist for safe lifting

- Check the weight of the load
- Decide which lifting method to use
- Select the appropriate lifting equipment
- Use chain equipment if the load is hotter than 100°C
- Check the lifting angles
- Never exceed 120° top angle (or 60° from the vertical)
- Always use corner protection on sharp corners and edges
- Lift vertically and make sure that the load is symmetrically distributed
- Never drag the load using the lifting equipment
- Never overload – stay within the working load limit (WLL)
- Do not walk under a suspended load
- Never leave suspended loads unattended
- Check that rating labels or tags are undamaged and legible
- Get to know your lifting equipment – read the user manual



# Lifting terms

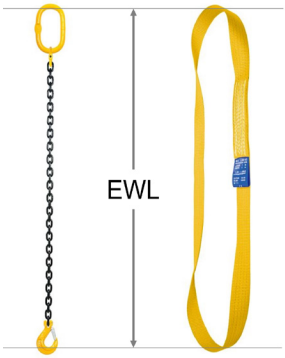
**Manufacturing Proof Force (MPF)**
The force that a device or component to be tested is subjected to before delivery. The force varies depending on the product and the governing standard and is usually 1.25–2.5 times higher than the permissible working load limit (WLL).

**Minimum Breaking Force (MBF)**
The minimum force the equipment has to withstand before breaking during destructive testing.

**Working Load Limit (WLL)**
The maximum working load of the equipment/product.

**Safety Factor (SF)**
The ratio of breaking force to working load limit of a material.

**EWL (Effective Working Length)**
EWL indicates the actual working length of the lifting equipment. For a webbing sling or round sling this is half the circumference.



# General information on lifting equipment

**Risk assessment**
Always carry out a risk assessment and take suitable action if necessary before starting to lift. What does the lifting area look like?
Who or what is within the risk zone?

**The correct lifting equipment**
Ensure that the right equipment is selected for the application and that it meets the relevant directives and requirements. The requirements also apply to documentation of the equipment.

**Knowledge**
Employers must ensure that employees who use lifting equipment have adequate theoretical and practical knowledge to use the equipment safely. This knowledge must be documented. Employees have a responsibility to follow regulations and instructions.

**Maintenance and inspection**
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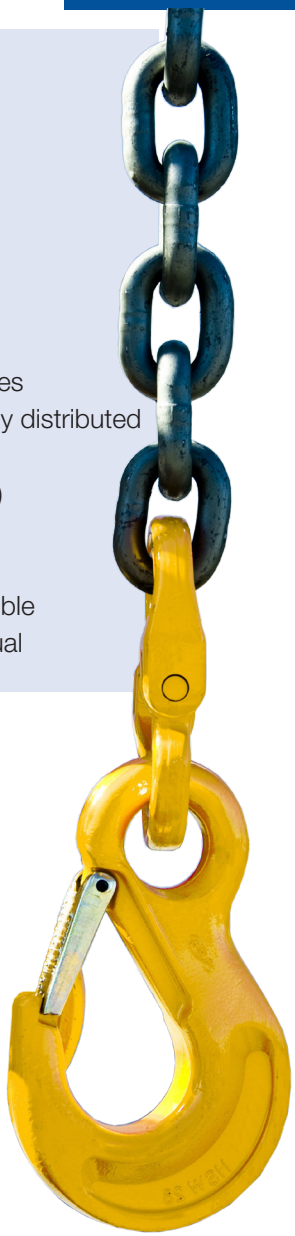
- Never overload – stay within the working load limit (WLL)
- Do not walk under a suspended load
- Never leave hanging loads unattended
- Check that rating labels or tags are undamaged and legible
- Get to know your lifting equipment – read the user manual



# Lifting terms

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The force varies depending on the product and the governing standard and is usually 1.25–2.5 times higher than the permissible working load limit (WLL).

**Minimum Breaking Force (MBF)**
The force at which the equipment breaks during destructive testing.

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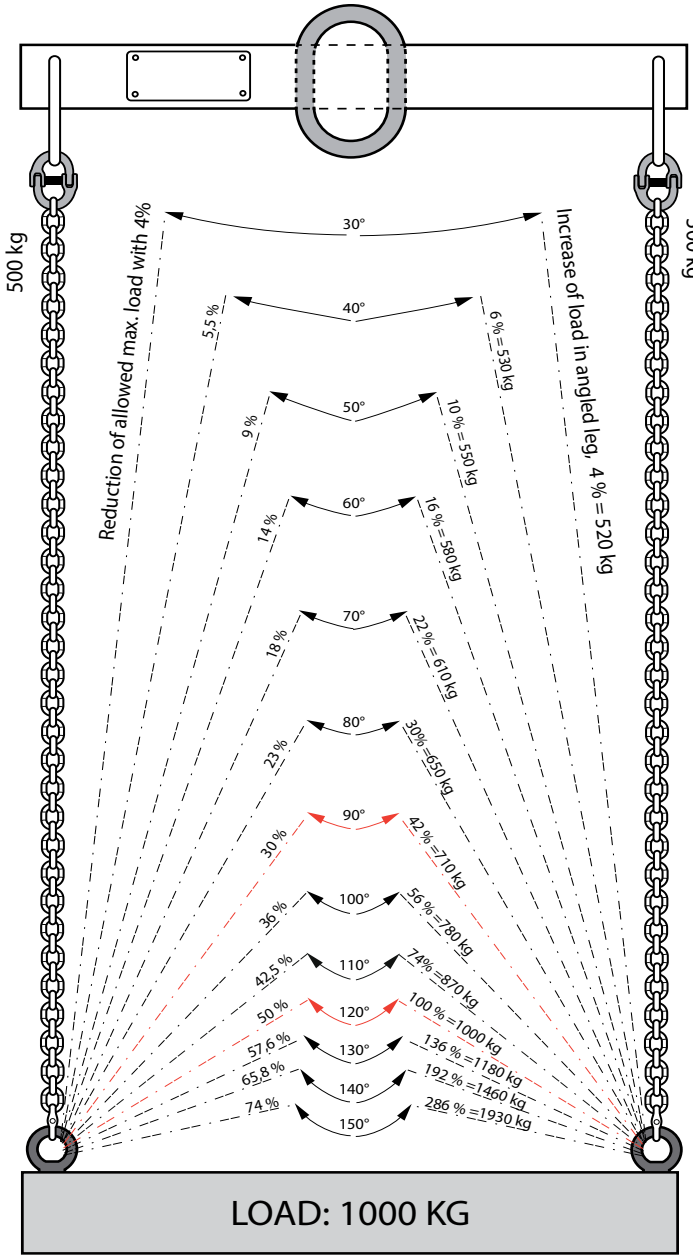
The ratio of breaking force to working load limit of a material.

## Effect of lifting angle on multi-part lifting equipment

The table shows the effect of the lifting angle on equipment capacity or the load to which the equipment is subjected at any given angle.

*The lifting angle must never exceed 60° from the vertical for any part.*



# Lifting equipment

Forankra's range of lifting equipment is designed for construction and industry. The range includes Grade 80 and Grade 100 lifting equipment, soft lifting equipment and a variety of lifting appliances. We also adapt chain equipment to the desired length and design.

## Choosing the right lifting equipment

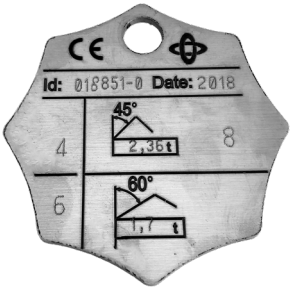
The choice of lifting equipment depends on what you intend to lift.

- *Chain lifting equipment* is durable, flexible and temperature resistant. Lifting chains can be combined with many different lifting components.
- *Soft lifting equipment* is cost-effective alternatives and is used for fragile goods and when you want to snag the load during lifting.

## CE mark

From 1 January 1995, all lifting equipment must be CE marked. The CE mark is proof that the equipment complies with the EU Machinery Directive. Instructions for use and a declaration of conformity are included with each shipment.
The Swedish Work Environment Authority (Arbetsmiljöverket) checks the labelling and documentation of lifting equipment in the workplace and in the event of deviations, may prohibit the use of equipment and even impose fines.

## Labelling of lifting equipment




### Labelling of chain equipment

The chain must carry an identification tag, which indicates the lifting class, size and whether it is intended for use with multiple parts.


### Labelling on soft lifting equipment

Soft lifting equipment must have a label that indicates the working load limit (WLL) and effective working length (EWL) of the equipment.

# Hard lifting equipment – Chain slings

Chain slings have high resistance to abrasion and wear and is often used in lifting applications where durability is an important factor. This equipment can withstand high temperatures and can be combined with many different lifting components. Chain slings are very flexible, for example, shortening hooks can be used to achieve the optimal length of one or more parts.

Chain slings use Grade 80 or Grade 100 chains and components.
Grade 100 components are about 25% stronger than the corresponding dimension in Grade 80. The chain must have short links.

Forankra supplies chain slings with one to four parts. When using lifting equipment with multiple parts, it is important to consider the angle between the parts.

Chains and equipment are manufactured according to the applicable parts of standard SS-EN 818 and components according to EN 1677.

| Chain Grade | Colour | Application |
|---|---|---|
| 80 | Black | Lifting equipment, lashing |
| 100 | Blue/Violet | Lifting equipment, lashing |

**Temperature**

Chain slings must not be used at temperatures below -40°C or above +200°C. When using equipment outside this range, the working load limit is reduced and special solutions must be applied.

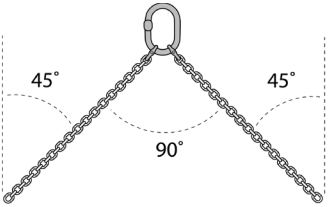
| Chain temperature | Reduction of WLL Grade 80 | Reduction of WLL Grade 100 |
|---|---|---|
| -40°C to +200°C | 0% | 0% |
| +200°C to +300°C | 10% | Not permitted |
| +300°C to +400°C | 25% | Not permitted |

**Chemicals**

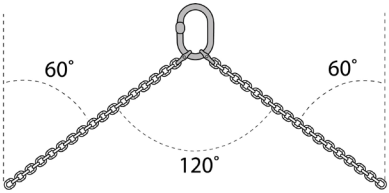
Grade 80 and Grade 100 chain slings must not come into contact with acids or other aggressive chemicals. The equipment must not be hot-dip galvanized.

**Capacity labelling of chain slings**

Capacity labelling is always based on an angle of 45° or 60°.




*Working angle 45°, lifting angle 90°*




*Working angle 60°, lifting angle 120°*

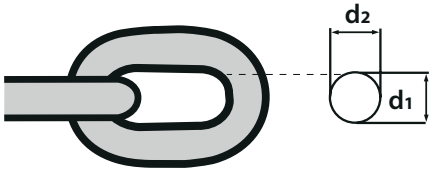
## Things to keep in mind when using chain slings:

- Only use approved equipment for lifting
- Never lift with a twisted chain
- Use grab hooks for shortening chain
- There must never be knots on the chain
- The working angle must never exceed 60° on any part
- Never place a load on the tip of a hook. The load must always be supported at the bottom of the hook
- The various components must always be able to move freely in the direction of the load
- Always avoid jerking during loading
- The chain must not be heat treated
- Always use corner protection to protect the chain from wear on sharp edges
- Get to know your lifting equipment – read the user manuals

## Replace chain lifting equipment:

- When there are signs of permanent elongation, deformation, cracks or other notches
- When wear on the chain measured in 2 perpendicular directions ($\mathbf{d}_1$, $\mathbf{d}_2$) exceeds 10% of the original dimension ($\mathbf{d}_{normal}$) according to the formula below:

$$\frac{\mathbf{d}_1 + \mathbf{d}_2}{\mathbf{2}} < \mathbf{0.9 \times d}_{normal}$$



## TABLE: Lifting equipment – Chain slings

| Grade 80 | 1 part **WLL** (ton) | 2 part 0–45° **WLL** (ton) | 2 part 45°-60° **WLL** (ton) | 3/4 part 0°-45° **WLL** (ton) | 3/4 part 45°-60° **WLL** (ton) |
|---|---|---|---|---|---|
| **Chain sling 6 mm** | 1.12 | 1.60 | 1.12 | 2.36 | 1.70 |
| **Chain sling 7 mm** | 1.50 | 2.12 | 1.50 | 3.15 | 2.24 |
| **Chain sling 8 mm** | 2.00 | 2.80 | 2.00 | 4.25 | 3.00 |
| **Chain sling 10 mm** | 3.15 | 4.25 | 3.15 | 6.70 | 4.75 |
| **Chain sling 13 mm** | 5.30 | 7.50 | 5.30 | 11.20 | 8.00 |
| **Chain sling 16 mm** | 8.00 | 11.20 | 8.00 | 17.00 | 11.80 |

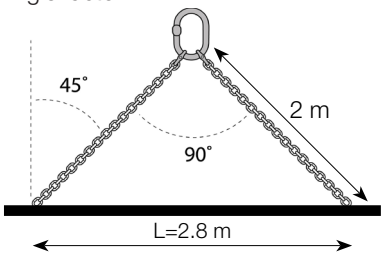
| Grade 100 | 1 part **WLL** (ton) | 2 part 0–45° **WLL** (ton) | 2 part 45°-60° **WLL** (ton) | 3/4 part 0°-45° **WLL** (ton) | 3/4 part 45°-60° **WLL** (ton) |
|---|---|---|---|---|---|
| **Chain sling 6 mm** | 1.40 | 2.00 | 1.40 | 3.00 | 2.10 |
| **Chain sling 8 mm** | 2.50 | 3.50 | 2.50 | 5.3 | 3.80 |
| **Chain sling 10 mm** | 4.00 | 5.60 | 4.00 | 8.00 | 5.70 |
| **Chain sling 13 mm** | 6.70 | 9.40 | 6.70 | 14.00 | 10.00 |
| **Chain sling 16 mm** | 10.00 | 14.00 | 10.00 | 21.20 | 15.00 |

## Calculating min. length of lifting chain based on angle

$$\text{Min. length of lifting chain} = \frac{\text{Distance between lifting points (L)}}{\text{Angle factor}}$$

**At max. lifting angle 90°**

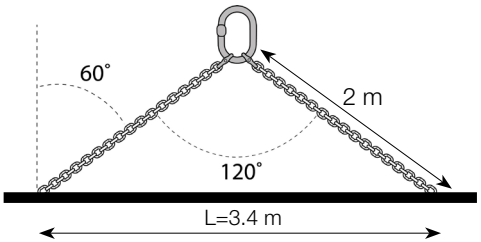
Angle factor **1.4**




Min. length of lifting chain = 2.8 m/1.4 =

**At max. lifting angle 120°**

Angle factor **1.7**




Min. length of lifting chain = 3.4 m/1.7 =

# Soft lifting equipment

Soft lifting equipment is used for fragile goods and when you want to snag the load during lifting. Round slings, webbing slings and eye-eye webbing slings are most often used separately, without other lifting equipment, but can be combined with Grade 80, Grade 100 or other approved lifting equipment if needed.

Soft lifting equipment has a low net weight in relation to its carrying capacity and a soft surface that is in contact with the goods, i.e. it does not damage the goods. This type of equipment is very versatile as it can be attached to the load in many different ways.

Soft lifting equipment must comply with the European Machinery Directive and is normally manufactured according to EN 1492-1 or EN 1492-2. The equipment is then colour-coded to show its working load limit (WLL).

**Chemicals**
Soft lifting equipment is usually made of polyester, which is not resistant to alkalis such as ammonia and caustic soda.

**Temperature**
Soft lifting equipment should not be used when lifting goods hotter than 100°C. For higher temperatures, chain equipment must be used.


Round sling seamless


Round sling Duplex


Eye-eye round sling


Webbing sling


Eye-eye webbing

**Round slings and eye-eye round slings** (EN 1492-2)
*Round sling* consist of a load supporting, endless loop of polyester fibre with a protective sleeve made of woven polyester fabric. Round sling Duplex has a double protective sleeve, which provides significantly higher wear resistance. *Eye-eye round sling* has eyes stitched into both ends, but is constructed with a fibre core and outer sleeve in the same way as round slings.

**Webbing slings and eye-eye webbing slings** (EN 1492-1)
*Webbing sling* consist of a woven polyester strap, which is stitched together into an endless sling. *Eye-eye webbing sling* is a woven strap with eyes stitched into both ends and is used when you want to distribute the pressure against the load.

## Calculating the nominal working load limit (WLL)

Soft lifting equipment is colour coded according to the working load limit (WLL) it is designed for, see the table below.

| Nominell arbetslast / Nominal carrying capacity for each basic configuration | Färgkod / Colour of sewn webbing component | WLL = Arbetslast / Working load limit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rakt lyft / Straight lift | | Snarat lyft / Choked lift | | U-lyft / Basket hitch | | U-lyft / Basket hitch | | | 2-parts lyftlänga / 2-leg sling | | | 3 och 4-parts lyftlänga / 3 and 4-leg sling | | |
| | | 100% | | 80% | | 200% | | 140% | | | 140% | | | 150% | | |
| | | WLL | kg | WLL | kg | WLL | kg | WLL | 45° | 60° kg | WLL | 45° | 60° kg | WLL | 45° | 60° kg |
| 1000 | Lila/Violet | 1000 | | 800 | | 2000 | | 1400 | | 1000 | 1400 | | 1000 | 2100 | | 1500 |
| 2000 | Grön/Green | 2000 | | 1600 | | 4000 | | 2800 | | 2000 | 2800 | | 2000 | 4200 | | 3000 |
| 3000 | Gul/Yellow | 3000 | | 2400 | | 6000 | | 4200 | | 3000 | 4200 | | 3000 | 6300 | | 4500 |
| 4000 | Grå/Grey | 4000 | | 3200 | | 8000 | | 5600 | | 4000 | 5600 | | 4000 | 8400 | | 6000 |
| 5000 | Röd/Red | 5000 | | 4000 | | 10000 | | 7000 | | 5000 | 7000 | | 5000 | 10500 | | 7500 |
| 6000 | Brun/Brown | 6000 | | 4800 | | 12000 | | 8400 | | 6000 | 8400 | | 6000 | 12600 | | 9000 |
| 8000 | Blå/Blue | 8000 | | 6400 | | 16000 | | 11200 | | 8000 | 11200 | | 8000 | 16800 | | 12000 |
| 10000 | Orange | 10000 | | 8000 | | 20000 | | 14000 | | 10000 | 14000 | | 10000 | 21000 | | 15000 |
| över 10000 | Orange | | | | | | | | | | | | | | | |

TABLE: Calculating the nominal working load limit (WLL)

## Things to keep in mind when using soft lifting equipment:

- Soft lifting equipment is easily damaged by friction or abrasion against sharp edges. You should therefore use lifting devices with soft edges as well as corner protections on sharp corners and edges
- Use lifting devices that has an inner radius that is at least equal to the width of the webbing
- Lift vertically and make sure that the load is symmetrically distributed
- Soft lifting equipment must not be used when lifting goods hotter than 100°C
- Make sure that soft lifting equipment does not come into contact with alkaline chemicals
- Never shorten soft lifting equipment with knots
- Never overload – stay within the working load limit. See table for nominal working load limit (WLL)
- Get to know your lifting equipment – read the user manual

Round sling hook is used with round slings

Corner protections protect against sharp edges

## When should soft lifting equipment be replaced?

### Round slings

Examine the entire sling and check that there are no irregularities inside. Also check that the cover is undamaged and that the label is legible. Discard the sling if there is any damage to the protective fabric.

### Webbing slings / eye-eye webbing slings

Examine that the seams are intact and that the label is legible. Discard the lifting equipment if eye protection has worn out or if there is any edge damage to the webbing.

# LIFTING COMPONENTS

There are many different types of lifting components. Here we present the most common types in Grade 80 and Grade 100.
For more information, see Products/Lifting Equipment at www.forankra.se.

## Hooks for lifting equipment

Hooks should always be chosen according to the dimension and grade of the chain.

### **Sling hooks** – The most common hooks

Eye

Clevis

Swivel

### Shortening hooks

Clevis

Eye

### **Autolock hooks** – Locks automatically under load

Eye

Clevis

Swivel

### Foundry hook

Eye

### Choke hook

Used with Omega link

## Connecting links

Are used to combine lifting equipment

Standard

Omega link

Round sling connection slink

## Master links

For 1–2 part lifting equipment

For 3–4 part liftimg equipment

**Chemicals**
Lifting components Grade 80 and Grade 100 meet the chain's safety factor and must not come into contact with acids or other aggressive environments. The equipment must not be hot-dip galvanized.

**Temperature**
Lifting components Grade 80 and Grade 100 meet the chain's safety factor and must not be used at temperatures below -40°C or above +200°C. When using chains outside this range, the working load limit is reduced and special solutions must be applied.

## Things to keep in mind when using lifting components:

- Check the lifting components before use and discard them if cracks, wear and other damage are detected
- Check hook latches and connecting link locks before use
- Wear on hooks must not exceed 10% of the starting material
- Max. permissible permanent hook gap increase is 10%
- Extension of connecting links is not permitted
- Sand off sharp notches and burrs on worn surfaces

## Lifting appliances

Forankra has a wide range of lifting appliances, such as chain blocks, lifting hoists, beam clamps, lifting beams, magnetic lifting clamps as well as vertical and horizontal lifting clamps etc.
For more information, see Products/Lifting Equipment at www.forankra.se.


Chain block and Lever hoist


Beam clamp


Lifting beam


Magnetic lifting clamps


Lifting clamp

# Safe lifting

Safe lifting requires approved and certified products, as well as correct handling and inspection of the lifting equipment before use.

With Forankra as your partner, you can be sure that the products are manufactured according to applicable legislation and standards and that they are provided with the required documentation.

## Contact us

Our experts are available for questions and recommendations and to suggest safe lifting solutions adapted to your needs.
In addition we offer production of customized products and solutions as well as training in Safe lifting.

You are always welcome to contact us via tel. +46 (0)322-66 78 00 or info@forankra.se

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