

# SHACKLES



## Applications

Shackles are used in lifting operations and static systems as removable links to connect (steel) wire rope, chain and other fittings. Screw pin shackles are used mainly for non-permanent applications. Safety bolt and fixed nut shackles are used for long-term or permanent applications or where the load may slide on the pin causing rotation of the pin. Chain- or dee shackles are mainly used on one-leg systems whereas anchor- or bow shackles are mainly used on multi-leg systems.

## Range

Green Pin® offers a wide range of bow and dee shackles for a variety of applications. The range stretches from WLL 0.33 t to 3000 t. This provides our customers with a very extensive range to choose a shackle that suits their application best. Most of the shackles are directly available from stock. Furthermore, shackles can be supplied to many standards such as the US Federal Specification RR-C-271, EN 13889, ISO 2415, British Standard 3032, DIN 82101 etc. Additionally we offer a wide range of general commercial shackles, which are not suitable for lifting but merely for fixing purposes. Van Beest offers a wide range of other shackles to complement the Green Pin® assortment.

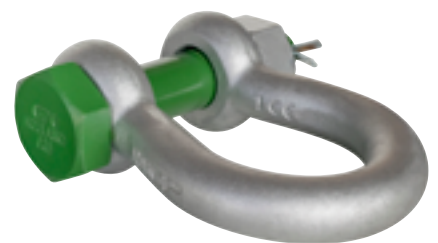
## Design

All Green Pin® shackles have a specific design for a specific application. Please find below some examples of highly functional designs, to optimize the use of the Green Pin® shackles in daily use:

- Green Pin Super® Shackles which are made from grade 8 steel. They are designed to be used in confined spaces. The higher material strength is used to reduce the physical dimensions of the product whilst maintaining its WLL and functionality;
- Green Pin Polar® Shackles are for use in extreme climatic conditions with material properties generally guaranteed up to temperatures of -60 °C;
- Green Pin Power Sling® Shackles are designed to provide a better bending efficiency for the sling. A larger radius increases the life span of the sling significantly;
- Another example of a functional design is a shackle pin with a square sunken hole. Because of the flat head there is less risk of the shackle getting caught in a net or a line.

How to recognize a genuine Green Pin® shackle?

- Marking in the shackle body and pin (from dia 13 mm and up)
- Steel grade (for example 6)
- CE conformity code
- Diameter bow (inch)
- Green Pin® logo (GP)
- Holland marking
- Working Load Limit (WLL in metric tonnes)
- Traceability code (2 letters)
- Green powder coated pin



Green Pin® Shackles meet all requirements of the Machinery Directive 2006/42/EC and its latest amendments.

## Finish

Shackles supplied by Green Pin® are either hot dipped galvanized, electro-galvanized, painted or self-coloured, depending on the type of shackle and its application. You can find the finish of each type of shackle in the product section further on.



## Certification

Upon request at time of order, all load rated shackles can be supplied with any of the following documents or certificates:

### Free of charge:

2.1 2.2 3.1 MTC<sup>a</sup> DNV 2.7-1<sup>a</sup> DNV 2.7-1<sup>b</sup> DNV 0377 DNV 0378 DNV NS 9415 CE IIA CE IIB ABS PDA ABS MA

### With additional charges:

MTC<sup>a</sup> MPI<sup>a</sup> MPI<sup>b</sup> US<sup>a</sup> US<sup>b</sup> DNV CG3 BL

On request the proof load test certificates can be supplied surveyed by an official classification society, such as LROS, DNV, BV, ABS or any other officially certified inspection body. Please verify your certification requirements with Green Pin<sup>®</sup> at the time of order.

Green Pin<sup>®</sup> Bow Shackles, Green Pin<sup>®</sup> Dee Shackles and Green Pin Polar<sup>®</sup> Shackles are DNV type approved. These shackles carry two DNV type approval certificates that show compliance with:

- DNV-ST-E271-2.71 Offshore Containers
- EN 12079-2 Offshore containers and associated lifting sets
- EN 13889 Forged steel shackles for general lifting purposes
- IMO/MSC Circular 860
- US Federal Specification RR-C-271
- DNV ST-E273 Portable Offshore Units
- DNV Standard No. 0378 Offshore and Platform Lifting Appliances
- ASME B30.26
- ISO 2415

The Green Pin Power Sling<sup>®</sup> Shackles are DNV type approved. This DNV type approval certificate is in compliance with:

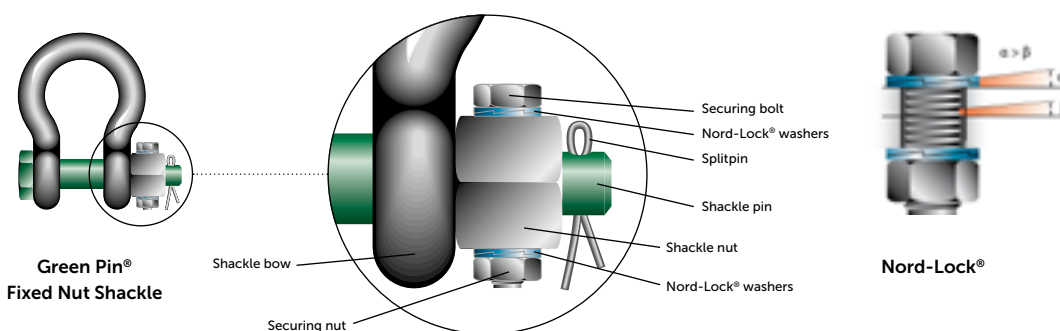
- DNV Standard for Certification No. 0377 Standard for Shipboard Lifting Appliances
- DNV Standard for Certification No. 0378 Offshore and Platform Lifting Appliances

Green Pin<sup>®</sup> Shackles G-4161, G-4163, G-4151, G-4153, G-5163, G-5261 and G-5263 are ABS Type Approved. The shackles have a Product Design Assessment Approval and a Manufacturer Assessment Approval Certificate. The shackles are type approved to be used as lifting gear or to be used as lifting device.

Type approval certificates can be found on [greenpin.com](http://greenpin.com).

## Fixed Nut Shackles

Shackles can also be used in more permanent constructions. These can be subject to dynamic loads and/or extreme vibrations. In such applications there is a risk that, over time, the nut may start to move over the thread. We offer our range of Green Pin<sup>®</sup> Fixed Nut Shackles to avoid this risk. All Green Pin<sup>®</sup> shackles with bolt and nut can be equipped with an extra AISI 316 securing bolt that is assembled through the nut and shackle pin. This securing bolt is fastened with two sets of Nord-Lock<sup>®</sup> washers and a securing nut. This will keep the shackle nut in position. The Nord-Lock<sup>®</sup> wedge-locking washers lock when subjected to extreme vibration or dynamic loads.

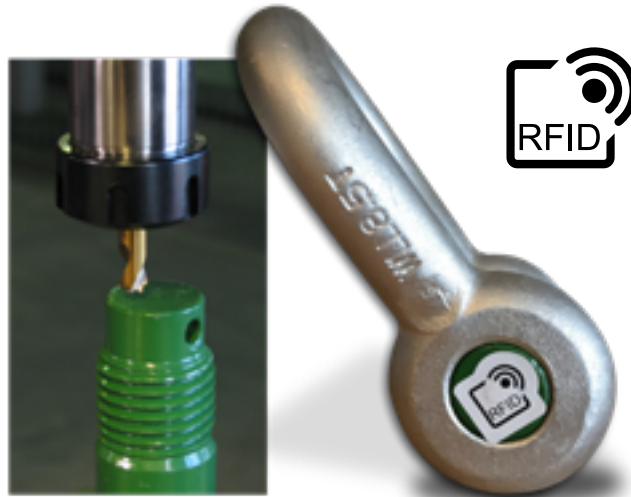


## Green Pin® Shackles with RFID

All lifting equipment requires regular inspection. Tracking and filing reports on paper can be a time consuming task. Green Pin® offers a solution with an easily accessible RFID (Radio Frequency Identification) chip in our range of Green Pin® Shackles. This RFID chip responds to a radio-signal that is transmitted by a reader. Each chip has a unique number and this number links the individual shackle to a record in an inspection management system. The chips are impact resistant and durable and they are countersunk into the end of the shackle pin. The chips are NFC (Near Field Communication) compatible, allowing users to scan, identify and track the shackles with the latest generation of NFC compatible smartphones.

Green Pin® offers the option of RFID implementation in all Green Pin® shackles. For detailed technical information please go to [www.greenpin.com/FAQ](http://www.greenpin.com/FAQ).

- **RF Protocol :** ISO 15693
- **Operating Frequency :** HF – 13.56 MHz



## Testing

Generally load rated products are Proofload tested, and certificates can be supplied upon request. For specific information on certificates we refer to the separate paragraph on certification.

Green Pin® shackles are Proofload tested (bow-pin configuration) at the following loads:

working load limit	Green Pin® Bow or Dee Shackles Polar® Shackles Heavy Duty Shackles BigMouth® Bow Shackle proof load	Green Pin Super® Shackles proof load	Green Pin® Sling Shackles proof load	Green Pin Power Sling® Shackle proof load	Green Pin® Web Sling Shackle proof load	Green Pin BigMouth® Dee Shackle proof load
t	t	t	t	t	t	t
0.33	0.66					
0.5	1					
0.75	1.5					
1	2					
1.5	3					
2	4					
3.25	6.5				8.13	
3.3		6.6				
4.6						9.2
4.75	9.5				11.88	
5		10				
6.5	13				16.25	
7		14	14			
8.5	17				21.25	
8.6						17.2
9.5	19	19				
12	24					
12.5		25	25			
13.5	27					
15		30				
15.5						31
16	32					
17	34					
18		36	36			
21		42				
25	50					
30	60	60	60			
35	70					
40		80	80			
42.5	85					
55	110	110	110			
75	150		150			
85	170	170				
120	240	240				
125			250	250		
150	300	300	300	300		
175		350				
200	400		300	400		
250	500		375	500		
300	600		450	600		
400	600		532	800		
500	750		750	1000		
600	900		900	900		
700	1050		931	1050		
800	1200		1064	1200		
900	1350		1350	1350		
1000	1500		1330	1500		
1250	1875		1663	1875		
1500	2250					
1550			2061.5	2325		

## Instructions for use

Select the correct type and WLL of the shackle for the particular application. If extreme circumstances or shock loading may occur, this must be taken into account when selecting the correct shackle. Please note that commercial shackles are not to be used for lifting applications.

Shackles should be inspected before use to ensure that:

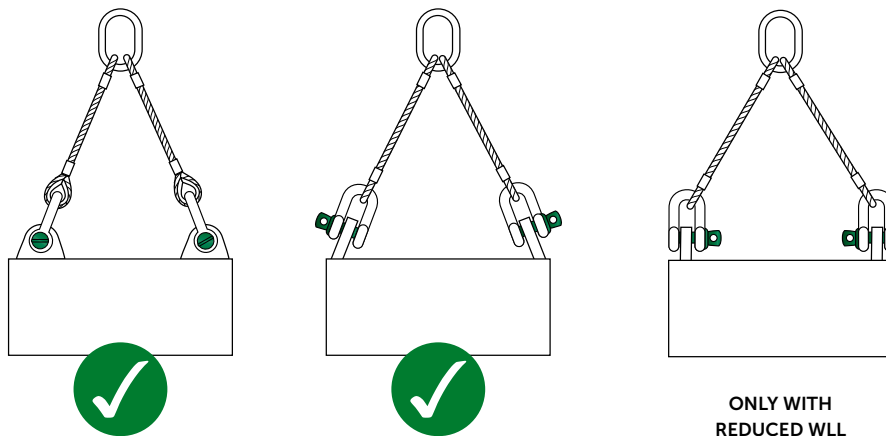
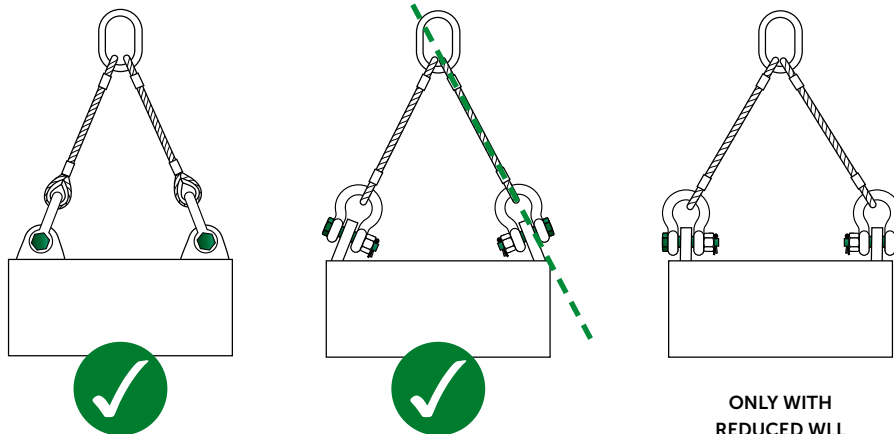
- all markings are legible;
- the body and pin are both of the same brand and type;
- the body and pin are both of the correct size;
- never use a safety bolt type shackle without using a securing pin;
- the pin, nut, cotter pin, or any other locking system cannot vibrate out of position;
- the threads of the pin and the body are undamaged;
- the body and the pin are not distorted or unduly worn;
- the body and pin are free from nicks, gouges, cracks and corrosion;
- shackles may not be heat treated as this may affect their WLL;
- never modify, repair or reshape a shackle by machining, welding, heating or bending as this will affect the WLL.

## Assembly

Ensure that the pin is correctly screwed into the shackle eye: tighten it hand-tight, then secure it using a wrench or other suitable tool so that the collar of the pin is fully seated against the shackle eye. Ensure that the pin is of the correct length so that it penetrates the full depth of the threaded eye and the collar of the pin touches the surface of the shackle eye.

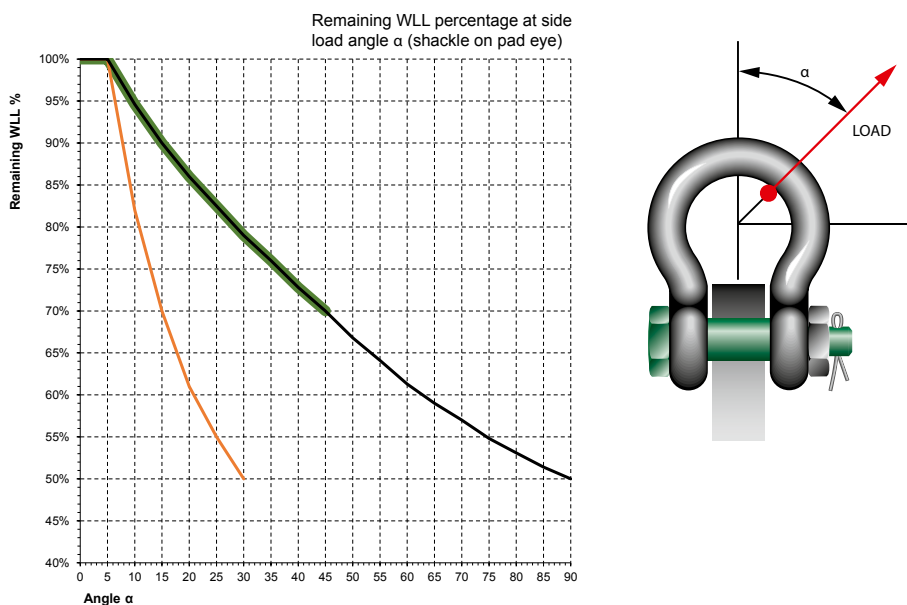
Incorrect positioning of the pin may be caused by a bent pin, too tight fitting thread or misalignment of the pin holes. Do not use the shackle under these circumstances. Never replace a shackle pin except with one of the same brand, type, make and size to ensure the shackle maintains its original WLL.

Make sure that the shackle is supporting the load correctly, i.e. along the axis of the shackle body centerline. Avoid bending loads, unstable loads and overloads.



## Side loads

Side loads should be avoided, as the products are not designed for this purpose. If side loads cannot be avoided, the WLL of the shackle must be reduced:

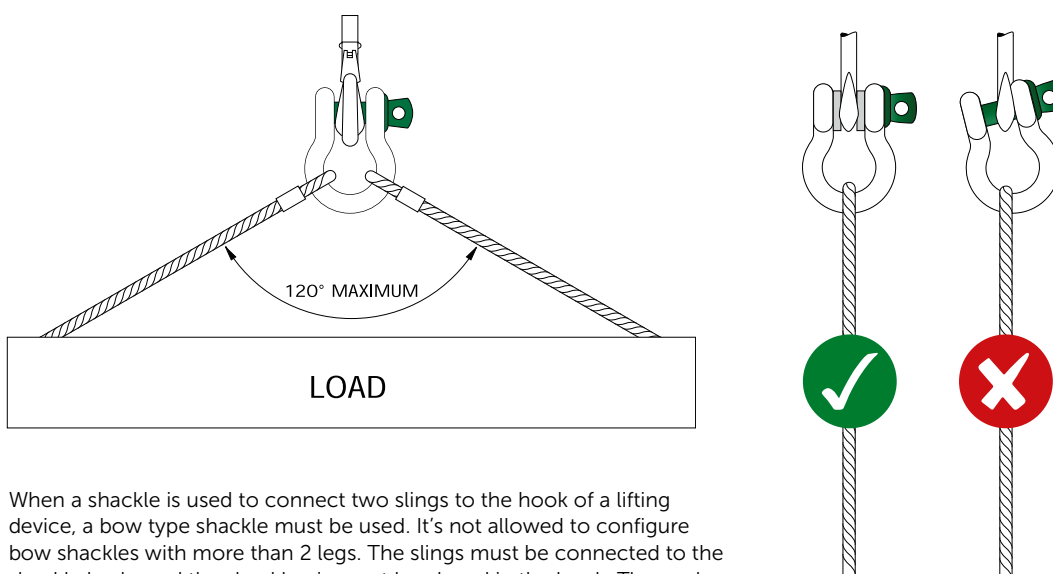


This black curve is valid for almost all Green Pin® shackles, except for ROV Shackles (P-5363 and P-5367) which are for in-line use only. The green curve is valid for Green Pin® Sling Shackles (P-6033, P-6013 and P-6065) and the orange curve is valid for the Green Pin Power Sling® Shackles (P-6043).

In-line lifting is considered to be a load perpendicular to the pin axis and in the plane of the bow. The load angles in the graph represent the deviating angles from in-line loading.

## Maximum loading angle

When connecting shackles to multi-leg slings, consider the effect of the angle between the legs of the sling. As the angle increases, so does the load in the sling leg and consequently in any shackle attached to that leg.



When a shackle is used to connect two slings to the hook of a lifting device, a bow type shackle must be used. It's not allowed to configure bow shackles with more than 2 legs. The slings must be connected to the shackle body, and the shackle pin must be placed in the hook. The angle between the slings should not exceed 120°. If symmetrically loaded the shackle may be used to the full WLL.

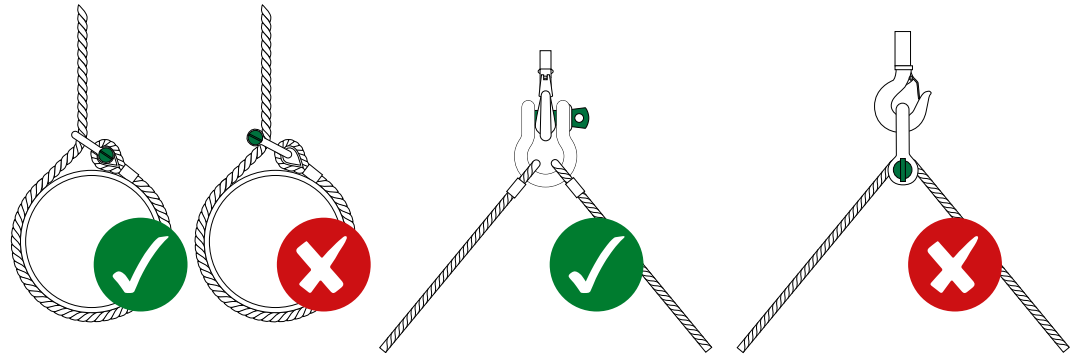
## Avoiding eccentric loading

To avoid eccentric loading of the shackle a loose spacer may be used on either end of the shackle pin. Do not reduce the width between the shackle jaws by welding washers or spacers to the inside of the shackle eyes or by narrowing the jaws, as this will affect the WLL of the shackle.

When a shackle is attached to the top block of a set of wire rope blocks the load on this shackle is increased by the value of the hoisting effect.

## Avoiding pin rotation

Avoid applications where the load moves over the shackle pin; the pin may rotate and possibly be unscrewed. If moving of the load cannot be avoided, or when the shackle is to be left in place for a prolonged period or where maximum pin security is required, use a shackle with a safety bolt, nut and cotter pin or a shackle with a fixed nut.

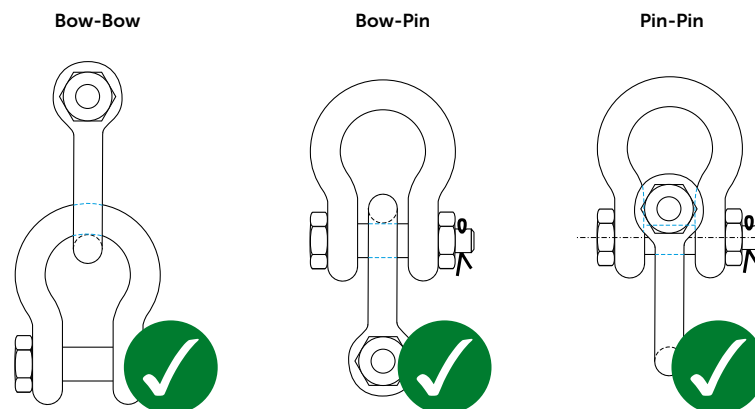


## Chemicals

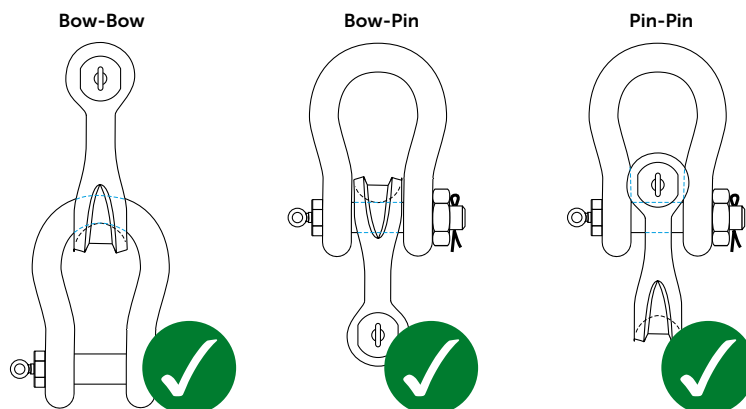
Shackles should not be immersed in acidic solutions or exposed to acidic fumes or other chemicals that are potentially harmful to the shackle.

## Point loading

Shackles are used in lifting- and static systems as removable links to connect (steel) wire rope, chain and other fittings. Most of the times the load bearing component that connects to a shackle is of a rounded shape. Point loading of shackles during lifting operations is allowed. The maximum load of the configuration is limited by the component with the lowest WLL. Increasing the contact area by using bigger diameters and/or pad eyes can be an advantage. Sharp edges shall be avoided. Green Pin® shackles can also be used in below configurations. The maximum load of the configuration is limited by the component with the lowest WLL.

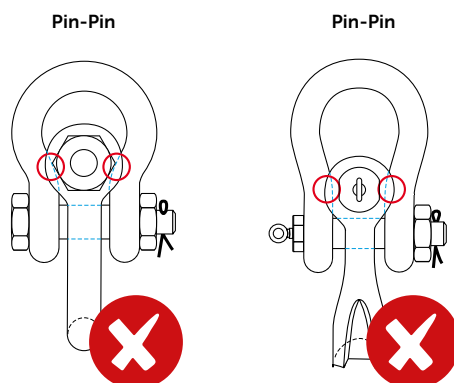


The crown of a Green Pin® Sling Shackle (P-6033) is wider than that of a standard shackle, thus creating a larger bearing surface. This improves the lifetime of the sling. Green Pin® Sling shackles can also be used in below configurations. The maximum load of the configuration is limited by the component with the lowest WLL. For information about point loading of the Green Pin Power Sling® Shackle (P-6043) please contact sales@vanbeest.eu.



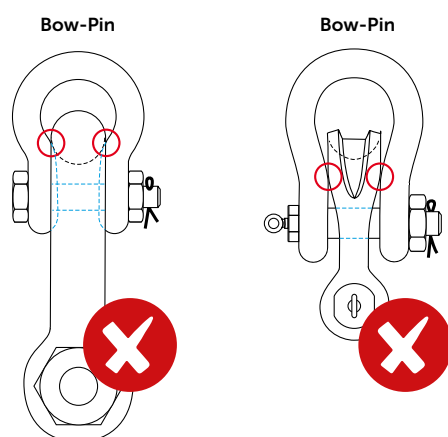
### Pin- Pin configuration

When the shackle eyes touch and the pins do not bear properly, the configuration shall not be used.



### Bow- Pin configuration

When the shackle body of the inner shackle touches the shackle eyes of the outer shackle and body and pin do not bear properly, the configuration shall not be used.



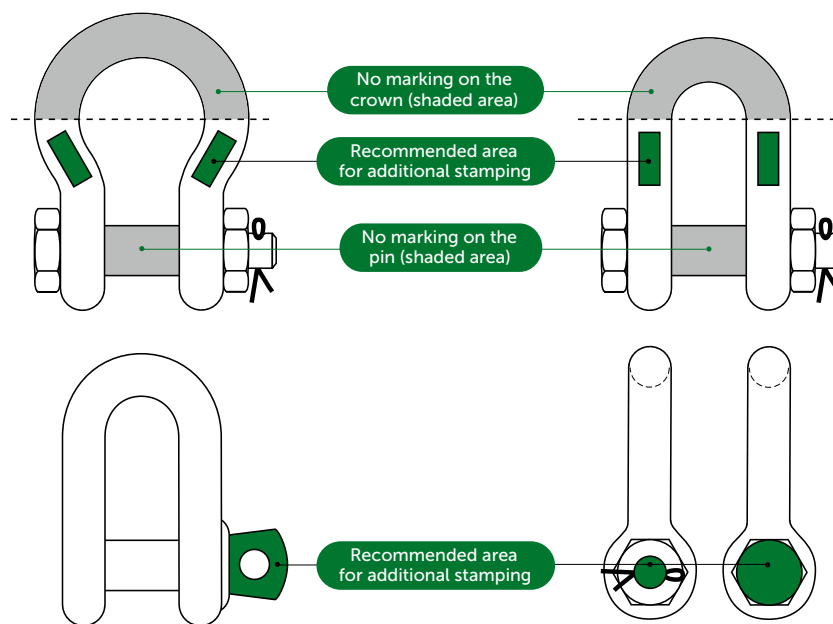
Contact Royal Van Beest, to check if a certain configuration is possible.

## Additional markings

It is possible to add additional stamping on Green Pin® shackles, but make sure that you follow the recommendations below. If the recommendations are followed, the performance of the shackles is guaranteed.

- permanent identification marks or symbols are to be made by dot peen marking or with stamps having rounded profiles (low-stress stamps);
- laser markings are allowed as long as the heat of the laser does not influence in a negative way the material structure and properties. The laser marking must be legibly and indelibly marked in a place where the markings will not be removed by use;
- the number of marks on a shackle is to be kept to a minimum;
- the use of fractions and oblique strokes is to be avoided and a dot or hyphen is preferable to a dividing line;
- values of WLL are, generally, to be marked to one place of decimals (except for 0.25 and 0.75) up to 100 t and in integers thereafter. The word "tonnes" may be abbreviated to "t";
- recommended sizes of marks are
  - Diameter of the part to be marked > recommended size of the mark;
  - less than 12.5 mm > 3.0 mm;
  - 12.5 to 26 mm > 4.5 mm;
  - over 26 mm > 6.0 mm.

Typical arrangements of marks can be found in the following illustrations.



## Temperature

If extreme temperature situations occur, the following load reductions must be taken into account:

Temperature	Reduction for elevated temperatures New Working Load Limit
up to 200 °C	100% of original Working Load Limit
200 - 300 °C	90% of original Working Load Limit
300 - 400 °C	75% of original Working Load Limit
> 400 °C	not allowed

The rating of shackles to EN 13889 assumes the absence of exceptionally hazardous conditions. Exceptionally hazardous conditions include offshore activities, the lifting of persons and the lifting of potentially dangerous loads such as molten metals, corrosive materials or fissile materials. In such cases a competent person should assess the degree of hazard and the WLL should be reduced accordingly.

## Inspection

Shackles must be regularly inspected in accordance with the safety standards and regulations given in the country of use. This is required because the products in use may be affected by wear, misuse, overloading etc. which may lead to deformation and alteration of the material structure. Inspection should take place at least every six months (follow the local rules in the country of use) and more frequently when the shackles are used in severe operating conditions.